

STATE OF DELAWARE  
DEPARTMENT OF EDUCATION  
DSC PROJECT NO. 2-26-31

SPECIFICATIONS  
FOR

**RENOVATIONS TO DICKINSON HIGH SCHOOL**

AT

1801 MILLTOWN ROAD  
WILMINGTON, DELAWARE 19808

PREPARED  
BY

GILBERT ARCHITECTS  
GA PROJECT NO. 2501

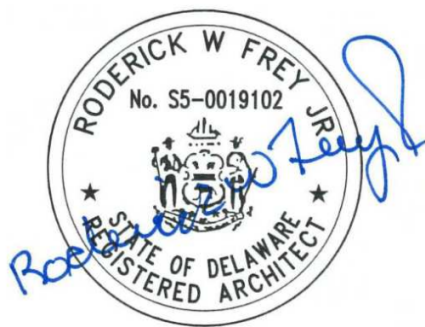
ISSUED FOR BID  
APRIL 2026

**SECTION 00 0107  
SEALS PAGE**

**Architect**

"The Contract Documents for the indicated public improvement were prepared under my supervision and, to the best of my knowledge, information and belief, they comply with the relevant building codes and Standards of the State of Delaware."

01



**Site/Civil Engineer**

"I hereby certify that the Site/Civil Documents were prepared or approved by me, and that I am a duly licensed Professional Engineer under the laws of the State of Delaware."



**Mechanical, /Plumbing/Electrical Engineers**

"I hereby certify that the Mechanical, Plumbing, and Electrical Documents were prepared or approved by me, and that I am a duly licensed Professional Engineer under the laws of the State of Delaware."



**END OF SECTION**

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**H.V.A.C.**

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**END OF SECTION**

**SECTION 00 0116  
INVITATION TO BID**

Sealed bids for **Red Clay Consolidated School District Contract No. 2-26-06 - Renovations to Dickinson High School** will be received by Red Clay Consolidated School District at the **Red Clay Consolidated School District Facilities Office, located at 1798 Limestone Road, Wilmington, DE 19804**, until **2:00pm local time on June 3, 2026** at which time bids will be publicly opened and read aloud. Bidder bear the risk of late delivery. Any bids received after the stated time will be returned unopened.

The project involves select MPE upgrades and renovations for accessibility.

A **MANDATORY** Pre-Bid Meeting will be held on **May 19, 2026 at 1:00pm local time at Stanton Middle School, 1800 Limestone Road, Wilmington, DE 19804**, for the purpose of establishing the list 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 Red Clay Consolidated School District, District Administration Building, 1502 Spruce Avenue, Wilmington, DE 19805. The outer envelope should clearly indicate: **“RENOVATIONS TO DICKINSON HIGH SCHOOL – SEALED BID – DO NOT OPEN.”**

Contract documents may be obtained at Reprographics Center, Inc., 298 Churchmans Road, New Castle, DE 19720, phone 302-398-5019 upon receipt of \$75 per electronic set/non-refundable. Checks are to be made payable to “Gilbert Architects.”

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.

**END OF SECTION**

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**SECTION 00 2113  
INSTRUCTIONS TO BIDDERS**

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6. POST-BID INFORMATION
7. PERFORMANCE BOND AND PAYMENT BOND
8. FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR



**ARTICLE 1: GENERAL**

**1.1 DEFINITIONS**

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

1.2 STATE: The State of Delaware.

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

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

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

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

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

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

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

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

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

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

- 1.13 BID: A complete and properly executed proposal to do the Work for the sums stipulated therein, submitted in accordance with the Bidding Documents.
- 1.14 BASE BID: The sum stated in the Bid for which the Bidder offers to perform the Work described in the Bidding Documents as the base, to which Work may be added or from which Work may be deleted for sums stated in Alternate Bids (if any are required to be stated in the bid).
- 1.15 ALTERNATE BID (or ALTERNATE): An amount stated in the Bid, where applicable, to be added to or deducted from the amount of the Base Bid if the corresponding change in the Work, as described in the Bidding Documents is accepted.
- 1.16 UNIT PRICE: An amount stated in the Bid, where applicable, as a price per unit of measurement for materials, equipment or services or a portion of the Work as described in the Bidding Documents.
- 1.17 SURETY: The corporate body which is bound with and for the Contract, or which is liable, and which engages to be responsible for the Contractor's payments of all debts pertaining to and for his acceptable performance of the Work for which he has contracted.
- 1.18 BIDDER'S DEPOSIT: The security designated in the Bid to be furnished by the Bidder as a guaranty of good faith to enter into a contract with the Agency if the Work to be performed or the material or equipment to be furnished is awarded to him.
- 1.19 CONTRACT: The written agreement covering the furnishing and delivery of material or work to be performed.
- 1.20 CONTRACTOR: Any individual, firm or corporation with whom a contract is made by the Agency.
- 1.21 SUBCONTRACTOR: An individual, partnership or corporation which has a direct contract with a contractor to furnish labor and materials at the job site, or to perform construction labor and furnish material in connection with such labor at the job site.
- 1.22 CONTRACT BOND: The approved form of security furnished by the contractor and his surety as a guaranty of good faith on the part of the contractor to execute the work in accordance with the terms of the contract.
- 1.23 CUSTOM FABRICATION: As defined in 29 Del. C. § 6902, the term "custom fabrication" means the offsite fabrication, assembly, or other production of non-standard goods or materials, including components, fixtures or parts thereof, specifically for a public works project. Such goods and materials shall include those used in the following trades or systems: (1) Plumbing or pipe fitting systems, including heating, ventilating, air-conditioning, refrigeration systems, sheet metal or other duct systems; (2) Electrical systems; (3) Mechanical insulation work; (4) Ornamental iron work; and (5) Commercial signage that does not attempt or appear to direct the movement of traffic on highways or roadways or interfere with, imitate, or resemble any official traffic sign, signal or device.

**ARTICLE 2: BIDDER'S REPRESENTATION**

- 2.1 PRE-BID MEETING

- 2.1.1 A pre-bid meeting for this project will be held at the time and place designated. Attendance at this meeting is a pre-requisite for submitting a Bid, unless this requirement is specifically waived elsewhere in the Bid Documents.
- 2.2 By submitting a Bid, the Bidder represents that:
  - 2.2.1 The Bidder has read and understands the Bidding Documents and that the Bid is made in accordance therewith.
  - 2.2.2 The Bidder has visited the site, become familiar with existing conditions under which the Work is to be performed, and has correlated the Bidder's personal observations with the requirements of the proposed Contract Documents.
  - 2.2.3 The Bid is based upon the materials, equipment, and systems required by the Bidding Documents without exception.
  - 2.2.4 Bidder has accounted for the possibility of price increases due to the direct and indirect effect of tariffs, other international events, inflation, and supply chain interruptions. Change Orders will be denied if they are based upon any of these events. Bidder is expected to account for these possibilities and include them in the bid.
- 2.3 JOINT VENTURE REQUIREMENTS
  - 2.3.1 For Public Works Contracts, each Joint Venturer shall be qualified and capable to complete the Work with their own forces.
  - 2.3.2 Included with the Bid submission, and as a requirement to bid, a copy of the executed Joint Venture Agreement shall be submitted and signed by all Joint Venturers involved.
  - 2.3.3 All required Bid Bonds, Performance Bonds, Material and Labor Payment Bonds must be executed by both Joint Venturers and be placed in both of their names.
  - 2.3.4 All required insurance certificates shall name both Joint Venturers.
  - 2.3.5 Both Joint Venturers shall sign the Bid Form.
  - 2.3.6 Both Joint Venturers shall include their Federal E.I. Number with the Bid.
  - 2.3.7 In the event of a mandatory Pre-bid Meeting, each Joint Venturer shall have a representative in attendance.
  - 2.3.8 Due to exceptional circumstances and for good cause shown, one or more of these provisions may be waived at the discretion of the State.
- 2.4 ASSIGNMENT OF ANTITRUST CLAIMS
  - 2.4.1 As consideration for the award and execution by the Owner of this contract, the Contractor hereby grants, conveys, sells, assigns and transfers to the State of Delaware all of its right, title and interests in and to all known or unknown causes of action it presently has or may now or hereafter acquire under the antitrust laws of the United States and the State of Delaware, relating to the particular goods or services purchased or acquired by the Owner pursuant to this contract.

**ARTICLE 3: BIDDING DOCUMENTS**

3.1 COPIES OF BID DOCUMENTS

- 3.1.1 Bidders may obtain complete sets of the Bidding Documents from the Architectural/Engineering firm designated in the Advertisement or Invitation to Bid in the number and for the deposit sum, if any, stated therein.
- 3.1.2 Bidders shall use complete sets of Bidding Documents for preparation of Bids. The issuing Agency nor the Architect assumes no responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.
- 3.1.3 Any errors, inconsistencies or omissions discovered shall be reported to the Architect immediately.
- 3.1.4 The Agency and Architect may make copies of the Bidding Documents available on the above terms for the purpose of obtaining Bids on the Work. No license or grant of use is conferred by issuance of copies of the Bidding Documents.

3.2 INTERPRETATION OR CORRECTION OF BIDDING DOCUMENTS

- 3.2.1 The Bidder shall carefully study and compare the Bidding Documents with each other, and with other work being bid concurrently or presently under construction to the extent that it relates to the Work for which the Bid is submitted, shall examine the site and local conditions, and shall report any errors, inconsistencies, or ambiguities discovered to the Architect.
- 3.2.2 Bidders or Sub-bidders requiring clarification or interpretation of the Bidding Documents shall make a written request to the Architect at least seven days prior to the date for receipt of Bids. Interpretations, corrections and changes to the Bidding Documents will be made by written Addendum. Interpretations, corrections, or changes to the Bidding Documents made in any other manner shall not be binding.
- 3.2.3 The apparent silence of the specifications as to any detail, or the apparent omission from it of detailed description concerning any point, shall be regarded as meaning that only the best commercial practice is to prevail and only material and workmanship of the first quality are to be used. Proof of specification compliance will be the responsibility of the Bidder.
- 3.2.4 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for all permits, labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for the proper execution and completion of the Work.
- 3.2.5 The Owner will bear the costs for all impact and user fees associated with the project.

3.3 SUBSTITUTIONS

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

- 3.3.2 Requests for substitutions shall be made in writing to the Architect at least ten days prior to the date of the Bid Opening. Such requests shall include a complete description of the proposed substitution, drawings, performance and test data, explanation of required installation modifications due the substitution, and any other information necessary for an evaluation. The burden of proof of the merit of the proposed substitution is upon the proposer. The Architect's decision of approval or disapproval shall be final. The Architect is to notify Owner prior to any approvals.
- 3.3.3 If the Architect approves a substitution prior to the receipt of Bids, such approval shall be set forth in an Addendum. Approvals made in any other manner shall not be binding.
- 3.3.4 The Architect shall have no obligation to consider any substitutions after the Contract award.
- 3.4 ADDENDA
- 3.4.1 Addenda will be mailed or delivered to all who are known by the Architect to have received a complete set of the Bidding Documents.
- 3.4.2 Copies of Addenda will be made available for inspection wherever Bidding Documents are on file for that purpose.
- 3.4.3 No Addenda will be issued later than 2 calendar days prior to the date for receipt of Bids except an Addendum withdrawing the request for Bids or one which extends the time or changes the location for the opening of bids.
- 3.4.4 Each bidder shall ascertain prior to submitting his Bid that they have received all Addenda issued, and shall acknowledge their receipt in their Bid in the appropriate space. Not acknowledging an issued Addenda could be grounds for determining a bid to be non-responsive.

#### **ARTICLE 4: BIDDING PROCEDURES**

- 4.1 PREPARATION OF BIDS
- 4.1.1 Submit the bids on the Bid Forms included with the Bidding Documents.
- 4.1.2 Submit the original Bid Form for each bid. Bid Forms may be removed from the project manual for this purpose.
- 4.1.3 Execute all blanks on the Bid Form.
- 4.1.4 Where so indicated by the makeup on the Bid Form, express sums in both words and figures, in case of discrepancy between the two, the written amount shall govern.
- 4.1.5 BID ALL REQUESTED ALTERNATES AND UNIT PRICES, IF ANY. If there is no change in the Base Bid for an Alternate, enter "No Change". The Contractor is responsible for verifying that they have received all addenda issued during the bidding period. Work required by Addenda shall automatically become part of the Contract.
- 4.1.6 Make no additional stipulations on the Bid Form and do not qualify the Bid in any other manner.
- 4.1.7 Each copy of the Bid shall include the legal name of the Bidder and a statement whether the Bidder is a sole proprietor, a partnership, a corporation, or any legal entity, and each copy shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid by a corporation shall further give the state of incorporation and have the corporate seal

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

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

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

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

## 4.2 BID SECURITY

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

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

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

## 4.3 SUBCONTRACTOR LIST

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

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

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

#### 4.4 AFFIDAVIT OF CONTRACTOR QUALIFICATIONS

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

#### 4.5 AFFIDAVIT OF CRAFT TRAINING COMPLIANCE

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

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

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

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

#### 4.6 EQUALITY OF EMPLOYMENT OPPORTUNITY ON PUBLIC WORKS

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

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

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

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

#### 4.7 PREVAILING WAGE REQUIREMENT

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

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

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

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

#### 4.8 SUBMISSION OF BIDS

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

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

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

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

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



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

4.9 MODIFICATION OR WITHDRAW OF BIDS

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

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

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

**ARTICLE 5: CONSIDERATION OF BIDS**

5.1 OPENING/REJECTION OF BIDS

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

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

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

5.2 COMPARISON OF BIDS

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

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

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

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

- 5.2.5 No qualifying letter or statements in or attached to the Bid, or separate discounts will be considered in determining the low Bid except as may be otherwise herein noted. Cash or separate discounts should be computed and incorporated into Unit Bid Price(s).
- 5.2.6 Bidder must account for the possibility of price increases due to the direct and indirect effect of tariffs or other international events, inflation, and supply chain interruptions. Change Orders will be denied if they are based upon any of these events. Bidder is expected to account for these possibilities and include them in the bid.
- 5.3 DISQUALIFICATION OF BIDDERS
- 5.3.1 An agency shall determine that each Bidder on any Public Works Contract is responsible before awarding the Contract. Factors to be considered in determining the responsibility of a Bidder include:
- A. The Bidder's financial, physical, personnel or other resources including Subcontracts;
  - B. The Bidder's record of performance on past public or private construction projects, including, but not limited to, defaults and/or final adjudication or admission of violations of the Prevailing Wage Laws in Delaware or any other state;
  - C. The Bidder's written safety plan;
  - D. Whether the Bidder is qualified legally to contract with the State;
  - E. Whether the Bidder supplied all necessary information concerning its responsibility; and,
  - F. Any other specific criteria for a particular procurement, which an agency may establish; provided however, that, the criteria be set forth in the Invitation to Bid and is otherwise in conformity with State and/or Federal law.
  - G. Any Bidder who is debarred in another State and/or by the United States Government is also debarred in Delaware.
- 5.3.2 If an agency determines that a Bidder is nonresponsive and/or nonresponsible, the determination shall be in writing and set forth the basis for the determination. A copy of the determination shall be sent to the affected Bidder within five (5) working days of said determination.
- 5.3.3 In addition, any one or more of the following causes may be considered as sufficient for the disqualification of a Bidder and the rejection of their Bid or Bids.
- 5.3.3.1 More than one Bid for the same Contract from an individual, firm or corporation under the same or different names.
- 5.3.3.2 Evidence of collusion among Bidders.
- 5.3.3.3 Unsatisfactory performance record as evidenced by past experience.
- 5.3.3.4 If the Unit Prices are obviously unbalanced either in excess or below reasonable cost analysis values.

- 5.3.3.5 If there are any unauthorized additions, interlineation, conditional or alternate bids or irregularities of any kind which may tend to make the Bid incomplete, indefinite or ambiguous as to its meaning.
- 5.3.3.6 If the Bid is not accompanied by the required Bid Security and other data required by the Bidding Documents.
- 5.3.3.7 If any exceptions or qualifications of the Bid are noted on the Bid Form.
- 5.4 ACCEPTANCE OF BID AND AWARD OF CONTRACT
- 5.4.1 A formal Contract shall be executed with the successful Bidder within twenty (20) calendar days after the award of the Contract.
- 5.4.2 Per Section 6962(d)(13)a., Title 29, Delaware Code, "The contracting agency shall award any public works contract within thirty (30) days of the bid opening to the lowest responsive and responsible Bidder, unless the Agency elects to award on the basis of best value, in which case the election to award on the basis of best value shall be stated in the Invitation To Bid. Any public school district and its board shall award public works contracts in accordance with this section's requirements except it shall award the contract within 60 days of the bid opening."
- 5.4.3 Each Bid on any Public Works Contract must be deemed responsive by the Agency to be considered for award. A responsive Bid shall conform in all material respects to the requirements and criteria set forth in the Contract Documents and specifications.
- 5.4.4 The Agency shall have the right to accept Alternates in any order or combination, and to determine the low Bidder on the basis of the sum of the Base Bid, plus accepted Alternates.
- 5.4.5 The successful Bidder shall execute a formal contract, submit the required Insurance Certificate, and furnish good and sufficient bonds, unless specifically waived in the General Requirements, in accordance with the General Requirement, within twenty (20) days of official notice of contract award. The successful Bidder shall provide, at least two business days prior to contract execution, copies of the Employee Drug Testing Program for the Bidder and all listed Subcontractors. Bonds shall be for the benefit of the Agency with surety in the amount of 100% of the total contract award. Said Bonds shall be conditioned upon the faithful performance of the contract. Bonds shall remain in affect for period of two (2) years after the date of the Certificate of Final Payment.
- 5.4.6 If the successful Bidder fails to execute the required Contract, Bond and all required information, as aforesaid, within twenty (20) calendar days after the date of official Notice of the Award of the Contract, their Bid guaranty shall immediately be taken and become the property of the State for the benefit of the Agency as liquidated damages, and not as a forfeiture or as a penalty. Award will then be made to the next lowest qualified Bidder of the Work or readvertised, as the Agency may decide.
- 5.4.7 Each bidder shall supply with its bid its taxpayer identification number (i.e., federal employer identification number or social security number) and should the vendor be awarded a contract, such vendor shall provide to the agency the taxpayer identification license numbers of such subcontractors. Such numbers shall be provided on the later of the date on which such subcontractor is required to be identified or the time the contract is executed. The successful Bidder shall provide to the agency to which it is contracting, within 30 days of entering into such public works contract, copies of all Delaware Business licenses of subcontractors and/or independent contractors that will perform work for such public works contract. However, if a

subcontractor or independent contractor is hired or contracted more than 20 days after the Bidder entered the public works contract the Delaware Business license of such subcontractor or independent contractor shall be provided to the agency within 10 days of being contracted or hired.

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

#### **ARTICLE 6: POST-BID INFORMATION**

##### **6.1 CONTRACTOR'S QUALIFICATION STATEMENT**

- 6.1.1 Bidders to whom an award of a Contract is under consideration shall, if requested by the Agency, submit a properly executed AIA Document A305, Contractor's Qualification Statement, unless such a statement has been previously required and submitted.
- 6.2 Bidders to whom an award of a Contract has been made must produce their Delaware Business License before the Contract can be executed.

#### **ARTICLE 7: PERFORMANCE BOND AND PAYMENT BOND**

##### **7.1 BOND REQUIREMENTS**

- 7.1.1 The cost of furnishing the required Bonds, that are stipulated in the Bidding Documents, shall be included in the Bid.
- 7.1.2 If the Bidder is required by the Agency to secure a bond from other than the Bidder's usual sources, changes in cost will be adjusted as provide in the Contract Documents.
- 7.1.3 The Performance and Payment Bond forms used shall be the standard OMB forms (attached).

##### **7.2 TIME OF DELIVERY AND FORM OF BONDS**

- 7.2.1 The bonds shall be dated on or after the date of the Contract.
- 7.2.2 The Bidder shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix a certified and current copy of the power of attorney.
- 7.2.3 The Performance Bond and/or the Payment Bond may be electronic bonds and need not be transmitted as paper documents.

#### **ARTICLE 8: FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR**

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

**END OF SECTION**

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BID FORM  
00 41 13

ALTERNATE No. A-03: Provide restorative bonding of floor and base tile in Toilet G107 and Toilet G108.

Add/Deduct: \_\_\_\_\_  
(\$ \_\_\_\_\_ )

ALTERNATE No. A-04: In Auditorium C111, remove existing and provide new Fixed Audience Seating. In Auditorium C111 and Stage C112, remove existing and provide new carpet. Auditorium C111, construct concrete ADA platform. In Auditorium C111, provide handrails. In Auditorium C111, paint existing wood base and provide new painted quarter round trim at all wood base. In Auditorium C111, paint all hollow metal doors and frames (Auditorium side only).

Add/Deduct: \_\_\_\_\_  
(\$ \_\_\_\_\_ )

ALTERNATE No. A-05: In Auditorium C111, provide high performance coating on concrete floor under Fixed Audience Seating and exposed portion of new concrete ADA platform.

Add/Deduct: \_\_\_\_\_  
(\$ \_\_\_\_\_ )

ALTERNATE No. A-06: In Auditorium C111, remove existing half walls and provide new full height partitions and wood diffusers. Provide new wood base and quarter round trim..

Add/Deduct: \_\_\_\_\_  
(\$ \_\_\_\_\_ )

ALTERNATE No. A-07: In Toilet Rooms A100B, A109E, A109F, A111, A113C, A113D, A117D, A117F, A119, C105A, C107A, C112C, C112E, M112, M114, M115A, M115B, M117, M119, M203, M205, M221, and M223 remove base and wall finish from partitions in its entirety. Provide new ceramic tile cove base CTB-1 and new ceramic tile wainscot CTB-2 to 7'-6" A.F.F in all rooms except A109F, A113C, A113D, and A117F. In those four rooms, provide new ceramic tile cove base CTB-1 and new full-height ceramic wall tile CTB-2.

Add/Deduct: \_\_\_\_\_  
(\$ \_\_\_\_\_ )

## **ALLOWANCES**

The base bid above includes all allowances specified in the contract documents.

Allowance No. 1: include an allowance entitled "General Owner's Allowance", in the amount of **\$100,000.00**. This allowance be utilized by the owner for owner-elected changes to the Work. Any or all unused allowance monies shall be returned to the owner via credit change order at the end of the project. This allowance shall be carried as an individual line-item on the Application for Payments. Acknowledge/Initial: \_\_\_\_\_

RENOVATIONS TO DICKINSON HIGH SCHOOL  
NEW CASTLE COUNTY, DELAWARE  
RCCSD PROJECT NO. 2-26-06

**BID FORM**

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:** \_\_\_\_\_  
(SEAL) ( Authorized Signature )  
\_\_\_\_\_  
( Title )  
**Date:** \_\_\_\_\_

**ATTACHMENTS**

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



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RENOVATIONS TO DICKINSON HIGH SCHOOL  
NEW CASTLE COUNTY, DELAWARE  
RCCSD PROJECT NO. 2-26-06

**BID FORM**

**SUBCONTRACTOR LIST**

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

| <u>Subcontractor Category</u> | <u>Subcontractor</u> | <u>Address (City &amp; State)</u> | <u>Subcontractors tax-payer ID #<br/>or Delaware Business license #</u> |
|-------------------------------|----------------------|-----------------------------------|-------------------------------------------------------------------------|
| 1. Masonry                    |                      |                                   |                                                                         |
| A.                            |                      |                                   |                                                                         |
| B.                            |                      |                                   |                                                                         |
| C.                            |                      |                                   |                                                                         |
| 2. Metal Studs and Drywall    |                      |                                   |                                                                         |
| A.                            |                      |                                   |                                                                         |
| B.                            |                      |                                   |                                                                         |
| C.                            |                      |                                   |                                                                         |

RENOVATIONS TO DICKINSON HIGH SCHOOL  
NEW CASTLE COUNTY, DELAWARE  
RCCSD PROJECT NO. 2-26-06

BID FORM (Continued)

|                        |  |  |  |
|------------------------|--|--|--|
| 3. Carpentry           |  |  |  |
| A.                     |  |  |  |
| B.                     |  |  |  |
| C.                     |  |  |  |
| 4. Flooring            |  |  |  |
| A.                     |  |  |  |
| B.                     |  |  |  |
| C.                     |  |  |  |
| 5. Restorative Bonding |  |  |  |
| A.                     |  |  |  |
| B.                     |  |  |  |
| C.                     |  |  |  |

RENOVATIONS TO DICKINSON HIGH SCHOOL  
NEW CASTLE COUNTY, DELAWARE  
RCCSD PROJECT NO. 2-26-06

BID FORM (Continued)

6. Ceramic Tile

A.

B.

C.

7. Painting

A.

B.

C.

8. Auditorium Seating

A.

B.

C.

RENOVATIONS TO DICKINSON HIGH SCHOOL  
NEW CASTLE COUNTY, DELAWARE  
RCCSD PROJECT NO. 2-26-06

BID FORM (Continued)

9. Fire Protection

- A.
- B.
- C.

|  |  |  |
|--|--|--|
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

10. Plumbing

- A.
- B.
- C.

|  |  |  |
|--|--|--|
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

11. Mechanical

- A.
- B.
- C.

|  |  |  |
|--|--|--|
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

RENOVATIONS TO DICKINSON HIGH SCHOOL  
NEW CASTLE COUNTY, DELAWARE  
RCCSD PROJECT NO. 2-26-06

BID FORM (Continued)

|                        |       |       |       |
|------------------------|-------|-------|-------|
| 12. BAS                | <hr/> | <hr/> | <hr/> |
| A.                     | <hr/> | <hr/> | <hr/> |
| B.                     | <hr/> | <hr/> | <hr/> |
| C.                     | <hr/> | <hr/> | <hr/> |
| 13. Electrical         | <hr/> | <hr/> | <hr/> |
| A.                     | <hr/> | <hr/> | <hr/> |
| B.                     | <hr/> | <hr/> | <hr/> |
| C.                     | <hr/> | <hr/> | <hr/> |
| 14. Sitework/Earthwork | <hr/> | <hr/> | <hr/> |
| A.                     | <hr/> | <hr/> | <hr/> |
| B.                     | <hr/> | <hr/> | <hr/> |
| C.                     | <hr/> | <hr/> | <hr/> |

RENOVATIONS TO DICKINSON HIGH SCHOOL  
NEW CASTLE COUNTY, DELAWARE  
RCCSD PROJECT NO. 2-26-06

BID FORM (Continued)

15. Demolition

A.

B.

C.

16. Concrete

A.

B.

C.

17. Doors and Frames

A.

B.

C.

RENOVATIONS TO DICKINSON HIGH SCHOOL  
NEW CASTLE COUNTY, DELAWARE  
RCCSD PROJECT NO. 2-26-06

BID FORM (Continued)

|                                    |       |       |       |
|------------------------------------|-------|-------|-------|
| 18. Toilet Accessories/Specialties | <hr/> | <hr/> | <hr/> |
| A.                                 | <hr/> | <hr/> | <hr/> |
| B.                                 | <hr/> | <hr/> | <hr/> |
| C.                                 | <hr/> | <hr/> | <hr/> |
| 19. Acoustical Treatment           | <hr/> | <hr/> | <hr/> |
| A.                                 | <hr/> | <hr/> | <hr/> |
| B.                                 | <hr/> | <hr/> | <hr/> |
| C.                                 | <hr/> | <hr/> | <hr/> |
| 20. Miscellaneous Metals           | <hr/> | <hr/> | <hr/> |
| A.                                 | <hr/> | <hr/> | <hr/> |
| B.                                 | <hr/> | <hr/> | <hr/> |
| C.                                 | <hr/> | <hr/> | <hr/> |



RENOVATIONS TO DICKINSON HIGH SCHOOL  
NEW CASTLE COUNTY, DELAWARE  
RCCSD PROJECT NO. 2-26-06

**BID FORM**

**NON-COLLUSION STATEMENT**

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

**AFFIDAVIT  
OF  
EMPLOYEE DRUG TESTING PROGRAM**

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

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

**Contractor/Subcontractor Name:** \_\_\_\_\_

**Contractor/Subcontractor Address:** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**Authorized Representative (typed or printed):** \_\_\_\_\_

**Authorized Representative (signature):** \_\_\_\_\_

**Title:** \_\_\_\_\_

Sworn to and Subscribed before me this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_.

My Commission expires \_\_\_\_\_. NOTARY PUBLIC \_\_\_\_\_.

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

RENOVATIONS TO DICKINSON HIGH SCHOOL  
NEW CASTLE COUNTY, DELAWARE  
RCCSD PROJECT NO. 2-26-06

**AFFIDAVIT  
OF  
CONTRACTOR QUALIFICATIONS**

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

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

**Contractor Name:** \_\_\_\_\_

**Contractor Address:** \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

**Authorized Representative (typed or printed):** \_\_\_\_\_

**Authorized Representative (signature):** \_\_\_\_\_

**Title:** \_\_\_\_\_

Sworn to and Subscribed before me this \_\_\_\_\_ day of \_\_\_\_\_ 20\_\_\_\_.

My Commission expires \_\_\_\_\_. NOTARY PUBLIC \_\_\_\_\_.

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

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**SECTION 00 4313  
BID BOND**

STATE OF DELAWARE  
OFFICE OF MANAGEMENT AND BUDGET

**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

By:

Seal

\_\_\_\_\_  
Authorized Signature

Attest \_\_\_\_\_

\_\_\_\_\_  
Title

\_\_\_\_\_  
Name of Surety

Witness: \_\_\_\_\_

By:

\_\_\_\_\_  
Title

**END OF SECTION**

**SECTION 00 5213  
STANDARD FORM OF AGREEMENT**

**STANDARD FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR  
A101-2017**

The contract to be utilized on this project shall be the "Standard Form of Agreement Between Owner and Contractor" AIA Document A101-2017, including AIA Document A101 – 2017 Exhibit A, as well as Supplements to A101-2017 and Exhibit A and the State of Delaware's General Requirements

**END OF SECTION**

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**SECTION 00 5413  
SUPPLEMENT TO AGREEMENT- A101-2017**

The following supplements modify the "Standard Form of Agreement Between Owner and Contractor," AIA Document A101-2017. 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 3: DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION**

- 3.1 Delete paragraph 3.1 in its entirety and replace with the following:
- "The date of Commencement of the Work shall be a date set forth in a notice to proceed issued by the Owner."

**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."
- 5.3 Insert the interest rate of "1% per month not to exceed 12% per annum."

**ARTICLE 6: DISPUTE RESOLUTION**

- 6.2 BINDING DISPUTE RESOLUTION
- Check the box "Other" – and add the following sentence:
- "Any remedies available in law or in equity."

**ARTICLE 7: TERMINATION or SUSPENSION**

- 7.1.1.1 Delete paragraph 7.1.1.1 in its entirety.

**ARTICLE 8: MISCELLANEOUS PROVISIONS**

- 8.4 Delete paragraph 8.4 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 SECTION**

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**SECTION 00 5414**  
**SUPPLEMENT TO A101-2017 – EXHIBIT A – INSURANCE & BONDS**

The following supplements modify the "Standard Form of Agreement Between Owner and Contractor," AIA Document A101-2017 Exhibit A Insurance and Bonds. 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 A.2 OWNER'S INSURANCE**

**A.2.1 General**

Delete paragraph A.2.1 in its entirety.

**A.2.2 Liability Insurance**

Delete paragraph A.2.2 in its entirety, except in the case of school projects this paragraph shall remain.

**A.2.3 Required Property Insurance**

Delete paragraph A.2.3 in its entirety.

**A.2.4 Optional Extended Property Insurance**

Delete paragraph A.2.4 in its entirety.

**A.2.5 Other Optional Insurance**

Delete paragraph A.2.5 in its entirety.

**ARTICLE A.3 CONTRACTORS INSURANCE AND BONDS**

**A.3.1.1 Strike the last sentence of the paragraph.**

**A.3.1.3 Additional Insured Obligations**

In the first sentence after "coverage to include (1)" delete "(1) the Owner,".

Strike the remainder of the first sentence beginning at the semicolon "; and (2) the Owner" through the end of the sentence.

Delete the second sentence in its entirety.

**A.3.2.2.1** Insert "\$1,000,000.00" in the blank for each occurrence.  
Insert "\$3,000,000.00" in the blank for general aggregate.  
Insert "\$3,000,000.00" in the blank for aggregate for products-completed operations hazard.

**A.3.2.3** Insert "\$1,000,000.00" in the blank for per accident.

**A.3.2.6** Insert "\$500,000.00" in the blank for each accident.

Insert "\$500,000.00" in the blank for each employee.  
Insert "\$500,000.00" in the blank for policy limit.

A.3.2.8 Insert "\$1,000,000.00" in the blank for per claim.  
Insert "\$3,000,000.00" in the blank for in the aggregate.

A.3.2.9 Insert "\$1,000,000.00" in the blank for per claim.  
Insert "\$3,000,000.00" in the blank for in the aggregate.

A.3.2.10 Insert "\$2,000,000.00" in the blank for per claim.  
Insert "\$4,000,000.00" in the blank for in the aggregate.

A.3.2.11 Strike in its entirety.

A.3.2.12 Strike in its entirety.

A.3.3.2.1 Delete paragraph 3.3.2.1 in its entirety

A.3.3.2.2 Strike in its entirety.

A.3.3.2.3 Insert "\$1,000,000.00" in the blanks for per claim.  
Insert "\$3,000,000.00" in the blanks for in the aggregate.

A.3.4 Insert the actual contract price in both the Payment Bond and the Performance Bond Penal Sum blanks. It must be 100% of the contract price.

Strike the last sentence in this section and replace with "Payment and Performance Bonds shall be in the standard form issued by the Delaware Office of Management and Budget."

## **END OF SECTION**

**SECTION 00 6113.13  
PERFORMANCE BOND**

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 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: \_\_\_\_\_

\_\_\_\_\_  
(SEAL)

Name:

(Corporate Seal)

By: \_\_\_\_\_

Name:

Title:

SURETY

Name: \_\_\_\_\_

Witness or Attest: Address: \_\_\_\_\_

\_\_\_\_\_  
(SEAL)

Name:

(Corporate Seal)

By: \_\_\_\_\_

Name:

Title:

**SECTION 00 6113.16  
PAYMENT BOND**

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.

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)



**SECTION 00 7213  
GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION A201 - 2017**

The General Conditions of this Contract are as stated in the American Institute of Architects Document AIA A201 (2017 Edition) entitled General Conditions of the Contract for Construction as revised by the Supplementary General Conditions and is part of this project manual as if herein written in full.

**END OF SECTION**

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**SECTION 00 7313  
SUPPLEMENTARY GENERAL CONDITIONS A201-2017**

The following supplements modify the "General Conditions of the Contract for Construction," AIA Document A201-2017. Where a portion of the General Conditions is modified or deleted by the Supplementary Conditions, the unaltered portions of the General Conditions shall remain in effect.

TABLE OF ARTICLES

GENERAL PROVISIONS

OWNER

CONTRACTOR

ADMINISTRATION OF THE CONTRACT

SUBCONTRACTORS

CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

CHANGES IN THE WORK

TIME

PAYMENTS AND COMPLETION

PROTECTION OF PERSONS AND PROPERTY

INSURANCE AND BONDS

UNCOVERING AND CORRECTION OF WORK

MISCELLANEOUS PROVISIONS

Renovations to Dickinson High School  
Red Clay Consolidated School District  
RCCSD Project No. 2-26-06

GA Project No. 2501  
April 2, 2026

TERMINATION OR SUSPENSION OF THE CONTRACT

CLAIMS AND DISPUTES

## **ARTICLE 1: GENERAL PROVISIONS**

### **1.1 BASIC DEFINITIONS**

#### **1.1.1 THE CONTRACT DOCUMENTS**

Strike the last sentence of Section 1.1.1 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 Section:

“1.1.1.1 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.”

#### **1.1.8 INITIAL DECISION MAKER**

Strike the last sentence of Section 1.1.8 in its entirety and add the following to the end of the remaining sentence:

“ and certify termination of the Agreement under Section 14.2.2.”

### **1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS**

#### **1.2.1.1 Insert “if possible” at the end of the second sentence.**

Add the following Sections:

“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**

Strike Section 1.5.1 in its entirety and replace with the following:

“All pre-design studies, drawings, specifications and other documents, including those in electronic form, prepared by the Architect under this Agreement are, and shall remain, the property of the Owner whether the Project for which they are made is executed or not. Such documents may be used by the Owner to construct one or more like Projects without the approval of, or additional compensation to, the Architect. The Contractor, Subcontractors, Sub-subcontractors, and Material or Equipment Suppliers are authorized to use and reproduce applicable portions of the Drawings, Specifications and other documents prepared by the Architect and the Architect’s consultants appropriate to and for use in the execution of their Work under the Contract Documents. They are not to be used by the Contractor or any Subcontractor, Sub-subcontractor or Material and Equipment Supplier on other Projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner, Architect and Architect’s consultants.

The Architect shall not be liable for injury or damage resulting from the re-use of drawings and specifications if the Architect is not involved in the re-use Project. 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.”

Strike Section 1.5.2 in its entirety.

#### 1.7 DIGITAL DATA USE AND TRANSMISSION

Strike Section 1.7 in its entirety and replace with the following:

“The parties shall agree upon protocols governing transmission and use of Instruments of Service or any other information or documentation in digital form.”

#### 1.8 BUILDING INFORMATION MODELS USE AND RELIANCE

Strike Section 1.8 in its entirety.

### **ARTICLE 2: OWNER**

#### 2.2 EVIDENCE OF THE OWNERS FINANCIAL ARRANGEMENTS

Strike Section 2.2 in its entirety.

#### 2.3 INFORMATION AND SERVICES REQUIRED OF THE OWNER

##### 2.3.3 Strike 2.3.3 in its entirety.

##### 2.3.4 Add the following sentence at the end of the paragraph:

"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."

Strike Section 2.3.6 in its entirety and replace with the following:

"2.3.6 The Contractor shall be furnished free of charge (1) electronic set of the Drawings and Project Manuals. Additional sets will be furnished at the cost of reproduction, postage and handling."

2.5 OWNER'S RIGHT TO CARRY OUT THE WORK

Add ", except as outlined in Section 3.15" after the reference to "Article 15" at the end of the last sentence of the Section.

**ARTICLE 3: CONTRACTOR**

3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

3.2.2 Add "and Owner" after "report to the Architect" in the second sentence.

3.2.4 Strike "subject to Section 15.1.7" in the second sentence.

3.2.4 Strike the third sentence.

3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

Add the following Sections:

"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, or as otherwise identified by the specifications. Consult the Owner and the Architect before storing any materials.”

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

### 3.4 LABOR AND MATERIALS

Add the Following Sections:

“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 Architect & Owner 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 Sections:

“3.5.3 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 years after Acceptance by the Owner, and will maintain all items in perfect condition during the period of warranty.”

“3.5.4 Defects appearing during the period of warranty 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 warranty will have elapsed.”

“3.5.5 Upon notification by the Owner of a defect covered by the Contractor's warranty, the Contractor shall respond within 4 hours of the notification.”



“3.5.6 In addition to the General Warranty there are other warranties required for certain items for different periods of time than the two years as above, and are particularly so stated in that part of the specifications referring to same. The said warranties will commence at the same time as the General Warranty.”

“3.5.7 If the Contractor fails to remedy any failure, defect or damage within a reasonable time after receipt of notice, the Owner will have the right to replace, repair, or otherwise remedy the failure, defect or damage at the Contractor’s expense.”

### 3.8 ALLOWANCES

Add the following Section:

“3.8.1.1 For costs to be covered under a project allowance, (included in the schedule of values) the Contractor shall submit a summary of those costs anticipated and an Allowance Access Authorization Form to the Architect and Owner, reflecting the projected costs. The Allowance Access Authorization Form must be signed by the Owner prior to initiating any work associated with the allowance.”

### 3.10 CONTRACTOR’S CONSTRUCTION AND SUBMITTAL SCHEDULES

3.10.1 Add “estimated” after “and the” and before “date of” in the second sentence.

3.10.2 Strike “and thereafter as necessary to maintain a current submittal schedule” in the first sentence.

### 3.11 DOCUMENTS AND SAMPLES AT THE SITE

Add the following Sections:

“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 the conformed contract 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 Upon completion of the work noted in 3.11.2 the contractor shall schedule a meeting with the Architect/Engineer and Owner to review the final record drawings and closeout documents prior to submission. After this meeting the Contractor shall make adjustments per the review, and submit one (1) original markup and (2) copies of the red line drawings (as-built conditions, to the Owner and one (1) print to the Architect. In addition, attach one complete set of the as-built documents to each of the Operating and Maintenance Instructions/Manuals. The Contractor will include (2) USB drives, each containing all “red line drawings (as-built) and Closeout Documents properly tabbed in accordance with closeout requirements as defined elsewhere in the contract documents.”

### 3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

3.12.10.2 Strike “If the Contract Documents require” from the beginning of the sentence.

3.12.10.2 Strike “to” between “professional” and certify” and replace with “shall”.

3.17 Insert “indemnify and” between “shall” and “hold” in the second sentence.

## **ARTICLE 4: ADMINISTRATION OF THE CONTRACT**

### 4.2 ADMINISTRATION OF THE CONTRACT

4.2.7 Strike the first sentence 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.”

4.2.7 Strike the second sentence 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 Section:

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

"4.2.13 Add "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

5.2.3 Strike Section 5.2.3 in its entirety and replace with the following:

"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."

5.2.4 Strike Section 5.2.4 in its entirety and replace with the following:

"The Contractor may not substitute any Subcontractor listed in its Bid unless the Contractor complies with the requirements of 29 Delaware Code § 6962(d)(10)b.3 and 4. Failure to comply with this requirement shall subject the Contractor to a penalty as outlined in Section 5.2 of the Owner's General Requirements."

Add the following Section:

"5.2.5 The Contractor shall comply and shall ensure all Subcontractors comply with all requirements for drug testing as set forth in TITLE 19 LABOR

DELAWARE ADMINISTRATIVE CODE 4000 Office of Management and Budget 4100 Division of Facilities Management **4104 Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on Large Public Works Projects.”**

## **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 Strike “and waiver of subrogation” from the end of the second sentence.

6.1.4 Strike Section 6.1.4 in its entirety.

### **6.2 MUTUAL RESPONSIBILITY**

6.2.3 Strike “shall” and replace with “may” in the second sentence.

## **ARTICLE 7: CHANGES IN THE WORK**

(SEE ARTICLE 7: CHANGES IN WORK IN THE STATE OF DELAWARE DIVISION OF FACILITIES MANAGEMENT GENERAL REQUIREMENTS)

### **7.2 CHANGE ORDERS**

Add the following Sections:

“7.2.2 In addition to the above:

7.2.2.1 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.

7.2.2.2 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 subcontractor's work.

7.2.2.3 Where the Third Tier Contractor is going to be completing the additional work, the Third-Tier contractor will be allowed a markup of fifteen percent (15%) overhead and profit on changes order work above and beyond the direct costs stated previously. To this amount, the Subcontractor will be allowed a markup not to exceed seven and one-half percent (7.5%) on the Third-Tier Contractor's work and the General Contractor will be allowed a markup not to exceed seven and one-half percent (7.5%) of the amount of the Subcontractor's markup.

7.2.2.4 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.

7.2.2.5 These markups shall include all costs including, but not limited to: overhead, profit, bonds, insurance, supervision, etc."

7.3.4.1 Strike "and other employee costs approved by the Architect" after "worker's compensation insurance,"

7.3.4.4 Add "work attributable to the" before "change" at the end of the sentence.

#### 7.4 MINOR CHANGES IN THE WORK

Add "unless such changes are approved" at the end of the third sentence.

### ARTICLE 8: TIME

#### 8.2 PROGRESS AND COMPLETION

8.2.1 Add the following Section:

"8.2.1.1 Refer to Project Specifications Section SUMMARY OF WORK for Contract time requirements."

8.2.2 After "by the Contractor" strike "and" and insert "to".

8.2.4 Add the following Section:

"8.2.4 If the Work falls behind the Progress Schedule as submitted by the Contractor, the Contractor shall employ additional labor and/or equipment necessary to bring the Work into compliance with the Progress Schedule at no additional cost to the Owner."

8.3 DELAYS AND EXTENSION OF TIME

8.3.1 Strike "binding dispute resolution" and insert "any and all remedies at law or in equity".

Add the following Section:

"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."

Strike Section 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 Section 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 Section:

"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 Sections:

“9.2.1 The Schedule of Values shall be submitted using AIA Document G703, Continuation Sheet to G702.”

“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 1.5% of the initial contract amount.”

### 9.3 APPLICATIONS FOR PAYMENT

9.3.1 Strike Section 9.3.1 in its entirety and replace with the following:

“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 for completed portions of the Work. The application shall be notarized, and supported by all data substantiating the Contractor’s right to payment that the Owner or Architect require, such as copies of requisitions, and releases and waivers of liens from Subcontractors and suppliers, and shall reflect retainage.”

Add the following Sections:

“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.”

“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 Subsections to 9.5.1:

- .8 failure to provide a current Progress Schedule;
- .9 a lien or attachment is filed;
- .10 failure to comply with mandatory requirements for maintaining Record Documents.

9.6 PROGRESS PAYMENTS

9.6.1 Strike Section 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.”

9.6.8 Strike “Provided the Owner has fulfilled its payment obligations under the Contract Documents,” in the first sentence.

9.7 FAILURE OF PAYMENT

Strike Section 9.7 in its entirety and replace with the following:

“If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within fourteen days after receipt of the Contractor’s Application for Payment, or if the Owner does not pay the Contractor within thirty days after the date established in the Contract Documents, the amount certified by the Architect, then the Contractor may, upon thirty additional days’ 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 shutdown, delay and start-up, plus interest as provided for in the Contract Documents.”

9.8 SUBSTANTIAL COMPLETION

9.8.3 At the end of Section 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 Strike “shall” and insert “may” in the second sentence.

9.8.5 Insert “1/2 of the” after “make payment of” in the second sentence.

9.9 PARTIAL OCCUPANCY OR USE

9.9.1 Strike the the first sentence and replace with the following (the remainder of the Section remains as written):



"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 authorized by public authorities having jurisdiction over the Project."

9.10.2 Strike "to remain in force after final payment is currently in effect" after "required by the Contract Documents" and replace with "shall remain in force until final payment is completed" in the first sentence.

9.10.4.4 Strike "if permitted by the Contract Documents,"

## **ARTICLE 10: PROTECTION OF PERSONS AND PROPERTY**

### **10.1 SAFETY PRECAUTIONS AND PROGRAMS**

Add the following Sections:

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

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

### **10.2 SAFETY OF PERSONS AND PROPERTY**

Add the following Section:

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.

10.2.5 Strike the second sentence in its entirety.

### **10.3 HAZARDOUS MATERIALS AND SUBSTANCES**

- 10.3.3 Strike Section 10.3.3 in its entirety.
- 10.3.4 Insert “hazardous” in the last sentence after “handling of such” .
- 10.3.6 Strike Section 10.3.6 in its entirety.

## **ARTICLE 11: INSURANCE AND BONDS**

### **11.1 CONTRACTOR’S INSURANCE AND BONDS**

- 11.1.1 Strike “Owner” from the third sentence.

### **11.2 OWNER’S LIABILITY INSURANCE**

Strike 11.2 in its entirety, except that in the case of school projects in which case Section 11.2 shall remain.

- 11.3 **WAIVERS OF SUBROGATION**  
Delete Section 11.3 in its entirety

- 11.4 **LOSS OF USE, BUSINESS INTERRUPTION, AND DELAY IN COMPLETION INSURANCE**  
Delete Section 11.4 in its entirety

## **ARTICLE 12: UNCOVERING AND CORRECTION OF WORK**

### **12.2.2 AFTER SUBSTANTIAL COMPLETION**

Add the following Section:

“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 non-conforming work and that required under contract including any damage to the structure.”

- 12.2.2.1 Strike all references to “one year” or “one-year” and replace with “two years”.
- 12.2.2.2 Strike “one-year” and replace with “two years”.

12.2.2.3 Strike “one-year” and replace with “two years”.

12.2.5 Strike “one-year” and replaced with “two years”.

## **ARTICLE 13: MISCELLANEOUS PROVISIONS**

### **13.1 GOVERNING LAW**

Strike the last sentence.

### **13.4 TESTS AND INSPECTIONS**

13.4.1 Strike the last sentence and replace with the following:

“The Owner shall pay for tests, inspections, or approvals where building codes or applicable laws or regulations prohibit the Owner from delegating their cost to the Contractor.”

### **13.5 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” and replace with “30 days of presentment of the authorized Certificate of Payment at the annual rate of 12% or 1% per month.”

Insert the following Section:

### **“13.6 CONFLICTS WITH FEDERAL STATUTES OR REGULATIONS**

13.6.1 If any provision, specifications or requirement of the Contract Documents conflict or is inconsistent with any statute, law or regulation of the government of the United State of America, the Contractor shall notify the Architect and Owner immediately upon discovery.”

## **ARTICLE 14: TERMINATION OR SUSPENSION OF THE CONTRACT**

### **14.1 TERMINATION BY THE CONTRACTOR**

- 14.1.1.4 Insert “, upon the Contractors’ request,” after “furnish to the Contractor”.
- 14.1.3 Strike “and profit on Work not executed, and” after “as well as reasonable overhead” and replace with “, profit, and reasonable”
- 14.3 SUSPENSION BY OWNER FOR CONVENIENCE
- 14.3.2 Strike “Adjustment of the Contract Sum shall include profit”.
- 14.4 TERMINATION BY THE OWNER FOR CONVENIENCE
- 14.4.3 Strike Section 14.4.3 in its entirety and replace with the following:

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

## **ARTICLE 15: CLAIMS AND DISPUTES**

- 15.1 CLAIMS
- 15.1.2 TIME LIMITS ON CLAIMS

Strike the last sentence.
- 15.1.3 NOTICE OF CLAIM

Strike all references to “21” and replace with “45”.
- 15.1.5 CLAIMS FOR ADDITIONAL COSTS

Strike the first sentence and replace with the following:

“Contractor shall not proceed to execute any portion of the Work that is subject to the Claim without prior approval of the costs or method of payment for the costs associated with the Claim as determined by the Architect and approved by the Owner.”
- 15.1.7 WAIVER OF CLAIMS FOR CONSEQUENTIAL DAMAGES

Strike Section 15.1.7 in its entirety.

15.2 INITIAL DECISION

15.2.1 Strike “and binding dispute resolution” in the fourth sentence and replace with “or any and all remedies at law or in equity”.

15.2.5 Strike Section 15.2.5 in its entirety and replace with the following:

“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 any or all remedies at law or in equity.”

15.2.6 Strike Section 15.2.6 and its sub-Sections in their entirety.

15.3 MEDIATION

15.3.1 Strike “binding dispute resolution” and replace with “any or all remedies at law or in equity”.

15.3.2 Strike “, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedure in effect on the date of the Agreement,” in the first sentence.

15.3.2 Strike all references to “binding dispute resolution” and replace with “any or all remedies at law and in equity”.

15.3.3 Strike Section 15.3.3 in its entirety.

15.4 ARBITRATION

Strike Section 15.4 and its Subsections in their entirety.

**END OF SECTION**

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**SECTION 00 7400  
DELAWARE PREVAILING WAGE RATES AND REPORTING FORM**

**ATTACHMENTS**

1. Delaware Department of Labor Prevailing Wage Rates for Building Construction.
  - Included by Reference: The State of Delaware Prevailing Wage Rate Regulations. A copy is available from the Department of Labor by calling 302-761-8200 or online on the State of Delaware website. Contractors are required to abide by all requirements issued by the State relating to prevailing wage regulations.
  - Contractors are required to submit payroll reports to the Department of Labor. Refer to the State Prevailing Wage regulations and the Instructions to Bidders section 00 2113 Article 4.5.

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**SECTION 00 8113  
GENERAL REQUIREMENTS**

**TABLE OF ARTICLES**

1. GENERAL
2. OWNER
3. CONTRACTOR
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5. SUBCONTRACTORS
6. CONSTRUCTION BY OWNER OR SEPARATE CONTRACTORS
7. CHANGES IN THE WORK
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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**

**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, 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.
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, sex, color, sexual orientation, gender identity 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.

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
- 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 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 material or performing labor in the performance of the Contract, of all sums of money due the person for such labor and material. (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 requires, 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.

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 pursuing 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 of 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 nonpurchase 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**

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.
- 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.
- 5.1.6 The Contractor may employ additional Subcontractors on the jobsite only after submitting a copy of the Subcontractor's Employee Drug Testing Program to the Owner for approval. A Contractor or Subcontractor shall not commence work until the Owner has concluded its review and determined that the submitted Employee Drug Testing Program complies with OMB Regulation 4104.
- 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 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 prevailing wage rates plus a maximum multiplier of 1.35 times DPE. For example, if the prevailing wage rate is \$50/hour, the DPE would be \$67.50/hour (50 x 1.35).

- 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:
- 7.3.3.1 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.
- 7.3.3.2 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 subcontractor's work.
- 7.3.3.3 Where the Third Tier Contractor is going to be completing the additional work, the Third-Tier contractor will be allowed a markup of fifteen percent (15%) overhead and profit on changes order work above and beyond the direct costs stated previously. To this amount, the Subcontractor will be allowed a markup not to exceed seven and one-half percent (7.5%) on the Third-Tier Contractor's work and the General Contractor will be allowed a markup not to exceed seven and one-half percent (7.5%) of the amount of the Subcontractor's markup.
- 7.3.3.4 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.
- 7.3.3.5 These markups shall include all costs including, but not limited to: overhead, profit, bonds, insurance, supervision, etc.

#### **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."
- 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.

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**

- 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 previously unknown hazardous material such as 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 to the closeout documents to be submitted at the end of the project.
- 10.2.1 Any activities with the potential to disturb lead-based materials should be performed by the Contractor in accordance with OSHA regulations pertaining to Lead in Construction, 29 CFR 1926.62, Lead.
- 10.2.1.1 The Contractor shall notify the Owner in the event they encounter previously unknown material that they suspect may contain "lead". The Owner will arrange with a qualified specialist for identification and testing and advise the Contractor of the results. In the case that testing identifies potential lead based materials, the contractor shall continue performance of the work that has the potential to disturb associated in accordance with OSHA regulations pertaining to Lead in Construction, 29 CFR 1926.62, Lead.
- 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 work place, and if employees may be exposed under normal conditions or in any foreseeable emergency situation. Material Safety Data Sheets must be provided directly to the Owner 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 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, may 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   | \$1,000,000<br>\$3,000,000 | for each occurrence<br>aggregate |
| Property Damage | \$1,000,000<br>\$3,000,000 | for each occurrence<br>aggregate |

11.7.2 Contractor's Protective Liability Insurance

Minimum coverage to be:

|                 |             |                     |
|-----------------|-------------|---------------------|
| Bodily Injury   | \$1,000,000 | for each occurrence |
|                 | \$3,000,000 | aggregate           |
| Property Damage | \$1,000,000 | for each occurrence |
|                 | \$3,000,000 | aggregate           |

11.7.3 Automobile Liability Insurance

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.

- 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 State Historic Preservation Office 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 by the Division of Historical and Cultural Affairs.

#### **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 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 OR SUSPENSION OF THE 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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**SECTION 00 8114**  
**DRUG TESTING REPORT FORMS**

**Period Ending:**\_\_\_\_\_

4104 Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on Large Public Works Projects requires that Contractors and Subcontractors who work on Large Public Works Contracts funded all or in part with public funds maintain testing data that includes but is not limited to the data elements below.

Project Number: \_\_\_\_\_

Project Name: \_\_\_\_\_

Contractor/Subcontractor Name: \_\_\_\_\_

Contractor/Subcontractor Address: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

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

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

Number of Negative Results \_\_\_\_\_ Number of Positive Results \_\_\_\_\_

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

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Date: \_\_\_\_\_

This form is not required to be submitted to the Owner. Included as a reference to show information required to be maintained by the Contractor. The Owner shall have the right to periodically audit all Contractor and Subcontractor test results at the Contractor's or Subcontractor's offices (or by other means to make the data available for inspection by the Owner).

## EMPLOYEE DRUG TESTING

### REPORT OF POSITIVE RESULTS

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

Project Number: \_\_\_\_\_

Project Name: \_\_\_\_\_

Contractor/Subcontractor Name: \_\_\_\_\_

Contractor/Subcontractor Address: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

Name of employee with positive test result: \_\_\_\_\_

Last 4 digits of employee SSN: \_\_\_\_\_

Date test results received: \_\_\_\_\_

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

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Authorized Representative of Contractor/Subcontractor: \_\_\_\_\_

(typed or printed)

Authorized Representative of Contractor/Subcontractor: \_\_\_\_\_

(signature)

Date: \_\_\_\_\_

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

ENCLOSE THIS TEST RESULTS FORM IN A SEALED ENVELOPE WITH THE NOTATION  
"DRUG TESTING FORM – DO NOT OPEN" ON THE FACE THEREOF AND PLACE IN A  
SEPARATE MAILING.

**END OF SECTION**

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RENOVATIONS TO DICKINSON HIGH SCHOOL  
WILMINGTON, DELAWARE  
RCCSD PROJECT NO. 2-26-06

**AFFIDAVIT OF  
CRAFT TRAINING COMPLIANCE**

We, the contractor, hereby certify that we and all applicable subcontractors will abide by the contractor and subcontractor craft training requirements outlined below for the duration of the contract. Craft training must be provided by a contractor and/or subcontractor for each craft on a project for which there are Delaware Department of Labor approved and registered training programs or, if the contractor and/or subcontractor meets the requirements under Title 29, Chapter 69, Section 6960A.(b)(1)c.1.-3., payment may be made in accordance with Title 29, Chapter 69, Section 6960A.(b)(1)d. A list of crafts for which there are approved and registered training programs is maintained by the Delaware Department of Labor and can be found at:

<https://laborfiles.delaware.gov/main/det/apprenticeship/DE%20Craft%20Training%20Occupation%20List%20Effective%20March%201%202022.pdf>. If you have questions regarding craft training programs, please submit all questions in writing to the Delaware Department of Labor at: [apprenticeship@delaware.gov](mailto:apprenticeship@delaware.gov). ***This Affidavit of Craft Training Compliance must be submitted prior to contract execution.***

In accordance with Title 29, Chapter 69, Section 6960A.(a)(1), a contract relating to a public works project under § 6962 of Title 29 must include a craft training program for each craft in the project if at the time the contractor executes a public works contract, all of the following apply:

- a. A project meets the prevailing wage requirement under Section 6960 of Title 29.
- b. The contractor employs 10 or more total employees.
- c. The project is not a federal highway project, except for the project under Section 6962(c)(11) of Title 29.
- d. There is an apprenticeship program for a craft in the project on the list of crafts under Section 204(b)(2) of Title 19.

Pursuant to Title 29, Chapter 69, Section 6960A.(a)(2), ***a contractor must commit that all subcontractors provide craft training*** if paragraph (a)(1) of this section applies to the subcontractor. Failure to provide required craft training or payment on the project may subject the successful contractor and/or subcontractor(s) to penalties as outlined in Title 29, Chapter 69, Section 6960A.(d)(1)-(3).

**Craft(s):**

---

**Contractor Name:**

---

**Contractor Address:**

---

---

---

**Contractor Program  
Registration Number(s)**

---

On this line also indicate whether DE, Other State (identify) or US Registration Number

**Or**

☐ **A payment has been made in the amount established under Section 204(b)(2)b.2. of Title 19, for the craft into the Delaware Department of Labor's Apprenticeship and Training Fund.**

**Or**

☐ **Craft Training requirements are not applicable because:**

\_\_\_\_\_  
**Authorized Representative (typed or printed):** \_\_\_\_\_

**Authorized Representative (signature):** \_\_\_\_\_

**Title:** \_\_\_\_\_

**State of Delaware** )  
 ) **ss:**  
**County of** \_\_\_\_\_ )

Before me, a notary public, in and for said county and state, personally appeared, \_\_\_\_\_, who acknowledged to me that she/he did execute the foregoing instrument on behalf of \_\_\_\_\_.

**IN TESTIMONY WHEREOF**, I have subscribed my name and affixed my official seal this \_\_\_\_ day of \_\_\_\_\_ 20\_\_.

\_\_\_\_\_  
Notary Public

Commission Expires \_\_\_\_\_

**THIS PAGE MUST BE SIGNED AND NOTARIZED TO BE CONSIDERED.**

**SECTION 01 1000  
SUMMARY OF THE WORK**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. This Section includes the following:
  - 1. The Work covered by the Contract Documents.
  - 2. Construction Milestones
  - 3. Use of the Premises.
  - 4. Submittals.
  - 5. Work Restrictions.
  - 6. Specification formats and conventions.
- B. Related Documents/Sections
  - 1. Section 00 7213 - General Conditions.
  - 2. Section 01 4500 - Quality Control.

**1.2 WORK COVERED BY THE CONTRACT DOCUMENTS**

- A. Project Identification: Renovations to Dickinson High School
  - 1. Project Location: 1801 Milltown Road, Wilmington, DE 19808.
- B. Owner: Red Clay Consolidated School District.
  - 1. Owner's Authorized Representative:  
Marcin Michalski  
Director of Facilities and Maintenance  
Red Clay Consolidated School District  
1798 Limestone Road  
Wilmington, DE 19804
- C. The Work of this Project may be summarized as follows:
  - 1. Renovations to Dickinson High School, including the site and related building and selective demolition Work, as indicated on the Drawings and specified herein.
  - 2. Proposed Alternates, as described in Section 01 2300.

**1.3 PERMITS, FEES AND INSPECTIONS**

- A. In accordance with AIA A201, Contractor shall obtain all permits, licenses, approvals, and inspections required for the Work.
- B. Contractor shall include all labor and administrative costs associated with permit procurement, coordination, and closeout in the Contract Sum.
- C. Owner will reimburse Contractor for Agency building permit and use fees only.
- D. Reimbursement shall be made from the Project Allowance in accordance with the Contract Documents.
- E. Contractor shall obtain, procure, and pay for all required trade permits and associated fees.

**1.4 CONSTRUCTION PHASING AND OCCUPANCY REQUIREMENTS**

- A. Work under this Contract shall be coordinated with the Red Clay Consolidated School District.

**1.5 USE OF THE PREMISES**

- A. Use of the Project Site: Limit use to the Premises. Do not disturb portions of the Project site beyond areas in which the Work is indicated on the Drawings.

1. Driveways and Entrances: Keep driveways and entrances serving the Premises clear and available to the Owner at all times. Do not use these areas for parking or storage of materials.
  - a. Schedule deliveries with School District. Deliveries must be made during non-peak school hours.
  - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
  - c. Clean areas around construction entrances, driveways and intersections at end of each working day.
  - d. Refer to civil drawings for site construction staging, utilization and logistics.
- B. Use of Existing Improvements: Maintain existing improvements throughout construction period. Repair damage caused by construction operations.
- C. Coordination: The School may be having limited summer activities. The Work must be coordinated with the designated District staff.

#### 1.6 SUBMITTALS

- A. The General Trades Contractor shall be required to submit detailed safety plan outlining steps taken to ensure conformance with OSHA 29CFR and all other applicable Federal, State and local safety regulations. In event of conflicting statutes, the Contractor shall conform to most stringent standard.

#### 1.7 WORK RESTRICTIONS

- A. The Contract Work shall not occur in occupied portions of the Building during school hours, without prior approval of Owner.
- B. Smoking Restriction: No smoking is allowed anywhere on the School property.
- C. Refer to the Terms and Conditions and Legal Requirements for additional requirements and restrictions.

#### 1.8 SPECIFICATION FORMATS AND CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for style of language and intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
  1. Abbreviated Language: Language used in the Specifications and the other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as sense requires. Singular words shall be interpreted as plural and plural words shall be interpreted as singular where applicable as context of the Contract Documents indicates.
  2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in imperative mood are to be performed by the Contractor. Occasionally, indicative or subjunctive mood may be used in the Section text for clarity to describe responsibilities that must be fulfilled indirectly by the Contractor or by others when so noted.
    - a. Words "shall," "shall be," or "shall comply with," depending on context, are implied where colon (:) is used within sentence or phrase.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

**END OF SECTION**



**SECTION 01 1300  
CONSTRUCTION PHASING AND OCCUPANCY REQUIREMENTS**

**PART 1.1 – GENERAL**

- A. Work under this Contract shall be coordinated with Red Clay Consolidated School District (RCCSD) to accommodate building occupancy, custodial operations, and school calendar constraints.
- B. The Contractor shall sequence and schedule the Work to maintain safe, clean, and orderly conditions at all times.
- C. All work activities shall be subject to approval by the District's Facilities Director.

**PART 1.2 – SUMMER WORK PERIOD (JUNE 11, 2026 – AUGUST 14, 2026)**

- A. Building Occupancy
  - 1. Only RCCSD custodial and administrative staff shall occupy the building during this period.
- B. Access and Work Areas
  - 1. The Contractor shall have access to all spaces within the building unless otherwise restricted by the District.
- C. Furniture and Contents
  - 1. RCCSD custodial staff shall relocate furniture and contents as required to support the Contractor's work schedule.
  - 2. The Contractor shall coordinate work sequencing to allow custodial staff access for cleaning and furniture replacement as areas are completed.
  - 3. Cleaning and turnover shall be phased. Contractor shall coordinate with RCCSD so custodial staff are provided reasonable access to completed areas for cleaning and furniture replacement. Cleaning accommodations shall be mutually agreed upon.
- D. Work Hours
  - 1. Flexible work hours are permitted Monday through Friday.
  - 2. RCCSD custodial staff will support approved overtime work as required.
  - 3. Weekend and holiday work shall be permitted only with prior approval by RCCSD staff and will be evaluated on a case-by-case basis.

**PART 1.3 – SUMMER WORK CLOSE-OUT PERIOD (AUGUST 10, 2026 – AUGUST 14, 2026)**

- A. Demobilization
  - 1. The Contractor shall remove all materials, equipment, debris, and temporary installations from spaces scheduled for occupancy.
- B. Agency Approvals
  - 1. The Contractor shall obtain all required inspections, approvals, and sign-offs from applicable agencies necessary for student and staff occupancy.
- C. Final Cleaning and Restoration
  - 1. RCCSD custodial staff shall complete final cleaning and replace furniture in remaining occupied spaces following Contractor demobilization.

**PART 1.4 – SCHOOL YEAR WORK**

- A. Subject to approval by the Facilities Director, the Contractor may perform work in unoccupied and support spaces without interruption to normal school operations.

1. Unoccupied and support spaces are defined as mechanical, electrical and storage spaces that can be accessed from the building exterior and all exterior work.
- B. Work may be performed during weekends, holidays, and scheduled school vacations, subject to District approval.
- C. The Contractor may, at their discretion, complete the following work during the school year:
  1. Work in Auditorium provided the work is completed and the Owner can have beneficial occupancy in 6 weeks.
  2. Work in one set (men's & women's) multi-user toilet rooms at a time. The Owner must have beneficial occupancy of the set being renovated prior to starting work on another set. The toilet rooms include the following:
    - a. A100B & A111
    - b. A117F
    - c. A119
    - d. M112 & M114
    - e. C105A & C107A
    - f. M115A & M115B
    - g. M117 & M119
    - h. C122C
    - i. C112E
    - j. M203 & M205
    - k. M221A & M223A
  3. Work in the following single user toilet room that can be completed in any order:
    - a. C102T
- D. If the Contractor elects to complete any of the above work during the school year, the Contractor and the District shall jointly develop a work schedule that is safe and does not adversely affect instructional time or school operations.
- E. Any work proposed to occur in occupied spaces during the school year shall be fully coordinated and approved by the District **no later than August 10, 2026**.
- F. All heating systems must be operational from October 31<sup>st</sup> until May 1<sup>st</sup>. Cooling systems must remain operational from May 1<sup>st</sup> until the last day teachers occupy the building and from first day teachers occupy the building until October 31<sup>st</sup>.

#### PART 1.5 – SUMMER WORK 2027 (IF REQUIRED)

- A. If additional summer work is required, the Contractor shall assume a construction schedule similar to Summer 2026.
- B. Specific dates and constraints for Summer 2027 work will be established by the District in Fall 2026.
- C. All work is to be substantially complete, with beneficial occupancy provided, on or before August 9, 2027. Punch list, close-out and final completion to be within 60 calendar days of substantial completion.

**END OF SECTION**

**SECTION 01 1400  
WORK RESTRICTIONS**

**PART 1 - GENERAL**

**1.1 SECTION INCLUDES**

- A. Work by Owner.
- B. Contractor use of site and premises.
- C. Owner occupancy.

**1.2 WORK BY OWNER**

- A. Items noted N.I.C. (Not in Contract) will be supplied and installed by Owner after completion of the Work.
- B. Owner shall have first right of refusal for all items removed and retain possession of items identified as S.D.O. (Salvage, Deliver to Owner). Contractor shall remove items identified as same and obtain receipt from Owner upon delivery and acceptance. Items shall be delivered and stored by Contractor to location as identified by Owner.

**1.3 CONTRACTOR USE OF SITE AND PREMISES**

- A. Limit use of site and premises to allow:
  - 1. Owner occupancy.
  - 2. Work by Others and Work by Owner.
- B. Emergency Building Exits During Construction: Means of egress shall be maintained throughout the construction period in accordance with applicable codes and regulations.
- C. Construction Operations: Limited to areas noted on Drawings.
- D. Time Restrictions for Performing Work: The typical workdays for the Project are defined as 7:00 am-3:30 pm, Monday through Friday, but the Owner shall make building available to the Contractor during the following times:
  - 1. Unoccupied Areas: Between the hours of 6:00 am and 8:00 pm.
  - 2. Occupied Areas: After 4pm or prior to 7 am. Areas shall be returned to condition that is acceptable to the Owner and be ready for the Owner's use 1 hour before the area is scheduled to be occupied.
  - 3. Additional availability may be arranged through the Owner.
  - 4. Owner reserves the right to reduce the hours available to the Contractor if the work is disruptive to the Owner's operations or if the Contractors fails to return the work area to the Owner in a condition acceptable to the Owner in a timely manner.
- E. Utility Outages and Shutdown: Contractors shall not disrupt Owners operations. Any disruption of utilities shall be scheduled and approved by the Owner a minimum of 72 hours prior to planned disruption. Approval shall be at the Owners discretion.

**1.4 OWNER OCCUPANCY**

- A. The Owner will occupy the site and premises during the period of construction.
- B. Cooperate with Owner to minimize conflict, and to facilitate Owner's operations.
- C. Schedule the Work to accommodate this requirement.

**1.5 LAYING OUT THE WORK**

- A. Layout and Bench Marks:

1. Location of Construction on the Project Site: The Contractor shall layout work and locate the construction on the site.
  2. Interior Layout and Bench Marks: The Contractor shall establish and maintain bench marks, reference points, layout walls and partitions.
  3. Verify locations of layout control points and benchmarks.
- B. Check layout data provided in the contract documents against existing control points and benchmarks before proceeding.
1. Promptly notify the Architect of discrepancies found.
  2. Protect existing benchmarks and control points during construction; replace if lost or destroyed using original survey control points.
  3. Do not change new control points without prior written approval.
- C. Perform layout using recognized surveying practices.
1. Locate and lay out using instrumentation or other appropriate methods.
  2. Establish required dimensions within the indicated tolerances.
    - a. Where no tolerances are indicated, use recognized limits.
    - b. Do not scale drawings to obtain required dimensions.
  3. As the work proceeds, check the location, level, and plumbness of every major element.
- D. Furnish location data required for work related to the project which is to be performed by other entities, including public utilities.
- E. Reference Points: Where actual location or elevation of layout points or lines cannot be marked, provide temporary reference points or marks sufficient to locate the construction.
1. Preserve reference points during construction.
  2. Promptly report and replace lost or destroyed reference points.
  3. Promptly report the necessity to relocate reference points due to required changes in grades or locations.
  4. Remove temporary reference points and marks when no longer needed; restore marked construction to original condition.
  5. Inform installers of marked lines and levels to which they must conform.
  6. Notify the Architect when deviations from required lines and levels exceed allowable tolerances.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION Not Used

**END OF SECTION**

**SECTION 01 2100  
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.
- B. Types of allowances include the following:
  - 1. Lump-sum allowances.
- C. Related Requirements:
  - 1. Section 01 2600 "Contract Modification Procedures" for procedures for submitting and handling Change Orders.

**1.3 DEFINITIONS**

- A. Allowance: A quantity of work or dollar amount included in the Contract, established in lieu of additional requirements, used 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.

**1.4 SELECTION AND PURCHASE**

- A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection, or purchase and delivery, of each product or system described by an allowance must be completed by the Owner to avoid delaying the Work.
- B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.
- C. Purchase products and systems selected by Architect from the designated supplier.

**1.5 SUBMITTALS**

- A. Submit proposals for purchase of products or systems included in allowances in the form specified for Change Orders.
- B. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.
- C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.6 LUMP-SUM ALLOWANCES

- A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include [**taxes**, ]freight[,] and delivery to Project site.
- B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner or selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.
- C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.
  - 1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

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. The allowance amount shall include all costs associated with the Work covered by the allowance, including Contractor overhead and profit.

3.3 SCHEDULE OF ALLOWANCES

- A. Allowance No. 1: include an allowance entitled "General Owner's Allowance", in the amount of \$100,000. This allowance be utilized by the owner for owner-elected changes to the Work. Any or all unused allowance monies shall be returned to the owner via credit change order at the end of the project. This allowance shall be carried as an individual line-item on the Application for Payments.

**END OF SECTION**

**SECTION 01 2116  
ALLOWANCE AUTHORIZATION**

**Project:** Renovations to Dickinson High School  
1801 Milltown Rd.  
Wilmington, DE 19808

**Architect:** Gilbert Architects

**Project No.** 2-26-06

**Contractor:**

**AAA No.:**

**Initiation Date:**

**The Allowance is allocated as follows:**

|                                                                               |    |
|-------------------------------------------------------------------------------|----|
| Total original Contract Allowance was:                                        | \$ |
| Amount of Contract Allowance Access previously authorized:                    | \$ |
| Adjusted Contract Allowance prior to this authorization is:                   | \$ |
| The amount of available Allowance will Decrease by this Access Authorization: | \$ |
| The remaining Contract Allowance, after this Access Authorization will be:    | \$ |

**Recommended by:  
Architect**

By (Signature): \_\_\_\_\_

Date: \_\_\_\_\_

**Accepted by:  
Contractor**

By (Signature): \_\_\_\_\_

Date: \_\_\_\_\_

**Approved by:  
Owner**

By (Signature): \_\_\_\_\_

Date: \_\_\_\_\_

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## **SECTION 01 2300 ALTERNATES**

### **PART 1 - GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Alternates bidding submission procedures.
- B. Documentation of changes to Contract Sum/Price.

#### **1.2 RELATED SECTIONS**

- A. Section 002100 - Instructions To Bidders, Section 002200 - Supplementary Instructions to Bidders: Requirements for Alternates.
- B. Section 004100 - Bid Form: Incorporating monetary value of applicable Alternates.
- C. Section 005200 - Agreement: Incorporation of monetary value of accepted Alternates.
- D. Section 013300 - Submittal Procedures: Requirements of submittals for proposed Alternates; Work schedule affected by Alternates.
- E. Section 016000 - Product Requirements: Product options and substitutions.

#### **1.3 SUBMISSION REQUIREMENTS**

- A. Submit Alternates indicating the amount to be added to or deducted from the Base Bid for the provision of or deletion of all labor, materials and all other Work incorporated and identified by the Specification Sections and Drawings referenced or affected.
- B. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at the sole discretion of the Owner. Accepted Alternates will be identified in the Owner-Contractor Agreement.
- C. Coordinate related work and modify surrounding work to integrate the Work of each Alternate.

#### **1.4 SCHEDULE OF GENERAL CONSTRUCTION ALTERNATES**

- A. Alternate No. A-01 - Provide electric hand dryers in lieu of paper towel dispensers at all locations located on drawings. Provide required electrical power and connection as indicated on Electrical drawings.
- B. Alternate No. A-02 – In Classrooms M200, M202, M204, M206, M208, M210, M211, M212, and M214 remove existing base. Provide new rubber base. Prepare slab as required to receive new finishes and provide new VCT flooring.
- C. Alternate No. A-03 - Provide restorative bonding of floor and base tile in Toilet G107 and Toilet G108.
- D. Alternate No. A-04 – In Auditorium C111, remove existing and provide new Fixed Audience Seating. In Auditorium C111 and Stage C112, remove existing and provide new carpet. Auditorium C111, construct concrete ADA platform. Auditorium C111 and Corridor C107C, provide handrails. In Auditorium C111, paint existing wood base and provide new painted quarter round trim at all wood base. In Auditorium C111, paint all hollow metal doors and frames (Auditorium side only).

- E. Alternate No. A-05 – In Auditorium C111, provide high performance coating on concrete floor under Fixed Audience Seating and exposed portion of new concrete ADA platform.
- F. Alternate No. A-06 – In Auditorium C111, remove existing half walls and provide new full height partitions and wood diffusers. Provide new wood base and quarter round trim.
- G. Alternate No. A-07 – In Toilet Rooms A100B, A109E, A109F, A111, A113C, A113D, A117D, A117F, A119, C105A, C107A, C112C, C112E, M112, M114, M115A, M115B, M117, M119, M203, M205, M221, and M223 remove base and wall finish from partitions in its entirety. Provide new ceramic tile cove base CTB-1 and new ceramic tile wainscot CTB-2 to 7'-6" A.F.F in all rooms except A109F, A113C, A113D, and A117F. In those four rooms, provide new ceramic tile cove base CTB-1 and new full-height ceramic wall tile CTB-2.

PART 2 - PRODUCTS Not Used.

PART 3 - EXECUTION Not Used.

END OF SECTION

## SECTION 01 2500 PRODUCT SUBSTITUTION PROCEDURES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.
- B. Related Requirements:
  - 1. Section 01 2300 "Alternates" for products selected under an alternate.
  - 2. Section 01 6000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

#### 1.2 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.

#### 1.3 ACTION SUBMITTALS

- A. Substitution Requests: Submit substitution requests electronically in accordance with Section 01 3300 – Submittal Procedures.
  - 1. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
    - a. Statement indicating why specified product or fabrication or installation method cannot be provided, if applicable.
    - b. Coordination of 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 substitutions 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 as well as 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 substitutions 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.
2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within **seven** days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within **15** days of receipt of request, or **seven** days of receipt of additional information or documentation, whichever is later.
- a. Forms of Acceptance: Change Order or Architect's Supplemental Instructions for minor changes in the Work.
  - b. Failure to respond shall not constitute approval.

#### 1.4 QUALITY ASSURANCE

- A. 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.

#### 1.5 PROCEDURES

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

#### 1.6 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than **7** 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 will not be considered.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

**END OF SECTION**

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**SECTION 01 2600  
CONTRACT MODIFICATION PROCEDURES**

**PART 1 - GENERAL**

**1.1 SECTION INCLUDES**

- A. Submittals.
- B. Documentation of change in Contract Sum and Contract Time.
- C. Change procedures.
- D. Stipulated Sum change order.
- E. Unit price change order.
- F. Execution of change orders.
- G. Correlation of Contractor submittals.

**1.2 RELATED SECTIONS**

- A. Section 00 5213 – Standard Form of Agreement
- B. Section 00 7213 - General Conditions Of The Contract For Construction - AIA A201
- C. Section 00 7313- Supplementary General Conditions – AIA A201
- D. Section 01 2900 - Payment Procedures: Payment applications.
- E. Section 01 3300 - Submittal Procedures: Schedule of values.
- F. Section 01 2500 – Substitution Procedures.
- G. Section 01 7700 - Contract Closeout: Project record documents.

**1.3 SUBMITTALS**

- A. Submit name of the individual authorized to receive change documents and be responsible for informing others in Contractor's employ or Subcontractors of changes to the Work.
- B. Change Order Forms: AIA G701-2017 Form

**1.4 DOCUMENTATION OF CHANGE IN CONTRACT SUM AND CONTRACT TIME**

- A. Maintain detailed records of work done. Provide full information required for evaluation of proposed changes, and to substantiate costs of changes in the Work.
- B. Document each quotation for a change in cost or time with sufficient data to allow evaluation of the quotation.
- C. On request, provide additional data to support computations:
  - 1. Quantities of products, labor, and equipment.
  - 2. Taxes, insurance, and bonds.
  - 3. Overhead and profit.
  - 4. Justification for any change in Contract Time.
  - 5. Credit for deletions from Contract, similarly documented.
  - 6. Contractor overhead and profit percentage applied.
- D. Support each claim for additional costs with additional information:
  - 1. Origin and date of claim.
  - 2. Dates and times work was performed, and by whom.
  - 3. Time records and wage rates paid.
  - 4. Invoices and receipts for products, equipment, and subcontracts, similarly

documented.

#### 1.5 CHANGE PROCEDURES

- A. The Architect/Engineer will advise of minor changes in the Work not involving an adjustment to Contract Sum or Contract Time as authorized by AIA A201, 2017 Edition, Paragraph 7.4 by issuing supplemental instructions on Architect generated form.
- B. The Architect/Engineer may issue a Proposal Request which includes a detailed description of a proposed change with supplementary or revised Drawings and specifications and a change, if applicable, in Contract Time for executing the change. Contractor will prepare and submit an estimate within seven days.
- C. The Contractor may propose a change by submitting a request for change to the Architect/Engineer, describing the proposed change and its full effect on the Work, with a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation and a statement describing the effect on Work by separate or other contractors.
- D. Substitution of Materials: No substitutions of materials will be considered after the bids without credit Change Order to the Owner, unless a Product becomes unavailable through no fault of the Contractor. Document any requested substitutions in accordance with Section 01 2500 – Product Substitution Procedure.
- E. Contractor shall not proceed with changed Work without written authorization in the form of a Change Order or Construction Change Directive.

#### 1.6 CONSTRUCTION CHANGE DIRECTIVE

- A. Architect may issue a document, signed by the Owner and Architect/Engineer, instructing the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
- B. The document will describe changes in the Work and will designate method of determining any change in Contract Sum or Contract Time.
- C. Promptly execute the change in Work.

#### 1.7 STIPULATED SUM CHANGE ORDER

- A. Based on Proposal Request and Contractor's fixed price quotation or Contractor's request for a Change Order as approved by Architect/Engineer.

#### 1.8 UNIT PRICE CHANGE ORDER

- A. For pre-determined unit prices and quantities, the Change Order will be executed on a fixed unit price basis.
- B. For unit costs or quantities of units of work which are not pre-determined, execute Work under a Construction Change Directive.
- C. Changes in Contract Sum or Contract Time will be computed as specified for Change Orders.

#### 1.9 EXECUTION OF CHANGE ORDERS

- A. Execution of Change Orders: Architect will issue Change Orders for signatures of Owner, Contractor, and Architect/Engineer as provided in the Conditions of the Contract.

#### 1.10 CORRELATION OF CONTRACTOR SUBMITTALS

- A. Promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.
- B. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-



schedules to adjust times for other items of work affected by the change, and resubmit.

C. Promptly enter changes in Project Record Documents.

PART 2 - PRODUCTS Not Used.

PART 3 - EXECUTION Not Used.

**END OF SECTION**

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**SECTION 01 2900  
PAYMENT PROCEDURES**

**PART 1 - GENERAL**

**1.1 SECTION INCLUDES**

- A. Procedures for preparation and submittal of applications for payment.

**1.2 RELATED SECTIONS**

- A. Section 00 5213 - Agreement Forms - Owner-Contractor Agreement: Contract Sum/Price.
- B. Section 00 7213 - General Conditions - AIA A201: Progress payments and final payment.
- C. Section 00 7313 - Supplementary Conditions: Progress payments and final payment
- D. Section 01 3300 - Submittals: Submittal procedures.
- E. Section 01 7700 - Contract Closeout: Final payment.

**1.3 FORMAT**

- A. AIA G702 - Application and Certificate for Payment and AIA G703 - Continuation Sheet.

**1.4 SCHEDULE OF VALUES**

- A. Coordinate preparation of the Schedule of Values with preparation of the Contractor's Construction Schedule.
- B. Contractor shall coordinate preparation of its Schedule of Values for its part of the work with preparation of the Contractor's Construction Schedule.
  - 1. Correlate the items in the Schedule of Values with other required administrative schedules and forms, including:
    - a. Contractor's construction schedule.
    - b. Application for Payment form.
    - c. List of subcontractors.
    - d. Schedule of alternates.
    - e. List of products.
    - f. List of principal suppliers and fabricators, if items purchased by Contractor.
    - g. Schedule of submittals.
  - 2. Submit the Initial Schedule of Values on the Detailed Prime Contract Breakdown Form provided by the Architect within 10 days of award of contract and prior to submittal of initial payment request. An electronic excel spreadsheet version is available from the Architect upon request.
  - 3. Sub-Schedules: Where the work is separated into phases, areas or floors that require separate payments, provide sub-schedules showing values correlated with portion of the work.
- C. Format: Use the Project Manual Table of Contents as a guide to establish the format for the Schedule of Values.
  - 1. Type Schedule on AIA Document G703 - Continuation Sheet for Application and Certificate for Payment or on 8-1/2 x 11 in. white bond paper.
  - 2. Contractor's standard forms or media driven printout will be considered upon request.
  - 3. Follow Table of Contents or Project Manual for listing component parts. Identify each line item by number and title of major Specification Section. Include the following Project identification on the Schedule of Values:
    - a. Project name and location.
    - b. Name of the Architect.
    - c. Project number.
    - d. Contractor's name and address.

e. Date of submittal.

D. Content:

1. List each "Major Item of Work" and each "Subcontracted Item of Work" and each item covered under "General Conditions":
  - a. As a separate line item to serve as a basis for computing values for Progress Payments.
2. For each major line item, list sub-values of products operations under the item for the various portions of the Work:
  - a. Each item shall include a directly proportional amount of the Contractor's overhead and profit.
  - b. For items on which progress payments will be requested for stored materials, breakdown the value into:
    - 1 The cost of the materials, delivered and unloaded, with taxes paid.
    - 2 The total installed value.
  - c. Contractor shall include in various items a proportional amount of overhead and profit on Owner's direct purchased materials which were included in Contractor's bid.
3. Submit a "Sub-Schedule" of unit costs and quantities for each separate stage, phase or portion of Work with unit values for the materials to be purchased by Contractor broken down into:
  - a. Cost of the material, delivered and unloaded at the site, with taxes paid.
  - b. Installation costs, including Contractor's overhead and profit.
4. The installed unit volume multiplied by the quantity listed shall equal the cost of that item in the Schedule of Values.
5. The sum of all values listed in the schedule shall equal the total Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by the Architect and paid for by the Owner.
  1. The initial Application for Payment, the Application for Payment at time of Substantial Completion, and the final Application for Payment involve additional requirements.
  2. All Certified payroll submitted with or before payment application for that period
  3. Completed lien waivers for all work and supplies covered by the Certificate for Payment.
- B. Payment: After the Architect have issued a Project Certificate for Payment; the Owner shall make payment within the time provided in the Contract Documents.
- C. Draft Applications for Payment shall be submitted to the Architect no later than the 25th day of each month for Work completed through that date. Upon review and certification by the Architect, submit executed Applications for Payment in the number of copies required by the Owner. Applications shall be submitted in sufficient time to allow review and processing in accordance with the Contract Documents. Payment shall be made in accordance with the Agreement and General Conditions
- D. Payment Application Forms: Use AIA Document G702 and Continuation Sheets G703 as the form for Application for Payment.
- E. Application Preparation: Complete every entry on the form, including notarization and execution by person authorized to sign legal documents on behalf of the Contractor. Incomplete applications will be returned without action.
  1. Entries shall be consistent with the most recent approved Construction Schedule. Use updated schedules if revisions have been made.
  2. Include amounts of Change Orders and Construction Change Directives issued prior to the last day of the construction period covered by the application.

- F. Transmit Applications for Payment to the Architect in accordance with Section 01 3300 – Submittal Procedures. Include all required supporting documentation, including certified payroll reports and lien waivers, as applicable.
- G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of the first Application for Payment include the following:
  - 1. Contractor's Construction Schedule per Section 01 3200.
  - 2. List of subcontractors.
  - 3. List of principal suppliers and fabricators for both Owner's direct purchase of Materials and Contractors.
  - 4. Schedule of Values.
  - 5. Schedule of principal products.
  - 6. Schedule of unit prices.
  - 7. Submittal Schedule.
  - 8. Copies of authorizations and licenses from governing authorities for performance of the work.
  - 9. Certificates of insurance and insurance policies.
  - 10. Performance and payment bonds.
- H. Application for Payment at Substantial Completion: Following issuance of the Certificate of Substantial Completion, submit an Application for Payment; this application shall reflect any Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the work. Administrative actions and submittals that shall proceed or coincide with this application include:
  - 1. Occupancy permits and similar approvals.
  - 2. Warranties (guarantees) and maintenance agreement.
  - 3. Test/adjust/balance records.
  - 4. Maintenance instructions.
  - 5. Meter readings.
  - 6. Start-up performance reports.
  - 7. Change-over information related to Owner's occupancy, use, operation and maintenance.
  - 8. Final cleaning.
  - 9. Application for reduction of retainage, and consent of surety.
  - 10. List of incomplete work, recognized as exceptions to Architect's Certificate of Substantial Completion.
- I. Final Payment Application: Administrative actions and submittals which must precede or coincide with submittal of the final payment Application for Payment include the following:
  - 1. Completion of Project close-out requirements.
  - 2. Completion of Punchlist items.
  - 3. Transmittal of required Project construction records to Owner.
  - 4. Resolution of all Claims
  - 5. Execution of all Change Orders
  - 6. Assessment of Liquidated Damages
  - 7. Removal of temporary facilities and services.
  - 8. Removal of surplus materials, rubbish and similar elements.
  - 9. Change of door locks to Owner's access.
  - 10. Consent of Surety to release final payment.
  - 11. Executed final waiver
- J. Owner Payment:
  - 1. Notwithstanding anything to the contrary, in no event shall Contractor stop the Work in connection with any withholding of payment for an item on failure to make payment relating to an item in connection with a good faith dispute.

2. Owner reserves the right, at its sole discretion, to issue joint checks. In no event shall joint payment create any obligations or contracts between Owner and a sub-contractor's supplier.

1.6 PAYMENT FOR STORED MATERIALS:

- A. The Owner may pay for off-site stored materials to be purchased by Contractor, at their discretion and through consultation with the Architect, provided the following requirements are met:
  1. Contractor must provide insurance certificate indicating such materials specifically insured. Materials remain Contractor's insurance responsibility until they are delivered to the job site, which is when the Owner's Builders Risk goes into effect. Reference insurance specifications.
  2. Materials shall be segregated and clearly marked with the Owner's name and project name.
  3. Contractor must provide a fully executed "Bill of Sale".
  4. Contractor must provide proof (through personal inspection by Owner's representative) that materials noted can be physically verified. Contractor shall reimburse the Owner and Architect for all reasonable expenses associated with representative's inspection trip.

1.7 SUBSTANTIATING DATA

- A. When Architect/Engineer or Owner requires substantiating information, submit data justifying dollar amounts in question.
- B. Provide one copy of data with cover letter for each copy of submittal. Indicate Application number and date, and line item by number and description.

PART 2 - PRODUCTS Not Used.

PART 3 - EXECUTION Not Used.

**END OF SECTION**

**SECTION 01 3100  
COORDINATION AND MEETINGS**

**PART 1 - GENERAL**

**1.1 SECTION INCLUDES**

- A. Coordination.
- B. Field engineering.
- C. Preconstruction meeting.
- D. Site mobilization meeting.
- E. Progress meetings.
- F. Preinstallation meetings.
- G. Project Superintendent meeting.
- H. Examination.
- I. Preparation

**1.2 SUMMARY**

- A. Sizes and locations of installed items and the general direction of installation area indicated on the Contract Documents. It is not the intent of the Documents to show every pipe, fitting connection, offset, etc., nor every structural difficulty to be encountered during installation. It is each Prime Contractors responsibility to verify routings before work commences and provide the materials and accessories necessary for a complete installation.
- B. Coordinate this section with the appropriate "Coordination Section" in the mechanical and electrical divisions of the Specifications.
- C. This section applies to Contractors and all Subcontractors. The Contractors shall ensure that all Subcontractors review and comply with requirements of this Section as applicable to their Work.

**1.3 RELATED SECTIONS**

- A. Section 01 7330 - Cutting and Patching.

**1.4 COORDINATION**

- A. Coordinate scheduling, submittals, and Work of the various sections of the Project Manual to assure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- B. Verify utility requirements and characteristics of operating equipment are compatible with utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- C. Coordinate space requirements and installation of mechanical and electrical work which are indicated diagrammatically on Drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- D. In finished areas, except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- E. Coordinate completion and clean up of Work of separate sections in preparation for Substantial Completion and for portions of Work designated for Owner's partial occupancy.
- F. After Owner occupancy, coordinate access to site for correction of defective Work and Work

not in accordance with Contract Documents, to minimize disruption of Owner's activities.

#### 1.5 FIELD ENGINEERING

- A. Contractor to locate and protect survey control and reference points.
- B. Verify set-backs and easements, confirm drawing dimensions and elevations.
- C. Provide field engineering services. Establish elevations, lines, and levels, utilizing recognized engineering survey practices.

#### 1.6 PRECONSTRUCTION MEETING

- A. Architect shall schedule a meeting after Notice to Proceed.
- B. Attendance Required: Owner, Architect/Engineer, Contractor.
- C. Agenda:
  - 1. Distribution of Contract Documents.
  - 2. Submission of list of Subcontractors, list of Products, schedule of values, and progress schedule not previously required.
  - 3. Designation of personnel representing the parties in Contract, Architect and other Consultants.
  - 4. Procedures and processing of field decisions, submittals, substitutions, Applications for Payments, proposal request, Change Orders, and Contract closeout procedures.
  - 5. Scheduling.
  - 6. Scheduling activities of inspection and testing service.
- D. Architect shall record minutes and distribute copies within five days after meeting to participants, with copies to those affected by decisions made.

#### 1.7 SITE MOBILIZATION MEETING

- A. Architect shall schedule a meeting at the Project site prior to Contractor occupancy.
- B. Attendance Required: Owner, Architect/Engineer, Contractor, Contractor's Major Subcontractors and other parties as deemed necessary by the Owner or Architect/Engineer.
- C. Agenda:
  - 1. Use of premises by Owner and Contractor.
  - 2. Owner's requirements and occupancy.
  - 3. Construction facilities and controls provided by Owner.
  - 4. Temporary utilities provided by Owner.
  - 5. Survey and layout.
  - 6. Security and housekeeping procedures.
  - 7. Schedules.
  - 8. Procedures for testing.
  - 9. Procedures for maintaining record documents.
  - 10. Requirements for start-up of equipment.
  - 11. Inspection and acceptance of equipment put into service during construction period.
- D. Architect shall record minutes and distribute copies within five days after meeting to participants, with copies to Consultants, Owner, and participants. Contractor shall distribute minutes to any subcontractors, suppliers and vendors affected by decisions made.

#### 1.8 PROGRESS MEETINGS

- A. Architect shall schedule and administer meetings throughout progress of the Work at two week intervals unless otherwise required by the Work.
- B. Architect shall prepare agenda with copies for participants and preside at meetings.
- C. Attendance Required: Owner, Architect, Job Superintendents, and Consultants as deemed



necessary by the Owner or Architect/Engineer.

D. Agenda:

1. Review minutes of previous meetings.
2. Review of Work progress.
3. Field observations, problems, and decisions.
4. Identification of problems which impede planned progress.
5. Review of submittals schedule and status of submittals.
6. Review of delivery schedules.
7. Maintenance of progress schedule.
8. Corrective measures to regain projected schedules.
9. Planned progress during succeeding work period.
10. Coordination of projected progress.
11. Maintenance of quality and work standards.
12. Effect of proposed changes on progress schedule and coordination.
13. Current safety changes
14. Other business relating to Work.

- E. Architect shall record minutes and distribute copies within five days after meeting to participants, with copies to Consultants, Owner, and participants. Contractors shall distribute minutes to any subcontractors, suppliers and vendors not in attendance affected by decisions made.

1.9 PREINSTALLATION MEETING

- A. When required in individual specification sections, the respective Contractor shall convene a preinstallation meeting at the site prior to commencing work of the section.
- B. Require attendance of parties directly affecting, or affected by, work of the specific section.
- C. Notify Architect/Engineer, Owner and other affected Contractors four days in advance of meeting date.
- D. Contractor shall prepare agenda and preside at meeting:
1. Review conditions of installation, preparation and installation procedures.
  2. Review coordination with related work.
- E. Record minutes and distribute copies within five days after meeting to participants, with two copies to Architect, single copy to Owner and those affected by decisions made.

1.10 COORDINATION MEETINGS

- A. When necessary, the appropriate Consultant will participate in coordination meetings.
- B. All Prime Contractors are required to participate in coordination meetings as necessary where mechanical and electrical work may coincide or interfere with their installations.

1.11 ADDITIONAL MEETING

- A. The Architect/Engineer may conduct additional meetings as required by the Project conditions or changes. All Contractors must attend these meetings at no additional cost to the Owner.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION – Not Used

**END OF SECTION**

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## **SECTION 01 3300 SUBMITTAL PROCEDURES**

### **PART 1 - GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Submittal Schedule
- B. Submittal procedures.
- C. Electronic Submissions
- D. Proposed Products list.
- E. Shop Drawings.
- F. Product Data.
- G. Samples.
- H. Manufacturers installation instructions.
- I. Manufacturers certificates.
- J. Electronic Documents.

#### **1.2 RELATED SECTIONS**

- A. General and Supplementary Conditions.
- B. Section 01 7700 - Contract Closeout: Contract warranties, manufacturers' certificates, and closeout submittals.

#### **1.3 DEFINITIONS**

- A. General: Work-related submittals of this section are categorized for convenience as follows, but not limited to:
  - 1. Shop Drawing: Include specially-prepared technical data for this Project, including drawings, diagrams, performance curves, data sheets, schedules, templates, patterns, reports, calculations, instructions, measurements and similar information not in standard printed form for general application to a range or similar projects.
  - 2. Product Data: Includes standard printed information on materials, products and systems; not specially-prepared for this project, other than the designation of selections from among available choices printed therein.
  - 3. Samples: Includes both fabricated and unfabricated physical examples of materials; products and units of work; both as complete units and as smaller portions or units of work; either for limited visual inspection or (where indicated) for more detailed testing and analysis.
  - 4. Mock-Ups: Are a special form of samples, which are too large or otherwise inconvenient for handling in specified manner for transmittal of sample submittals.

#### **1.4 SUBMITTAL SCHEDULE**

- A. Within 10 days of Notice to Proceed, Contractor shall submit a Submittal Schedule to the Architect.
- B. The Schedule shall indicate the following information:
  - 1. A list of submittals organized by specification section number.
  - 2. Delivery date for each Submittal based upon the demands of the schedule
  - 3. Expected date of submittal return from the Architect.
  - 4. Identify all Long Lead items that are on the Critical Path.
  - 5. Identify by submission by specification section number.
  - 6. A list of submittals required by the Authorities Having Jurisdiction (AHJ)

7. Indicate scheduled date for initial submittal, date for approval, and date for possible resubmittal for each submittal.
- C. Schedule submittals to expedite the Project and deliver to Architect at business address. Coordinate submission of related items.
- D. Unless otherwise indicated specifically on the transmittal from the Contractor the Submittals Schedule will be used by the Architect to prioritize the review of Submittals.
- E. Coordinate Schedule of Submittals with Construction Schedule. Revise and update Schedule of Submittals when required by changes in the Construction Schedule. Provide Architect with updated schedules within 5 days of date that the construction schedule is revised.

#### 1.5 SUBMITTAL PROCEDURES

- A. All submittals shall be submitted electronically through the Owner's designated project management platform, except for the following:
  1. Samples
  2. Color charts and color samples
  3. O&M Manuals
  4. Applications for Payment
  5. Legal Notices
  6. Final Manufacturer's warranties.
  7. Other items as directed by the Architect.
- B. Accompany each submittal with an Architect-accepted electronic transmittal form. Review comments and submittal status will be returned through the designated electronic platform.
- C. For submittals not transmitted electronically, provide transmittal documentation as directed by the Architect.
- D. Sequentially number the transmittal form. Revised submittals shall include the original number will be assigned a numeric suffix.
- E. Identify Date, Project, Architect/Engineer, Contractor, Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate.
- F. Apply Contractor's stamp, signed or initialed certifying that review, verification of Products required, field dimensions, adjacent construction Work, and coordination of information, is in accordance with the requirements of the Work and Contract Documents.
- G. Prior to submission, the Contractor shall review each submittal for compliance with the Contract Documents and verify field measurements, field conditions, catalog information, and coordination with related Work. Submission of a submittal constitutes the Contractor's certification that such review has been performed.
- H. Schedule submittals to expedite the Project and deliver to Architect at address as identified in Preconstruction Meeting. Coordinate submission of related items.
- I. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.
- J. Identify variations from Contract Documents and Product or system limitations which may be detrimental to successful performance of the completed Work.
- K. Submittals requiring coordination between trades shall be coordinated prior to submission. Submittals lacking evidence of coordination may be returned without review.
- L. Provide space for Contractor and Architect/Engineer review stamps.
- M. Architect's Review Stamp: Submittals will be stamped indicating one of the following:

1. Submittals which are correct but do not require further review will be returned to the Contractor bearing the Architect's stamp, "Reviewed".
  2. Submittals which are incorrect but do not require further review will be returned to the Contractor bearing the Architect's stamp, "Reviewed as Noted".
  3. Submittals which are incorrect and require further review will be returned to the Contractor bearing the Architect's stamp, "Revise and Resubmit".
  4. Submittals which are incomplete will be returned to the Contractor bearing the Architect's stamp, "Not Approved".
  5. Drawings and Submittals which are incorrect, do not require further review, but are required for record purposes, will be returned to the Contractor bearing the Architect's stamp "resubmit for Record Purposes".
- N. Architect's review is for general conformance with the design concept and does not relieve Contractor of responsibility for errors, omissions, or coordination.
- O. Revise and resubmit as required, identify all changes made since previous submission.
- P. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with provisions.
- Q. Submittals not requested will not be recognized or processed.
- R. Once all the required Submittals for items of work have been returned with an "Reviewed" or "Reviewed as Note" marked on them the item of work may be incorporated in to the Project; unless additional approvals are required from the Authority Having Jurisdiction prior to installation. The Contractor shall be responsible for providing all submittals required by the Authority Having Jurisdiction to the Authority and obtaining all related approvals from that Authority.
- S. Submittals to Authority Having Jurisdiction (AHJ):
1. Test Reports and Independent Inspection Reports: Sent to AHJ, Owner, Architect, Contractor concurrently.
  2. Other Submittals: All other submittals required to be sent to AHJ must be marked "Reviewed" or "Reviewed as Noted" prior to submitting to AHJ.
  3. Changes requested by the AHJ shall be reported to Architect for review and approval prior to incorporating the change into the Project.
  4. Proceeding with any work in advance of AHJ approval is at the sole risk of the Contractor.
  5. Scheduling:
    - a. The Contractor shall include in the Submittal Schedule and Project Construction Schedule adequate time for AHJ review.
    - b. Contractor shall include reasonable time required by the AHJ.
    - c. If the AHJ requests changes to a submittal allow an additional 10 days for review and approval by the Architect.
- 1.6 PROPOSED PRODUCTS LIST
- A. Within 10 days after date of Owner-Contractor Agreement, submit list of major Products proposed for use, with name of manufacturer, supplier, trade name, and model number of each product.
  - B. For Products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.
- 1.7 ELECTRONIC SUBMISSIONS
- A. The following submittals shall be submitted electronically:
    1. Transmittals for all communication
    2. Product Data

3. Shop Drawings
  4. Meeting Agenda & Minutes.
  5. RFI (Requests for Information)
  6. CCD (Construction Change Directives)
  7. Punch Lists
  8. Daily reports
  9. Project Record Documents.
- B. All electronic submittals shall be submitted through the Owner's designated project management platform as identified at the Preconstruction Meeting.
- C. All submittals will be returned to the Contractor will be returned electronically with the exceptions of samples color charts and O&M Manuals.
- D. When utilizing electronic submittal process the Contractor is only required to submit one copy and only one copy will be returned electronically for revisions or distribution.
- E. Electronic Document Format:
1. Submit information in one of the following formats:
    - a. PDF is the preferred format.
    - b. Microsoft word for PC
    - c. Revit Models in RVT format
  2. Returned Items will be sent in PDF Format.
  3. Size Printable to a minimum of 8-1/2" x 11" and a maximum size of 30" x 42".
  4. Each document shall be printable in a clear and thorough manner.
  5. Title each drawing with Project Name, Contract name and Contract Number.
  6. Plans, elevations, sections and details shall be include a printable graphic scale as well as a numerical scale. Drawing scale shall be of an equal or larger scale than similar drawings in the Contract Documents.
  7. Indicate field verified dimensions. Include relationships to adjacent materials and provide coordination notes.
  8. Schematics and Diagrams shall be logically arranged and present in a clear and understandable manner with all items clear identified and labeled.
  9. Internal Wiring Diagrams: Provide internal wiring and elementary ladder diagrams for factory pre-wired equipment.
  10. Control Diagrams: Show relative positions of each component as a system diagram.
- 1.8 SHOP DRAWINGS
- A. Shop Drawings: Submit for review. After review, produce copies and distribute in accordance with the SUBMITTAL PROCEDURES article above and for record documents purposes described in Section 017700 - CONTRACT CLOSEOUT.
- B. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- 1.9 PRODUCT DATA
- A. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information unique to this Project.
- B. Indicate Product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- C. After review distribute in accordance with the Submittal Procedures article above and provide copies for record documents described in Section 017700 - CONTRACT CLOSEOUT.
- 1.10 SAMPLES

- A. Submit samples to illustrate functional and aesthetic characteristics of the Product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
- B. Submit samples of finishes from the full range of manufacturers' standard colors or in custom colors selected, textures, and patterns for Architect/Engineer selection.
- C. Include identification on each sample, with full Project information.
- D. Submit minimum of three samples; one of which will be retained by Architect.
- E. Reviewed samples which may be used in the Work are indicated in individual specification sections.

#### 1.11 MANUFACTURER INSTALLATION INSTRUCTIONS

- A. When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, to Architect, in quantities specified for Product Data.
- B. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

#### 1.12 MANUFACTURER CERTIFICATES

- A. When specified in individual specification sections, submit certification by manufacturer to Architect in quantities specified for Product Data.
- B. Indicate material or Product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
- C. Certificates may be recent or previous test results on material or Product but must be acceptable to Architect.

### PART 2 - PRODUCTS Not Used

### PART 3 - EXECUTION

#### 3.1 ELECTRONIC DOCUMENTS

- A. Gilbert Architects will make the drawings available to the Contractor after the execution of the Owner-Contractor Agreement (**ELECTRONIC DOCUMENTS ARE NOT AVAILABLE DURING BIDDING**).
- B. Files will be furnished in their original software format and are not available in any other format. The Architect does not guarantee software/hardware compatibility..
- C. The documents provided were prepared by Gilbert Architects or their consultants as instruments of service to the Owner for this Project. The Owner and the Architect do not endorse or warrant the documents as suitable for any other purpose. These documents are furnished without warranties or guarantees (express, implied, or statutory), for the accuracy, reliability and completeness. These files may vary from the documents used during bidding and do not include modifications issued by addenda or bulletins.
- D. In order to obtain any documents in electronic format the Contractor shall submit to the Architect a letter on company letterhead which includes the following information:
  - 1. At this time our company is requesting the following drawings in electronic format:
    - a. (List each drawing by the sheet no. as it appears in the contract documents)
  - 2. In making this request for documents in electronic format our company hereby agrees to the following conditions:
    - a. We agree to remove any and all identification of the Architect and consultants

- from title block prior to the use of the documents.
- b. We agree to release and indemnify the Owner, Architect and their consultants against any losses or claims as a result of any errors or omissions in the electronic data.
  - c. Electronic files are not construction documents. Differences may exist between the electronic files and corresponding hard-copy construction documents. The Architect and Owner make no representation regarding the accuracy or completeness of the electronic files. In the event that a conflict is discovered between the hard copy construction documents and the electronic files, hard-copy construction documents shall govern. The Contractor is responsible for determining if any conflict exists.
  - d. The use of the electronic files, does not relieve the Contractor of fully complying with the Contract Documents or the need to check, confirm and coordinate all dimensions, and details, take field measurements, verify field conditions and coordinate your work with that of other contractors for the Project.
  - e. Under no circumstances shall delivery of the electronic files be deemed a sale. The Owner and Architect make no warranties, either express or implied, of merchantability and fitness for any particular purpose. In no event shall we be liable for any loss of profit or any consequential damages as a result of your use of these electronic files.

**END OF SECTION**



**SECTION 01 3516  
ALTERATION PROJECT PROCEDURES**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section includes special procedures for alteration work.

**1.2 DEFINITIONS**

- A. Alteration Work: This term includes remodeling, renovation, repair, and maintenance work performed within existing spaces or on existing surfaces as part of the Project.
- B. Match: To blend with adjacent construction and manifest no apparent difference in material type, species, cut, form, detail, color, grain, texture, or finish; as approved by Architect.
- C. Refinish: To remove existing finishes to base material and apply new finish to match original, or as otherwise indicated.
- D. Repair: To correct damage and defects, retaining existing materials, features, and finishes. This includes patching, piecing-in, splicing, consolidating, or otherwise reinforcing or upgrading materials.
- E. Replace: To remove, duplicate, and reinstall entire item with new material. The original item is the pattern for creating duplicates unless otherwise indicated.
- F. Retain: To keep existing items that are not to be removed or dismantled.
- G. Strip: To remove existing finish down to base material unless otherwise indicated.

**1.3 INFORMATIONAL SUBMITTALS**

- A. Alteration Work Program: Submit 10 days after Notice to Proceed
- B. Fire-Prevention Plan: Submit 10 days after Notice to Proceed.

**1.4 QUALITY ASSURANCE**

- A. Title X Requirement: Each firm conducting activities that disturb painted surfaces shall be a "Lead-Safe Certified Firm" according to 40 CFR 745, Subpart E, and use only workers that are trained in lead-safe work practices.
- B. Alteration Work Program: Prepare a written plan for alteration work for whole Project, including each phase or process and protection of surrounding materials during operations. Show compliance with indicated methods and procedures specified in this and other Sections. Coordinate this whole-Project alteration work program with specific requirements of programs required in other alteration work Sections.
  - 1. Dust and Noise Control: Include locations of proposed temporary dust- and noise-control partitions and means of egress from occupied areas coordinated with continuing on-site operations and other known work in progress.
  - 2. Debris Hauling: Include plans clearly marked to show debris hauling routes, turning radii, and locations and details of temporary protective barriers.
- C. Fire-Prevention Plan: Prepare a written plan for preventing fires during the Work, including placement of fire extinguishers, fire blankets, rag buckets, and other fire-control devices during each phase or process. Coordinate plan with Owner's fire-protection equipment and requirements. Include fire-watch personnel's training, duties, and authority to enforce fire safety.
- D. Safety and Health Standard: Comply with ANSI/ASSE A10.6.

## 1.5 STORAGE AND HANDLING OF SALVAGED MATERIALS

### A. Salvaged Materials:

1. Clean loose dirt and debris from salvaged items unless more extensive cleaning is indicated.
2. Pack or crate items after cleaning; cushion against damage during handling. Label contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area designated by Owner.
5. Protect items from damage during transport and storage.

### B. Salvaged Materials for Reinstallation:

1. Repair and clean items for reuse as indicated.
2. Pack or crate items after cleaning and repairing; cushion against damage during handling. Label contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment unless otherwise indicated. Provide connections, supports, and miscellaneous materials to make items functional for use indicated.

### C. Existing Materials to Remain: Protect construction indicated to remain against damage and soiling from construction work. Where permitted by Architect, items may be dismantled and taken to a suitable, protected storage location during construction work and reinstalled in their original locations after alteration and other construction work in the vicinity is complete.

### D. Storage: Store salvaged and existing materials to be reinstalled in a dry, secure location protected from moisture, damage and theft. Protect materials from deterioration and environmental exposure until reinstallation.

## PART 2 - PRODUCTS (Not Used)

## PART 3 - EXECUTION

### 3.1 PROTECTION

#### A. Protect persons, motor vehicles, surrounding surfaces of building, building site, plants, and surrounding buildings from harm resulting from alteration work.

1. Use only proven protection methods, appropriate to each area and surface being protected.
2. Provide temporary barricades, barriers, and directional signage to exclude the public from areas where alteration work is being performed.
3. Erect temporary barriers to form and maintain fire-egress routes.
4. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during alteration work.
5. Contain dust and debris generated by alteration work, and prevent it from reaching the public or adjacent surfaces.
6. Provide shoring, bracing, and supports as necessary. Do not overload structural elements.
7. Protect floors and other surfaces along hauling routes from damage, wear, and staining.
8. Provide supplemental sound-control treatment to isolate demolition work from other areas of the building.

#### B. Temporary Protection of Materials to Remain:

1. Protect existing materials with temporary protections and construction. Do not remove existing materials unless otherwise indicated.
  2. Do not attach temporary protection to existing surfaces except as indicated as part of the alteration work program.
- C. Comply with each product manufacturer's written instructions for protections and precautions. Protect against adverse effects of products and procedures on people and adjacent materials, components, and vegetation.
- D. Utility and Communications Services:
1. Notify Owner, Architect, authorities having jurisdiction, and entities owning or controlling wires, conduits, pipes, and other services affected by alteration work before commencing operations.
  2. Disconnect and cap pipes and services as required by authorities having jurisdiction, as required for alteration work.
  3. Maintain existing services unless otherwise indicated; keep in service, and protect against damage during operations. Provide temporary services during interruptions to existing utilities.
- E. Existing Drains: Prior to the start of work in an area, test drainage system to ensure that it is functioning properly. Notify Architect immediately of inadequate drainage or blockage. Do not begin work in an area until the drainage system is functioning properly.
1. Prevent solids such as adhesive or mortar residue or other debris from entering the drainage system. Clean out drains and drain lines that become sluggish or blocked by sand or other materials resulting from alteration work.
  2. Protect drains from pollutants. Block drains or filter out sediments, allowing only clean water to pass.
- F. Existing Roofing: Prior to the start of work in an area, install roofing protection as indicated on Drawings.

### 3.2 PROTECTION FROM FIRE

- A. General: Follow fire-prevention plan and the following:
1. Comply with NFPA 241 requirements unless otherwise indicated.
  2. Remove and keep area free of combustibles, including rubbish, paper, waste, and chemicals, unless necessary for the immediate work.
    - a. If combustible material cannot be removed, provide fire blankets to cover such materials.
- B. Heat-Generating Equipment and Combustible Materials: Comply with the following procedures while performing work with heat-generating equipment or combustible materials, including welding, torch-cutting, soldering, brazing, removing paint with heat, or other operations where open flames or implements using high heat or combustible solvents and chemicals are anticipated:
1. Obtain Owner's approval for operations involving use of welding or other high-heat equipment. **Use of open-flame equipment is not permitted.** Notify Owner **at least 72 hours** before each occurrence, indicating location of such work.
  2. As far as practicable, restrict heat-generating equipment to shop areas or outside the building.
  3. Do not perform work with heat-generating equipment in or near rooms or in areas where flammable liquids or explosive vapors are present or thought to be present. Use a combustible gas indicator test to ensure that the area is safe.
  4. Use fireproof baffles to prevent flames, sparks, hot gases, or other high-temperature material from reaching surrounding combustible material.

5. Prevent the spread of sparks and particles of hot metal through open windows, doors, holes, and cracks in floors, walls, ceilings, roofs, and other openings.
  6. Fire Watch: Before working with heat-generating equipment or combustible materials, station personnel to serve as a fire watch at each location where such work is performed. Fire-watch personnel shall have the authority to enforce fire safety. Station fire watch according to NFPA 51B, NFPA 241, and as follows:
    - a. Train each fire watch in the proper operation of fire-control equipment and alarms.
    - b. Prohibit fire-watch personnel from other work that would be a distraction from fire-watch duties.
    - c. Cease work with heat-generating equipment whenever fire-watch personnel are not present.
    - d. Have fire-watch personnel perform final fire-safety inspection each day beginning no sooner than 30 minutes after conclusion of work in each area to detect hidden or smoldering fires and to ensure that proper fire prevention is maintained.
    - e. Maintain fire-watch personnel at each area of Project site until 60 minutes after conclusion of daily work.
  - C. Fire-Control Devices: Provide and maintain fire extinguishers, fire blankets, and rag buckets for disposal of rags with combustible liquids. Maintain each as suitable for the type of fire risk in each work area. Ensure that nearby personnel and the fire-watch personnel are trained in fire-extinguisher and blanket use.
  - D. Sprinklers: Where sprinkler protection exists and is functional, maintain it without interruption while operations are being performed. If operations are performed close to sprinklers, shield them temporarily with guards.
    1. Remove temporary guards at the end of work shifts, whenever operations are paused, and when nearby work is complete.
- 3.3 PROTECTION DURING APPLICATION OF CHEMICALS
- A. Protect adjacent surfaces and building components from damage due to chemical products and adhesives.
  - B. Prevent chemicals from entering drainage systems.
  - C. Dispose of waste materials in accordance with applicable regulations.
  - D. Use chemical products and adhesives in accordance with manufacturer's written instructions.
- 3.4 GENERAL ALTERATION WORK
- A. Record existing work before each procedure (preconstruction), and record progress during the work. Use digital preconstruction documentation photographs or video recordings.
  - B. Perform surveys of Project site as the Work progresses to detect hazards resulting from alterations.
  - C. Notify Architect of visible changes in the integrity of material or components whether from environmental causes including biological attack, UV degradation, freezing, or thawing or from structural defects including cracks, movement, or distortion.
    1. Do not proceed with the work in question until directed by Architect or Owner's representative.

**END OF SECTION**

## **SECTION 01 4500 QUALITY CONTROL**

### **PART 1 - GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Quality assurance - control of installation.
- B. Tolerances
- C. References.
- D. Inspecting and testing laboratory services.
- E. Manufacturers' field services and reports.

#### **1.2 RELATED SECTIONS**

- A. Section 01 3000 - Submittal Procedures: Submission of manufacturers' instructions and certificates.
- B. Section 01 6000 - Product Requirements: Requirements for material and product quality.

#### **1.3 QUALITY ASSURANCE - CONTROL OF INSTALLATION**

- A. Monitor quality control over suppliers, manufacturers, Products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.
- C. If manufacturers' instructions conflict with the Contract Documents, request clarification from the Architect before proceeding.
- D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Perform work by persons qualified to produce workmanship of specified quality.
- F. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

#### **1.4 TOLERANCES**

- A. Monitor tolerance control of installed Products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. If manufacturers' tolerances conflict with the Contract Documents, request clarification from the Architect before proceeding..
- C. Adjust Products to appropriate dimensions; position before securing Products in place.

#### **1.5 REFERENCES**

- A. For Products or workmanship specified by association, trade, or other consensus standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to reference standard by date of issue current on date of Contract Documents, date specified in the individual specification sections, except where a specific date is established by code.
- C. Obtain copies of standards where required by product specification sections.
- D. The contractual relationship, duties, and responsibilities of the parties in Contract nor those

of the Architect/Engineer shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

#### 1.6 MANUFACTURERS' FIELD SERVICES AND REPORTS

- A. Definitions:
  - 1. Authority Having Jurisdiction (AHJ): The public agency authorized by the local government to enforce the building code or portion of the building code.
  - 2. Inspector: The person or company retained to perform inspections of the construction. For structural components, retain a structural engineer registered in the state where the project is located and to observe the construction making either periodical inspections or continuous inspections as required by code.
  - 3. Testing Agency or Independent Testing Laboratory: A professional firm retained by the Owner conduct test and inspections to determine if the construction in compliance with the Building Code and the Contract Documents.
  - 4. Other definitions shall be as defined in 2021 IBC.
- B. When specified in individual specification sections, require material or Product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation quality of workmanship, and start-up of equipment, as applicable, and to initiate instructions when necessary.
- C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.
- D. Submit report electronically to the Architect.

#### 1.7 INSPECTING AND TESTING LABORATORY SERVICES

- A. The Owner will retain and pay for the services of an independent Testing Agency to conduct testing and independent inspections as required by the Building Code, the Authority Having Jurisdiction or the Contract Documents. The independent firm will perform inspections, tests, and other services specified in this Section, individual specification sections or elsewhere in the Contract Documents unless specifically indicated in the Contract Documents to be performed by the Contractor.
- B. Test results and inspection reports will be furnished to the Owner, Architect, and Contractor simultaneously. Test results and inspection reports required by the Authority Having Jurisdiction will be submitted to the Authority by the Testing Laboratory.
- C. Reports will be submitted, indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.
- D. Notify Owner's Representative and Architect 72 hours prior to expected time for operations requiring services.
- E. Retesting required because of non-conformance to specified requirements will be performed by the same independent firm on instructions by the Architect. Payment for retesting will be charged to the Contractor by deducting inspecting or testing charges from the Contract Sum/Price.
- F. The Contractor shall store at the site in location accessible to the Owner, the Architect, and the Independent Testing Agency, all test results and reports provided from the Testing Agency.
- G. Testing or inspection does not relieve Contractor to performing Work in accordance with the Contract Documents.

**END OF SECTION**

**SECTION 0 5000**  
**TEMPORARY FACILITIES AND UTILITIES**

**PART 1 GENERAL**

**1.1 SUMMARY**

- A. This Section includes requirements for temporary utilities, facilities, security, protection, and controls necessary for proper execution and completion of the Work.
- B. Contractor is responsible for furnishing, installing, maintaining, and removing temporary facilities required to perform the Work.

**1.2 CONTRACTOR RESPONSIBILITY**

- A. Contractor shall provide temporary services and facilities necessary to support construction operations and to protect existing building areas, occupants, and property.
- B. Coordinate temporary facility locations with Owner and Architect.
- C. Comply with applicable codes, OSHA regulations, utility company requirements, and governing authorities.
- D. Temporary facilities shall not interfere with school operations or public safety.

**PART 2 - PRODUCTS**

**2.1 MATERIALS**

- A. Provide new or serviceable materials suitable for intended temporary use.
- B. Temporary installations shall meet applicable safety standards.

**PART 3 - EXECUTION**

**3.1 TEMPORARY UTILITY INSTALLATION**

- A. Temporary Water and Electrical Utilities
  - 1. Contractor will be permitted to use existing on-site water and electrical utilities within the Project area.
  - 2. Contractor shall be responsible for providing all equipment, connections, protection, and extensions necessary to distribute water and electrical service from existing source locations to locations required for the Work.
  - 3. Contractor shall coordinate tie-in locations with Owner.
  - 4. Contractor shall protect existing systems from overload or damage.
  - 5. Remove temporary extensions at completion of Work and restore systems to original condition.
- B. Temporary Heating
  - 1. Project area is currently within conditioned space.
  - 2. If existing HVAC systems serving the Project area are removed or rendered inoperable, Contractor shall provide temporary heat as required to support the Work and maintain required construction conditions.
  - 3. Maintain minimum temperatures required by product manufacturers.
  - 4. Open-flame heaters are prohibited.

**3.2 TEMPORARY CONSTRUCTION AND SUPPORT FACILITIES INSTALLATION**

- A. Field Office and Meeting Space
  - 1. Owner will provide Contractor use of an area within the building for field office and meeting purposes.

2. Contractor shall provide all furniture, furnishings, and equipment required for field office use.
  3. Owner will provide furniture for designated meeting spaces only.
- B. Temporary Toilet Facilities
1. Contractors for both renovation projects and roofing projects shall provide temporary toilet facilities for their employees and their subcontractors' employees.
  2. Maintain facilities in clean and sanitary condition in accordance with applicable regulations.
- C. Waste Disposal
1. Provide dumpsters and waste collection as required.
  2. Remove construction debris regularly to maintain a safe and orderly site.
  3. Disposal of materials in accordance with applicable regulations
  4. Do not allow accumulation of debris within the building.
- D. Dust and Protection Control
1. Provide dust partitions and temporary barriers to separate construction areas from occupied or adjacent spaces.
  2. Seal penetrations and maintain negative air where required to prevent migration of dust.
  3. Protect existing finishes, furnishings, and building systems from damage
- E. Storage and Security
1. Owner will designate on-site storage areas
  2. Contractor shall provide all temporary storage facilities required for materials and equipment.
  3. Storage of materials and equipment within the building and outside designated construction areas is prohibited.
  4. Contractor shall be fully responsible for security of all on-site materials and equipment.
- F. Temporary Fire Protection
1. Contractor shall provide and maintain temporary fire protection in accordance with applicable OSHA requirements for the duration of construction.
  2. Maintain fire protection systems at all times during construction.
  3. Coordinate impairments with Owner and local authorities having jurisdiction.
- G. Weather Protection
1. Protect Work from weather damage during construction.
- H. Communication
1. Contractor shall provide its own communication equipment including phone, fax, and computer systems.
  2. Owner will provide internet service connection for Contractor use.
- 3.3 REMOVAL
- A. Remove temporary facilities and restore affected areas at completion of the Work.
- B. Repair damage caused by installation or removal of temporary facilities.

**END OF SECTION**



**SECTION 01 6000  
PRODUCT REQUIREMENTS**

**PART 1 - GENERAL**

**1.1 SECTION INCLUDES**

- A. Products.
- B. Transportation and handling.
- C. Storage and protection.
- D. Product options.
- E. Substitutions.

**1.2 RELATED SECTIONS**

- A. Instructions to Bidders: Product options and substitution procedures.

**1.3 PRODUCTS AND EQUIPMENT**

- A. Do not use materials and equipment removed from existing premises, except as specifically permitted by the Contract Documents.
- B. Provide products of the same manufacturer for each type of component unless otherwise approved by the Architect.
- C. If, during the course of the Project, a specified item of equipment or appliance is discontinued, or if changes are made to the manufacturer's standard features, the replacement item provided by the Contractor shall include, at a minimum, the features specified at the time of bidding. Provide a replacement product with equal or greater functionality at no additional cost to the Owner.

**1.4 COLOR SELECTION**

- A. Where color selection is required, provide manufacturer's standard color range unless otherwise required.

**1.5 TRANSPORTATION AND HANDLING**

- A. Transport and handle products in accordance with manufacturer's instructions.
- B. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
- C. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

**1.6 STORAGE AND PROTECTION**

- A. Store and protect products in accordance with manufacturers' instructions, with seals and labels intact and legible.
- B. Store sensitive products in weather tight, climate controlled enclosures.
- C. For exterior storage of fabricated products, place on sloped supports, above ground.
- D. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation or potential degradation of product.
- E. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- F. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

- G. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.
- H. Provide all temporary protection necessary to protect the Work, whether in progress or completed, from damage due to weather, other construction operations, or similar activities. Maintain such protection until it is no longer required or until Substantial Completion, whichever occurs first.
- I. Store roofing materials off the ground and protect from moisture and weather exposure.

#### 1.7 SUBSTITUTIONS PRIOR TO RECEIPT OF BID

- A. Prior to Bidding: To be considered prior to bidding, requests for substitution must be submitted during the bidding period and received no later than 10 days prior to receipt of bids. Comply with the requirements specified in this section. This does not limit the bidder from proposing alternatives at the time of bid receipt in accordance with the Supplementary Instructions to Bidders.
- B. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.
- C. A request constitutes a representation that the Prime Bidder:
  - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
  - 2. Will provide the same warranty for the Substitution as for the specified product.
  - 3. That the use of this product will not have an adverse effect on any other trade or Contractor or the Construction Schedule.
  - 4. Will coordinate and make changes to this and other Work which may be required for complete installation at no additional cost to Owner.
  - 5. Has investigated proposed product and determined that its use will not adversely affect the Project Schedule.
  - 6. That he waives all rights to claims for additional costs or time extension which may subsequently become apparent.
- D. Substitution Submittal Procedure:
  - 1. Submit request for Substitution for consideration. Limit each request to one proposed Substitution. Identify specification section of product being considered.
  - 2. Clearly delineate on Contract Document specification section applicable for product which a proposed substitution is being submitted, differences between substitution and product specified.
  - 3. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer.
  - 4. The Architect will notify all bidders in writing of decision to accept a request by addendum.
  - 5. Each request shall include all information required to make a technical comparison of the product to be substituted with the specified product. This information shall include color and finish samples if the installed product will be visible after installation.
- E. Submit each request for substitution accompanied by a separate Substitution Request Form a copy of which is bound in these specifications.
- F. In submitting its bid, Bidder shall not use or consider any substitutions, other than those approved by Addendum.

#### 1.8 SUBSTITUTIONS AFTER EXECUTION OF THE AGREEMENT

- A. Substitutions will not be considered after execution of the Contract except where the specified product becomes unavailable through no fault of the Contractor. Unavailability caused by the Contractor's failure to timely order materials, submit required

submittals, or otherwise properly coordinate procurement shall not constitute grounds for substitution. Such conditions are solely the responsibility of the Contractor and shall not be justification for adjustment of the Contract Sum or Contract Time.

- B. If all specified products become unavailable through no fault of the Contractor, the following procedures shall be followed prior to considering any request for substitution and NO ACTION TO REVIEW THE PROPOSED SUBSTITUTION WILL BE TAKEN BY THE ARCHITECT OR ENGINEER UNTIL THE CONTRACTOR HAS SUBMITTED THE FOLLOWING:
1. A copy of the warranty.
  2. A summary of the schedule impact.
- C. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request as included above, or when acceptance will require revision to the Contract Documents.
- D. In submitting a substitution request the Contractor acknowledges that:
1. The Contractor has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
  2. The product will provide the same warranty for the Substitution as for the specified product.
  3. The use of this product will not have an adverse effect on any other trade or Prime Contractor or the Construction Schedule.
  4. The Contractor will coordinate and make changes to this and other Work which may be required for complete the installation at no additional cost to Owner.
  5. The Contractor has investigated proposed product and determined that it's use will not adversely affect the Project Schedule.
  6. He waives all rights to claims for additional costs or time extension which may subsequently become apparent.

PART 2 - PRODUCTS Not Used.

PART 3 - EXECUTION Not Used.

**END OF SECTION**

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### SUBSTITUTION REQUEST FORM

To: \_\_\_\_\_ Project: \_\_\_\_\_

Section Paragraph Specified Item

\_\_\_\_\_

Drawing No: \_\_\_\_\_

Proposed Substitute: \_\_\_\_\_

Attach complete description, catalog, spec data, laboratory tests if applicable, and side by side comparison chart of all features, characteristics, and performance criteria per requirements of Section 01 6000.

1. Will substitute affect dimensions indicated on Drawings? \_\_\_\_\_

2. Will substitute affect wiring, piping, ductwork, etc. indicated on the Drawings? \_\_\_\_\_

3. What effect will substitution have on other trades? \_\_\_\_\_

4. Difference between proposed substitute and specified item: \_\_\_\_\_

5. The undersigned agrees to pay for architectural and engineering costs if required to revise the Contract Drawings caused by this substitution.

6. Manufacturer's warranties of the specified items and proposed items are (select one):

Same: \_\_\_\_\_ Different (Explain) \_\_\_\_\_

7. If the substitution is accepted, it will result in (select one):

No cost impact: \_\_\_\_\_ Credit (amount): \_\_\_\_\_

SUBMITTED BY:  
COMMENTS

Firm: \_\_\_\_\_

Address: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

ARCHITECT/ENGINEER'S REVIEW

\_\_\_\_\_ Accepted \_\_\_\_\_ Accepted as noted

\_\_\_\_\_ Not Accepted

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

REMARKS: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

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**SECTION 01 7310  
SELECTIVE DEMOLITION**

**PART 1 - GENERAL**

**1.1 SECTION INCLUDES**

- A. Removal of designated building equipment and fixtures.
- B. Removal of designated construction.
- C. Storage of removed materials as indicated.
- D. Disposal of materials.
- E. Identification of utilities.

**1.2 RELATED SECTIONS**

- A. Section 00 7000 – General Conditions of the Contract
- B. Section 00 8000 – Supplementary Conditions

**1.3 SUBMITTALS**

- A. Submit project record information under Section 01 3000 – Submittals.

**1.4 REGULATORY REQUIREMENTS**

- A. Conform to applicable codes for demolition work, dust control, products requiring electrical disconnection and re-connection, safety of adjacent construction and discovered hazards.
- B. Obtain required permits from authorities having jurisdiction.
- C. Do not close or obstruct egress width to any building or site exit.
- D. Do not disable or disrupt building fire or life safety systems without 3 days prior written notice to Owner.
- E. Conform to procedures applicable when hazardous or contaminated materials are discovered.

**1.5 SCHEDULING**

- A. Schedule demolition work to coordinate with the roofing replacement operations and to minimize disruption to school operations.

**1.6 PROJECT CONDITIONS**

- A. Owner assumes no responsibility for actual condition of items or structures to be demolished.
- B. Conduct demolition to minimize interference with adjacent and occupied building areas. Repair damages at no cost to Owner.
- C. Cease operations immediately if structure appears to be in danger and notify the Owner's Representative and Architect/Engineer. Do not resume operations until directed.
- D. Extent of selective demolition includes work required to remove existing materials and components necessary to install the new work indicated on the Drawings.
- E. The Owner shall be given the opportunity to retain ownership of all removed materials and equipment. All such items shall be carefully handled and protected and shall be stored by the Contractor at the site as directed by the Construction Manager and Owner. Any such materials and equipment not desired by the Owner shall become the property of the Contractor and shall be removed promptly from the project site.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION

3.1 PREPARATION

- A. Store removed materials, equipment and systems in location as directed.
- B. Protect existing materials and construction which are not to be demolished.

3.2 DEMOLITION

- A. General
  - 1. Perform demolition in an orderly and careful manner to minimize damage to existing construction designated to remain.
  - 2. Coordinate demolition activities with roofing installation to maintain a weather-tight building.
  - 3. Do not remove or disturb structural elements unless specifically indicated on the Drawings.
- B. Utilities
  - 1. Locate, identify, disconnect, and cap utilities serving areas to be demolished as required for completion of Work.
  - 2. Maintain continuity of service to portions of the building that are to remain in operation.
  - 3. Provide minimum 72 hours advance notice to the Owner before interrupting any building service.
  - 4. Provide temporary bypass connections where required to maintain service to occupied areas.
- C. Removal of Roofing Materials
  - 1. Remove existing roofing materials including membrane, flashings, insulation, blocking, and accessories as required to install the new roofing system.
  - 2. Remove deteriorated or damaged substrate materials where required to provide proper installation of the new roofing system.
  - 3. Protect roof drains, vents, curbs, and other components designated to remain.
- D. Protection of Building Interior
  - 1. Protect building interior from moisture, debris, and damage during demolition operations.
  - 2. Provide temporary coverings, tarpaulins, or other weather protection as required when roofing materials are removed.
  - 3. At the end of each work day, leave roof areas in a weather-tight condition.
- E. Protection of Existing Construction
  - 1. Protect existing construction, equipment, and building components that are to remain.
  - 2. Repair or replace damage caused by demolition operations at no additional cost to the Owner.
- F. Disposal of Demolished Materials
  - 1. Remove demolished materials from the site promptly.
  - 2. Do not allow demolition debris to accumulate on the roof or within the building.
  - 3. Dispose of materials in accordance with Section 01 7419 Construction Waste Management.
  - 4. Burning or burying materials on site is not permitted.
- G. Materials to be Salvaged
  - 1. Items designated by the Owner to be salvaged shall be carefully removed and stored at locations directed by the Owner.



2. Protect salvaged items from damage until accepted by the Owner.

H. Hazardous Conditions

1. If suspected hazardous materials are encountered during demolition, stop work in the affected area and notify the Architect and Owner immediately.
2. Do not disturb hazardous materials except as authorized by the Owner.

**END OF SECTION**

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## **SECTION 01 7329 CUTTING AND PATCHING**

### **PART 1 - GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Requirements and limitations for cutting and patching of Work.
  - 1. If a Contractor, subcontractor, or sub-subcontractor requires cutting of openings in new work installed by others, the work shall be performed by the trade that installed the original work, unless otherwise approved by the Architect.
  - 2. Cutting and patching of existing materials shall be performed by a subcontractor experienced in the cutting and patching of the materials being modified.
  - 3. Obtain Architect's approval prior to performing cutting and patching that affects existing construction.
  - 4. Provide blocking, bracing, reinforcement, or structural enhancement required due to cutting and patching at no additional cost to the Owner. Patching shall match adjacent existing work unless otherwise indicated..

#### **1.2 RELATED SECTIONS**

- A. Section 01 3000 - Submittals
- B. Section 01 6000 - Product Requirements
- C. Section 01 7310 – Selective Demolition

#### **1.3 SUBMITTALS**

- A. Submit written request in advance of cutting or alteration which affects:
  - 1. Structural integrity of any element of Project.
  - 2. Integrity of weather exposed or moisture resistant element.
  - 3. Efficiency, maintenance, or safety of any operational element.
  - 4. Visual qualities of sight exposed elements.
  - 5. Work of Owner or separate contractor.
  - 6. Existing construction including exposed finished surfaces to remain.
- B. Include in request:
  - 1. Identification of Project.
  - 2. Location and description of affected Work.
  - 3. Necessity for cutting or alteration.
  - 4. Description of proposed Work and Products to be used.
  - 5. Alternatives to cutting and patching.
  - 6. Effect on work of Owner or separate contractor.
  - 7. Written permission of affected separate contractor.
  - 8. Date and time work will be executed.

### **PART 2 - PRODUCTS**

#### **2.1 MATERIALS**

- A. Primary Products: Those required for original installation.
- B. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 6000.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Examine existing conditions prior to commencing Work, including elements subject to damage or movement during cutting and patching.
- B. After uncovering existing Work, assess conditions affecting performance of work.
- C. Beginning of cutting or patching means acceptance of existing conditions.

### 3.2 PREPARATION

- A. Provide temporary supports to ensure structural integrity of the Work. Provide devices and methods to protect other portions of Project from damage.
- B. Provide protection from elements for areas which may be exposed by uncovering work.

### 3.3 CUTTING

- A. Execute cutting and fitting including excavation and fill to complete the Work.
- B. Uncover work to install improperly sequenced work.
- C. Remove and replace defective or non-conforming work.
- D. Remove samples of installed work for testing when requested.
- E. Provide openings required for installation of mechanical, electrical, and other building systems.
- F. Employ original or skilled and experienced installer to perform cutting for weather exposed, moisture resistant elements, sight exposed surfaces and construction elements currently warranted.
- G. Where existing warranted construction is involved, employ mechanics and utilize means and methods necessary to protect warranty coverage.
- H. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

### 3.4 PATCHING

- A. Execute patching to complement adjacent Work.
  - 1. Restore roofing and waterproofing assemblies to maintain a weather-tight condition.
- B. Fit Products together to integrate with other Work.
- C. Execute work by methods to avoid damage to other Work, and which will provide appropriate surfaces to receive patching and finishing.
- D. Employ original installer to perform patching for weather exposed moisture resistant elements, sight-exposed surfaces and construction elements currently warranted.
- E. Where existing warranted construction is involved, employ mechanics and utilize means and methods necessary to protect warranty coverage.
- F. Restore work with new Products in accordance with requirements of Contract Documents.
- G. Fit work to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- H. At penetrations of fire rated walls, partitions, or ceiling construction, completely seal voids with fire rated material in accordance applicable codes and related Sections, to full thickness of the penetrated element.
- I. Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.

## END OF SECTION

## SECTION 01 7419 CONSTRUCTION WASTE MANAGEMENT

### PART 1 – GENERAL

#### 1.1 SUMMARY

- A. Section includes: Administrative and procedural requirements for construction waste management activities.

#### 1.2 DEFINITIONS

- A. Construction, Demolition, and Land clearing (CDL) Waste: Includes all non-hazardous solid wastes resulting from construction, remodeling, alterations, repair, demolition and land clearing. Includes material that is recycled, reused, salvaged or disposed as garbage.
- B. Salvage: Recovery of materials for on-site reuse, sale or donation to a third party.
- C. Reuse: Making use of a material without altering its form. Materials can be reused on-site or reused on other projects off-site. Examples include, but are not limited to the following: Crushing or grinding of concrete for use as sub-base material. Chipping of land clearing debris for use as mulch.
- D. Recycling: The process of sorting, cleaning, treating, and reconstituting materials for the purpose of using the material in the manufacture of a new product.
- E. Source-Separated CDL Recycling: The process of separating recyclable materials in separate containers as they are generated on the job-site. The separated materials are hauled directly to a recycling facility or transfer station.
- F. Co-mingled CDL Recycling: The process of collecting mixed recyclable materials in one container on-site. The container is taken to a material recovery facility where materials are separated for recycling.
- G. Approved Recycling Facility: Any of the following:
  - 1. A facility that can legally accept CDL waste materials for the purpose of processing the materials into an altered form for the manufacture of a new product.
  - 2. Material Recovery Facility: A general term used to describe a waste-sorting facility. Mechanical, hand-separation, or a combination of both procedures, are used to recover recyclable materials.
- H. Universal waste components (UWC) are as follows: electric motors, PCB ballasts, non PCB ballasts, capacitors, contactors, circuit breakers, elemental and liquid mercury containing articles, transformers, lead acid batteries, fluorescent light bulbs, and all HID light bulbs.

#### 1.3 SUBMITTALS

- A. Contractor shall develop a Waste Management Plan: Submit 3 copies of plan within 14 days of date established for the **Notice to Proceed**.
- B. Contractor shall provide Waste Management Report: Concurrent with each Application for Payment, submit **3** copies of report.

#### 1.4 PERFORMANCE REQUIREMENTS

- A. General: Divert a minimum of **75%** CDL waste, by weight, from the landfill by one, or a combination of the following activities:
  - 1. Salvage
  - 2. Reuse
  - 3. Source-Separated CDL Recycling
  - 4. Co-mingled CDL Recycling
- B. CDL waste materials that can be salvaged, reused or recycled include, but are not limited to, the following:
  - 1. Acoustical ceiling tiles
  - 2. Asphalt
  - 3. Asphalt shingles
  - 4. Cardboard packaging
  - 5. Carpet and carpet pad
  - 6. Concrete
  - 7. Drywall
  - 8. Fluorescent lights and ballasts
  - 9. Land clearing debris (vegetation, stumpage, dirt)
  - 10. Metals
  - 11. Paint (through hazardous waste outlets)
  - 12. Wood
  - 13. Plastic film (sheeting, shrink wrap, packaging)
  - 14. Window glass
  - 15. Wood
  - 16. Field office waste, including office paper, aluminum cans, glass, plastic, and office cardboard.

#### 1.5 QUALITY ASSURANCE

- A. Waste Management Coordinator Qualifications: Experienced firm, with a record of successful waste management coordination of projects with similar requirements, that employs a LEED Accredited Professional, certified by the USGBC as waste management coordinator.
- B. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.
- C. Regulatory Requirements: Conduct construction waste management activities in accordance with hauling and disposal regulations of all authorities having jurisdiction and all other applicable laws and ordinances.
- D. Preconstruction Conference: Schedule and conduct meeting at Project site prior to construction activities.
  - 1. Attendees: Inform the following individuals, whose presence is required, of date and time of meeting.
    - a. Owner
    - b. Architect

- c. Contractor's superintendent
    - d. Major subcontractors
    - e. Waste Management Coordinator
    - f. Other concerned parties.
  - 2. Agenda Items: Review methods and procedures related to waste management including, but not limited to, the following:
    - a. Review and discuss waste management plan including responsibilities of Waste Management Coordinator.
    - b. Review requirements for documenting quantities of each type of waste and its disposition.
    - c. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
    - d. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
    - e. Review waste management requirements for each trade.
  - 3. Minutes: Record discussion. Distribute meeting minutes to all participants.  
Note: If there is a Project Architect, they will perform this role.
- 1.5 WASTE MANAGEMENT PLAN – Contactor shall develop and document the following:
- A. Develop a plan to meet the requirements listed in this section at a minimum. Plan shall consist of waste identification, waste reduction plan and cost/revenue analysis. Distinguish between demolition and construction waste. Indicate quantities by weight throughout the plan.
  - B. Indicate anticipated types and quantities of demolition, site-cleaning and construction waste generated by the project. List all assumptions made for the quantities estimates.
  - C. List each type of waste and whether it will be salvaged, recycled, or disposed of in an landfill. The plan should included the following information:
    - 1. Types and estimated quantities, by weight, of CDL waste expected to be generated during demolition and construction.
    - 2. Proposed methods for CDL waste salvage, reuse, recycling and disposal during demolition including, but not limited to, one or more of the following:
      - a. Contracting with a deconstruction specialist to salvage materials generated,
      - b. Selective salvage as part of demolition contractor's work,
      - c. Reuse of materials on-site or sale or donation to a third party.
    - 3. Proposed methods for salvage, reuse, recycling and disposal during construction including, but not limited to, one or more of the following:
      - a. Requiring subcontractors to take their CDL waste to a recycling facility;
      - b. Contracting with a recycling hauler to haul recyclable CDL waste to an approved recycling or material recovery facility;
      - c. Processing and reusing materials on-site;
      - d. Self-hauling to a recycling or material recovery facility.
    - 4. Name of recycling or material recovery facility receiving the CDL wastes.

5. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location on project site where materials separation will be located.
- D. Cost/Revenue Analysis: Indicate total cost of waste disposal as if there was no waste management plan and net additional cost or net savings resulting from implementing waste management plan. Include the following:
  1. Total quantity of waste.
  2. Estimated cost of disposal (cost per unit). Include hauling and tipping fees and cost of collection containers for each type of waste.
  3. Total cost of disposal (with no waste management).
  4. Revenue from salvaged materials.
  5. Revenue from recycled materials.
  6. Savings in hauling and tipping fees by donating materials.
  7. Savings in hauling and tipping fees that are avoided.
  8. Handling and transportation costs. Including cost of collection containers for each type of waste.
  9. Net additional cost or net savings from waste management plan.

## PART 2 - PRODUCTS (Not Used)

## PART 3 – EXECUTION

### 3.1 CONSTRUCTION WASTE MANAGEMENT, GENERAL

- A. Provide containers for CDL waste that is to be recycled clearly labeled as such with a list of acceptable and unacceptable materials. The list of acceptable materials must be the same as the materials recycled at the receiving material recovery facility or recycling processor.
- B. The collection containers for recyclable CDL waste must contain no more than 10% non-recyclable material, by volume.
- C. Provide containers for CDL waste that is disposed in a landfill clearly labeled as such.
- D. Use detailed material estimates to reduce risk of unplanned and potentially wasteful cuts.
- E. To the greatest extent possible, include in material purchasing agreements a waste reduction provision requesting that materials and equipment be delivered in packaging made of recyclable material, that they reduce the amount of packaging, that packaging be taken back for reuse or recycling, and to take back all unused product. Insure that subcontractors require the same provisions in their purchase agreements.
- F. Conduct regular visual inspections of dumpsters and recycling bins to remove contaminants.

### 3.2 SOURCE SEPARATION

- A. General: Contractor shall separate recyclable materials from CDL waste to the maximum extent possible.

Separate recyclable materials by type.



1. Provide containers, clearly labeled, by type of separated materials or provide other storage method for managing recyclable materials until they are removed from Project site.
2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water and to minimize pest attraction. Cover to prevent windblown dust.
3. Stockpile materials away from demolition area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from weather.

### 3.3 CO-MINGLED RECYCLING

- A. General: Do not put CDL waste that will be disposed in a landfill into a co-mingled CDL waste recycling container.

### 3.4 REMOVAL OF CONSTRUCTION WASTE MATERIALS

- A. Remove CDL waste materials from project site on a regular basis. Do not allow CDL waste to accumulate on-site.
- B. Transport CDL waste materials off Owner's property and legally dispose of them.
- C. Burning of CDL waste is not permitted.

### 3.5 UNIVERSAL WASTE DIVERSION

- A. Remove all universal waste from fixtures, panels, and related devices for proper diversion and reclamation.
- B. Store all universal waste in containers provided by contact person within facilities operations.
- C. Store all universal waste in a secured location and request periodic removal from assigned contact person.
- D. Exemption: electric motors, circuit breakers, transformers and lighting contactors are exempt from this provision provided the contractor chooses to salvage or reuse the components.
- E. No identified universal waste will be discarded into the waste stream.

**END OF SECTION**

| WASTE MANAGEMENT PROGRESS REPORT                                                           |                                                  |                                                          |                                         |        |
|--------------------------------------------------------------------------------------------|--------------------------------------------------|----------------------------------------------------------|-----------------------------------------|--------|
| MATERIAL CATEGORY                                                                          | DISPOSED IN<br>MUNICIPAL SOLID<br>WASTE LANDFILL | DIVERTED FROM LANDFILL BY<br>RECYCLING, SALVAGE OR REUSE |                                         |        |
|                                                                                            |                                                  | Recycled                                                 | Salvaged                                | Reused |
| 1. Acoustical Ceiling Tiles                                                                |                                                  |                                                          |                                         |        |
| 2. Asphalt                                                                                 |                                                  |                                                          |                                         |        |
| 3. Asphalt Shingles                                                                        |                                                  |                                                          |                                         |        |
| 4. Cardboard Packaging                                                                     |                                                  |                                                          |                                         |        |
| 5. Carpet and Carpet Pad                                                                   |                                                  |                                                          |                                         |        |
| 6. Concrete                                                                                |                                                  |                                                          |                                         |        |
| 7. Drywall                                                                                 |                                                  |                                                          |                                         |        |
| 8. Fluorescent Lights and Ballasts                                                         |                                                  |                                                          |                                         |        |
| 9. Land Clearing Debris (vegetation, stumpage, dirt)                                       |                                                  |                                                          |                                         |        |
| 10. Metals                                                                                 |                                                  |                                                          |                                         |        |
| 11. Paint (through hazardous waste outlets)                                                |                                                  |                                                          |                                         |        |
| 12. Wood                                                                                   |                                                  |                                                          |                                         |        |
| 13. Plastic Film (sheeting, shrink wrap, packaging)                                        |                                                  |                                                          |                                         |        |
| 14. Window Glass                                                                           |                                                  |                                                          |                                         |        |
| 15. Field Office Waste (office paper, aluminum cans, glass, plastic, and coffee cardboard) |                                                  |                                                          |                                         |        |
| 16. Other (insert description)                                                             |                                                  |                                                          |                                         |        |
| 17. Other (insert description)                                                             |                                                  |                                                          |                                         |        |
| Total (In Weight)                                                                          |                                                  | (TOTAL OF ALL ABOVE VALUES – IN WEIGHT)                  |                                         |        |
|                                                                                            |                                                  | Percentage of Waste Diverted                             | (TOTAL WASTE DIVIDED BY TOTAL DIVERTED) |        |

**SECTION 01 7500  
STARTING AND ADJUSTING**

**PART 1 - GENERAL**

**1.1 SECTION INCLUDES**

- A. Starting systems.
- B. Adjusting.
- C. Demonstration and instructions.

**1.2 RELATED SECTIONS**

- A. General and Supplementary Conditions.
- B. Section 01 4500 - Quality Control: Manufacturers' field services and reports.
- C. Section 01 7700 - Contract Closeout: System operation, maintenance data and extra materials.

**1.3 STARTING SYSTEMS**

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Notify Architect and Owner at least seven days prior to start-up.
- C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, or for other conditions which may cause damage.
- D. Verify that tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- E. Verify wiring and support components for equipment are complete and tested.
- F. Execute start-up under supervision of applicable manufacturer's representative and Contractors' personnel in accordance with manufacturers' instructions.
- G. When specified in individual Specification sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.
- H. Submit a written report that equipment or system has been properly installed and is functioning correctly.
- I. Do not place systems into permanent operation until start-up procedures have been completed and deficiencies corrected.

**1.4 ADJUSTING**

- A. Adjust operating Products and equipment to ensure smooth and unhindered operation.
- B. Adjust operating Products and equipment in accordance with manufacturer's instructions

and individual specifications sections.

#### 1.5 DEMONSTRATION AND INSTRUCTIONS

- A. Demonstrate operation and maintenance of Products to Owner's personnel no more than two weeks prior to date of Substantial Completion.
- B. Demonstrate Project equipment and instruct in a classroom environment located at site and instructed by a qualified manufacturers' representative who is knowledgeable about the Project.
- C. Contractor shall digitally record all demonstrations and instructional sessions in an Owner-approved electronic format (MP4 or similar). Provide the recording as an electronic file via file transfer or on USB drive at Project closeout, or as otherwise directed by Architect. Recording shall clearly capture both audio and visual content of the instruction.
- D. For equipment or systems requiring seasonal operation, schedule additional demonstration within six months of Substantial Completion or at beginning of applicable season, as directed by Owner.
- E. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owners' personnel in detail to explain all aspects of operation and maintenance.
- F. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at scheduled time, at equipment or designated location.
- G. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.
- H. Coordinate demonstrations with submission of operation and maintenance data required by Section 01 7700 – Contract Closeout.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION Not Used

**END OF SECTION**

**SECTION 01 7600  
FINAL CLEANING**

**PART 1 - GENERAL**

**1.1 SUMMARY OF WORK**

- A. This Section includes requirements for the interim cleaning during construction and final cleaning prior to Substantial Completion.
- B. Provide cleaning necessary to leave the Project ready for occupancy by the Owner.

**1.2 RELATED SECTIONS**

- A. Section 01 7700 – Contract Closeout.
- B. Individual Specification Sections for cleaning of specific products or systems.

**1.3 CLEANING STANDARDS**

- A. Perform cleaning in accordance with manufacturer's written recommendations for each surface and material.
- B. Use cleaning materials and methods that will not damage, stain, corrode, or otherwise adversely affect surfaces.
- C. Replace materials and finishes damaged by cleaning operations.
- D. Conduct cleaning operations in a manner that does not interfere with Owner occupancy or completed Work.

**1.4 SUBSTANTIAL COMPLETION REQUIREMENT**

- A. Complete final cleaning prior to requesting inspection for Substantial Completion.
- B. Building shall be free of construction debris, dust, stains, labels (except permanent labels), and foreign substances.
- C. Installation of Work is not complete until cleaning and protection requirements are satisfied.
  - 1. Concrete Floors: Broom clean in unoccupied spaces.
  - 2. Carpets: Vacuum clean carpet and similar soft surfaces, removing debris and excess nap. Shampoo if required.
  - 3. Other Floors: Broom clean, vacuum or mop as required to remove dust, dirt, or stains that are deposited during construction activities.

**PART 2 – PRODUCTS Not Used**

**PART 3 – EXECUTION**

**3.1 INTERIM CLEANING**

- A. Maintain Project site in a clean and orderly condition throughout construction.
- B. Remove waste materials, debris, and surplus materials on a regular basis.
- C. Keep interior areas broom clean and free of accumulated dust and debris.
- D. Remove construction protection materials prior to final cleaning.

**3.2 FINAL CLEANING – GENERAL**

- A. Remove temporary facilities and construction equipment from Project site.
- B. Remove labels that are not permanent labels.
- C. Clean exposed interior and exterior surfaces to a uniform, dust-free, stain-free condition.

- E. Remove paint splatter, adhesives, grout haze, mortar droppings, and similar construction residue.
- F. Clean concealed or limited-access spaces including plenums, shafts, trenches, and equipment spaces where debris has accumulated.
- G. Replace air filters and clean permanent filters prior to Substantial Completion.

### 3.3 INTERIOR CLEANING REQUIREMENTS

Clean the following surfaces and components, including but not limited to:

- A. Floors:
  - 1. Concrete floors – broom clean in unoccupied areas.
  - 2. Resilient flooring – clean in accordance with manufacturer's instructions.
  - 3. Carpet – vacuum clean; remove debris and excess nap. Shampoo where required.
  - 4. Tile floors – remove grout haze and clean surface.
- B. Walls and Ceilings:
  - 1. Clean painted and finished wall surfaces.
  - 2. Replace or clean damaged ceiling tiles.
  - 3. Clean ceiling grids and exposed supports.
- C. Glass and Cleaning
  - 1. Clean interior and exterior surfaces of glass.
  - 2. Remove vision-obscuring materials.
  - 3. Replace chipped or broken glass.
- D. Doors and Hardware
  - 1. Clean doors, frames and hardware.
  - 2. Clean tops of doors.
- E. Casework and Millwork
  - 1. Clean interior and exterior cabinets and drawers.
  - 2. Clean countertops and shelving.
- F. Specialties and Equipment
  - 1. Clean toilet partitions and accessories.
  - 2. Clean signage
  - 3. Clean fire extinguishers and cabinets.
  - 4. Clean lockers and similar installed equipment.

### 3.4 BUILDING SYSTEMS

- A. Mechanical Systems
  - 1. Clean exposed ductwork, diffusers, registers, and grilles.
  - 2. Clean exposed mechanical equipment surfaces.
  - 3. Replace disposable filters and clean permanent filters.
- B. Plumbing Fixtures:
  - 1. Clean fixtures to sanitary condition.
  - 2. Remove stains and water marks.
- C. Electrical Equipment
  - 1. Clean light fixtures, lamps and reflectors to full operating efficiency.

2. Replace burned out lamps.
3. Clean exposed electrical device plates and equipment surfaces.

3.5 EXTERIOR CLEANING

- A. Remove debris from site and adjacent areas affected by construction.
- B. Sweep paved surfaces.
- C. Rake and restore disturbed landscape areas.

3.6 PROTECTION AND DAMAGE

- A. Protect cleaned surfaces and completed Work from damage and contamination following final cleaning until Substantial Completion and acceptance by the Owner..
- B. Repair or replace building materials, finishes, equipment, or other Work damaged during cleaning operations at no additional cost to the Owner. Rake and restore disturbed landscape areas.
- C. Maintain the Project in a clean condition after final cleaning until the date of Substantial Completion. Re-clean surfaces if required due to additional construction activities, inspections, or Owner occupancy.
- D. Protect finished floors, walls, doors, hardware, fixtures, equipment, and site improvements from damage caused by construction traffic or continued work.
- E. Remove protective coverings and perform final touch-up cleaning immediately prior to Substantial Completion inspection.

3.7 ACCEPTANCE

- A. Final cleaning shall be subject to review by Architect and Owner.
- B. If cleaning is found incomplete or unsatisfactory, re-clean affected areas until acceptable

**END OF SECTION**

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**SECTION 01 7700  
CONTRACT CLOSEOUT**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Closeout procedures.
  - 2. Project record documents.
  - 3. Warranties.
  - 4. Hazardous-free materials certification.
  - 5. Operation and maintenance data.
  - 6. Spare parts and maintenance materials.
- B. Related Sections:
  - 1. General and Supplementary Conditions.
  - 2. Section 01 3300 - Submittal Procedures; for closeout documents submittals.
  - 3. Section 01 5000 - Temporary Facilities and Controls: Progress cleaning.

**1.2 CLOSEOUT PROCEDURES**

- A. Completion of the Work specified herein is a condition precedent to issuance of the Final Certificate of Payment by Architect in accordance with AIA A201 Article 9.
- B. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Architect review.
- C. Submit contract closeout documents to the Architect prior to requesting final inspection and with the final Application for Payment.
- D. Provide submittals to Architect that are required by governing or other authorities having jurisdiction.
- E. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.
- F. Review Contract Documents, prepare and submit required certificates of insurance, affidavits, consents of surety, wage certifications and other documentation with final Application for Payment.

**1.3 PROJECT RECORD DOCUMENTS**

- A. Maintain on site, one set of the following record documents; record actual revisions to the Work:
  - 1. Drawings.
  - 2. Specifications.
  - 3. Addenda.
  - 4. Change Orders and other modifications to the Contract.
  - 5. Reviewed Shop Drawings, and Product Data.
  - 6. Manufacturer's instruction for assembly, installation, and adjusting.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress.
- E. Specifications: Legibly mark and record at each Product section description of actual Products installed, including the following:

1. Manufacturer's name and product model and number.
  2. Product substitutions or alternates utilized.
  3. Changes made by Addenda and modifications.
- F. Record Documents and Shop Drawings: Legibly mark each item to record actual construction including:
1. Measured depths of foundations in relation to finish floor.
  2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
  3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
  4. Field changes of dimension and detail.
  5. Details not on original Contract Drawings.
- G. Submit documents to Architect with final Application for Payment.

#### 1.4 WARRANTIES

- A. Provide triplicate notarized copies.
- B. Execute and assemble transferable warranty documents from Subcontractors, suppliers, and manufacturers.
- C. Submit prior to final Application for Payment.
- D. For items of Work delayed beyond date of Substantial Completion, provide updated submittal within 10 days after acceptance, listing date of acceptance as start of warranty period.

#### 1.5 OPERATION AND MAINTENANCE DATA

- A. Submit data on 8-1/2 x 11 inch text pages, bound in three D side ring binders with durable plastic covers.
- B. Prepare binder cover and edge with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS" and title of Project. If more than one volume is required, indicate volume number on edge and cover.
- C. Internally subdivide the binder contents with permanent page dividers, organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.
- D. Contents: Table of Contents for each volume, typed on white paper, in three parts as follows:
  1. Part 1: Directory
    - a. Names, addresses, and telephone numbers of Architect/Engineer, Contractor, Subcontractors, and major equipment suppliers. Include for all mechanical and electrical equipment a compilation of the nameplate data for equipment; name, address and phone number of nearest distributor; name, address and phone number of nearest service organization.
  2. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
    - a. Significant design criteria.
    - b. List of equipment.
    - c. Parts list for each component.
    - d. Operating instructions.
    - e. Maintenance instructions for equipment, systems and finishes including recommended cleaning methods and materials and special precautions identifying detrimental agents.

3. Part 3: Project documents and certificates, including the following:
    - a. Shop drawings and product data.
    - b. Air and water balance reports.
    - c. Certificates.
    - d. Photocopies of warranties and bonds.
  - E. Submit 1 draft copy of completed volumes 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architects comments. Revise content of all document sets as required prior to final submission.
  - F. Submit 1 copy of revised final volumes and 2 thumb drives with electronic copies, within 10 days after final inspection.
- 1.6 SPARE, EXTRA PARTS AND MAINTENANCE MATERIALS
- A. Provide products, spare parts, maintenance and extra materials in quantities specified in individual specification sections.
  - B. Deliver to Project site and place in location as directed extra materials and parts as indicated within the respective specification sections; obtain receipt from Owner upon delivery and placement and prior to final payment.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION Not Used

**END OF SECTION**

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**SECTION 01 91 00  
GENERAL COMMISSIONING REQUIREMENTS**

**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 general requirements that apply to implementation of commissioning without regard to systems, subsystems, and equipment being commissioned.
- B. Related Sections include the following:
  - 1. Division 22 Section "Commissioning of Plumbing" for specific requirements for commissioning Plumbing systems.
  - 2. Division 23 Section "Commissioning of HVAC" for specific requirements for commissioning HVAC systems.
  - 3. Division 26 Section "Commissioning of Electrical" for specific requirements for commissioning electrical systems.

**1.3 COMMISSIONING PROCESS**

- A. Commissioning. Commissioning is a systematic process of ensuring that all building systems perform interactively according to the design intent and the Owner's operational needs. The commissioning process shall encompass and coordinate the traditionally separate functions of system documentation, equipment startup, control system calibration, testing, adjusting and balancing, performance testing, and training.
- B. Commissioning during the design phase is intended to achieve the following specific objectives:
  - 1. Incorporate commissioning requirements into the contract documents.
  - 2. Provide design review comments with a focus on compliance with the Owner's Project Requirements, design clarity, accessibility and maintainability, O&M training and documentation requirements, and the ability to test and verify system operation.
- C. Commissioning during the construction phase is intended to achieve the following specific objectives according to the Contract Documents:
  - 1. Verify applicable equipment and systems are installed according to the Owner's project requirements, manufacturer's recommendations, and industry accepted minimum standards.
  - 2. Verify applicable equipment and systems receive adequate operational checkout by installing contractors.
  - 3. Observe and document proper performance of equipment and systems.
- D. The commissioning process does not take away from or reduce the responsibility of the system designers or installing contractors to provide a finished and fully functioning product.
- E. Abbreviations. The following are common abbreviations that may be used in the specifications and the Commissioning Plan.
  - 1. A/E: Architects and Engineers
  - 2. AABC: Associated Air Balance Council
  - 3. ACG: AABC Commissioning Group
  - 4. AHJ: Authority Having Jurisdiction
  - 5. ASHRAE: American Society of Heating, Refrigeration and Air-Conditioning Engineers
  - 6. BAS: Building Automation System

7. BOD: Basis of Design
8. Cx: Commissioning
9. CIL: Construction Issues Log
10. CxA: Commissioning Authority
11. CM: Construction Manager
12. TCC: Temperature Controls Contractor
13. DB/C: Design Build Contractor
14. EC: Electrical Contractor
15. FO: Field Observation Report
16. FPT: Functional Performance Test:
17. GC: General Contractor
18. IST: Integrated Systems Test
19. LEED: Leadership in Energy and Environmental Design
20. MFR: Manufacturer
21. MC: Mechanical Contractor
22. NEBB: National Environmental Balancing Bureau
23. O&M: Operation and Maintenance
24. OPR: Owner's Project Requirements
25. PC: Plumbing Contractor
26. PFC: Pre-Functional Checklist
27. PM: Project Manager
28. Subs: Subcontractors to General
29. TAB: Test, Adjust & Balance Contractor

#### 1.4 DEFINITIONS

- A. Acceptance: A formal action, taken by a person with appropriate provider (which may or may not be contractually defined) to declare that some aspect of the project meets defined requirements, thus permitting subsequent activities to proceed.
- B. Approval: Acceptance that a piece of equipment or system has been properly installed and is functioning in the tested modes according to the contract documents.
- C. BoD: Basis of Design. A document that records concepts, calculations, decisions, and product selections used to meet the OPR and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.
- D. Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.
- E. Commissioning Authority: An entity identified by the Owner who leads, plans, schedules, and coordinates the commissioning team to implement the Commissioning Process.
- F. Cx Team: The individuals who through coordinated actions are responsible for implementing the Commissioning Process.
- G. Data Logging: The monitoring and recording of flows, currents, status, pressures, etc., of equipment using stand-alone data recorders separate from the control system or the trending capabilities of control systems.
- H. Deficiency: A condition in the installation or function of a component, piece of equipment, or system that is not in compliance with the contract documents.
- I. Field Report: A written document that details activities completed as part of the commissioning process and significant findings from those activities.
- J. Functional Performance Test (FPT): A test designed to exercise the equipment or system's controllability or functionality. These tests are designed using the approved engineered sequence of operations for a given system. The test procedure is most often unique and

specific for a system with a given project. Generally speaking a functional test is required if a system has moving parts, environmental controls or input and output functions.

- K. Issues Log: A formal and ongoing record of problems or concerns - and their resolution - that have been raised by members of the commissioning team during the course of the commissioning process.
- L. OPR: Owner's Project Requirements. A document that details the functional requirements of a project and the expectations of how it will be used and operated. These include Project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information.
- M. Seasonal Performance Tests: Performance tests that are deferred until the system(s) will experience conditions closer to their design conditions based on weather conditions.
- N. Systems, Subsystems, Equipment, and Components: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, equipment, and components.
- O. Trending: The monitoring, by a building management system or other electronic data gathering equipment, and analyzing of the data gathered over a period of time.

#### 1.5 COMMISSIONING TEAM

- A. Members Appointed by Contractor(s): Individuals, each having the authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated action. The commissioning team shall consist of, but not be limited to, representatives of Contractor, including Project Superintendent and subcontractors, installers, suppliers, and specialists deemed appropriate by the CxA.
- B. Members Appointed by Owner:
  - 1. CxA: The designated person, company, or entity that plans, schedules, and coordinates the commissioning team to implement the commissioning process.
    - a. The CxA for this project will be: IMEG Consultants Corp. The project manager is Donny Jagoda ([Donald.P.Jagoda@imegcorp.com](mailto:Donald.P.Jagoda@imegcorp.com)).
  - 2. Representatives of the facility user and operation and maintenance personnel.
  - 3. Architectural and Engineering design professionals.

#### 1.6 RESPONSIBILITIES

- A. Owner's Responsibilities:
  - 1. Provide direction to Design Team and Contractors based on CxA recommendations.
  - 2. Attend commissioning team meetings held on an as scheduled basis.
- B. Design Team Responsibilities:
  - 1. Conduct design review meetings.
  - 2. Respond to CxA design review comments.
  - 3. Incorporate Cx Specifications within the Contract Documents.
  - 4. Address and provide direction to Contractors to resolve design related issues that transpire during the commissioning process.
- C. Contractor's Responsibilities:
  - 1. Contractor shall assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform commissioning process activities including, but not limited to, the following:
    - a. Integrate and coordinate commissioning process activities with construction schedule.

- b. Provide commissioning team access to project documentation including but not limited to approved submittals, startup reports, RFI, shop drawings, and operating and maintenance criteria.
- c. Attend commissioning team meetings held on an as scheduled basis.
- d. Review and accept commissioning process test procedures provided by the Commissioning Authority.
- e. Demonstrate system operation to assist with completing Functional Performance Test procedures, and seasonal testing as required.
- f. Evaluate performance deficiencies identified in site observation and functional test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
- g. Cooperate with the CxA for resolution of issues recorded in the Issues Log.
- h. Provide requested information to the CxA for updating the commissioning plan throughout the project.
- i. Pre-test all systems/equipment prior to engaging CxA for functional performance testing.
- j. Provide necessary documentation for inclusion in the systems manual including, but not limited to O&Ms, warranty information, as-built drawings, and final TAB report.
- k. Participate in training sessions for Owner's operation and maintenance personnel.
  - 1) Provide sign in sheet and agenda for Owners' building staff training.

D. CxA's Responsibilities:

- 1. Organize and lead the commissioning team.
- 2. Provide commissioning specifications for inclusion in the overall project specification.
- 3. Provide commissioning plan.
- 4. Review design documents and provide necessary comments to design team
- 5. Review approved submittals from the Contractor.
- 6. Conduct commissioning team meetings including a Cx kickoff meeting.
- 7. Prepare and provide functional performance testing procedures
- 8. Perform site observation visits during the construction phase and provide site observation reports to project team.
- 9. Prepare and maintain the Commissioning Issues Log.
- 10. Witness systems, assemblies, equipment, and component startup as necessary.
- 11. Lead functional testing efforts. Document test results and maintain Cx issues log.
- 12. Prepare and provide preliminary and final commissioning reports.

1.7 COMMISSIONING DOCUMENTS

- A. Commissioning Specifications: The contract document(s) that detail the objective, scope, and implementation of the commissioning process as developed in the Commissioning Plan.
- B. Commissioning Plan: The Commissioning Plan (Cx Plan) provides definition for the execution of the commissioning process. The CxA will issue the Cx Plan at or before the Commissioning Kickoff meeting. The Commissioning Authority (CxA) shall update the Cx Plan when appropriate during the Cx process.
- C. Functional Performance Tests (FPTs): A set of documents created by the CxA to verify the systems are functioning as intended. FPTs include test procedures, expected results, and actual results for point checks and sequence testing.
- D. Commissioning Issues Log: A tool used to document commissioning issues observed during the commissioning process and track the issues to resolution. Contractors provide updates and CxA verifies issue resolution before issues are closed.
- E. Commissioning Report: A document that the CxA submits to the Owner towards the end of the project, which includes the commissioning plan, completed pre-functional checklists, functional



performance test results, cx issues log, as well as supporting documentation provided by the Contractors (e.g. TAB Report, Training Plan, etc.) that were referenced during the commissioning process.

#### 1.8 EQUIPMENT/SYSTEMS TO BE COMMISSIONED

- A. The following equipment/systems will be commissioned, subject to change depending on the final Construction Documents):

| Equipment/System                       | Quantity | Sampling Strategy |
|----------------------------------------|----------|-------------------|
| Building Automation System Integration | -        | 100%              |
| Air-Cooled CHW System                  | 2        | 100%              |
| Hydronic Pumps                         | 17       | 100%              |
| AHUs                                   | 5        | 40%               |
| Unit Ventilators                       | 28       | 25%               |
| Fan Coil Units                         | 33       | 25%               |
| Electric Baseboard Heaters             | 2        | 100%              |
| Hydronic Unit Heater                   | 22       | 25%               |
| Electric Radiant Heat Panels           | 2        | 100%              |
| Exhaust Fans                           | 59       | 25%               |
| DHW Heaters                            | 1        | 100%              |
| DHW Recirculation Pumps                | 1        | 100%              |
| Generators                             | 1        | 100%              |
| Automated Transfer Switches            | 1        | 100%              |
| Lighting Controls / Emergency Lights   | -        | 100%              |

### PART 2 - PRODUCTS

#### 2.1 TEST EQUIPMENT

- A. All standard testing equipment required to perform startup, initial checkout, and functional performance testing shall be provided by the Division Contractor. If required, two-way radios, ladders and/or man-lifts shall be provided by the General Contractor or applicable subcontractor.
- B. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the related specifications. All equipment shall be calibrated according to the manufacturer's recommended intervals and when dropped or damaged shall be replaced. Calibration tags shall be affixed or certificates readily available.

### PART 3 - EXECUTION

#### 3.1 EXECUTION

- A. The Commissioning Process requires efficient and effective communication among all trades, the design team, the contractors, the vendors, the Owner, and the Commissioning Authority. To facilitate the transition from one activity to the next and to prove system readiness for functional testing; the Commissioning Authority requires documentation showing compliance with the project requirements as well as providing evidence of conformance with manufacturer's recommendations. The following shall be documented by the Contractors and submitted for review and acceptance by the Commissioning Authority in a timely manner for each commissioned piece of equipment or system:

1. Startup reports filled out by a factory authorized representative as required by the project technical specifications.
  2. Field quality control test reports as required by the project technical specifications.
  3. Building automation system "point to point" reports.
  4. Testing, adjusting, and balancing reports as required by the project technical specifications.
  5. Contractor completed Functional Performance Test documenting that, at a minimum "one of", for each functional test has been completed without deficiency.
- B. These documents will be reviewed and accepted by the Commissioning Authority, with concerns and deficiencies tracked in the Construction Issues Log. Commissioning Authority review of these documents is independent of any Architect/Engineer of Record review and approval as required elsewhere in the project technical specifications.
- C. Functional Performance Test procedures document conformance with the Owner's project requirements, establish a baseline for equipment and system performance, and are critical tools for troubleshooting by O&M staff during occupancy.
1. The Commissioning Authority will develop the Functional Performance Tests based on the Owner's project requirements, the design construction documents, and approved submittals.
  2. The Commissioning Authority will develop DRAFT copies for the Commissioning Team to review and provide comments.
  3. The Commissioning Authority will incorporate comments from the team as required and issue FINAL copies that the contractors will implement as required in this section, Paragraph 3.2A.7.
  4. The Commissioning Authority will witness the Contractors demonstrate operation of each system and will document final Functional Performance Testing.
  5. If Functional Performance Tests fail or deficiencies are found that do not allow the Commissioning Authority to complete the testing, the deficiency will be documented in the Commissioning Actions Issues Log.
  6. Seasonal testing shall be scheduled for the CxA to witness the Contractors demonstrate operation of any system that is not able to be artificially loaded or tested during opposite seasons to verify full load operation.
- D. In the event Functional Performance Testing cannot be completed due to Contractor negligence in completing and submitting documentation listed in Paragraph 3.2A or due to Contractor misrepresenting a system is ready for testing, a retesting charge will be submitted by the Commissioning Authority. Retesting charges to satisfactorily complete the Functional Performance Testing shall include labor and reimbursable expenses. These will be assessed to the Owner, wholly transferrable to the General Contractor at the discretion of the Owner.
- 3.2 OWNER TRAINING
- A. The Contractor shall conduct Owner Training according to the project specifications
- 3.3 COMMISSIONING REPORT
- A. The CxA will develop and submit a final commissioning report in electronic format. The final commissioning report shall include the final commissioning plan, an executive summary, list of commissioning team members, overview of the commissioning scope, brief description of building systems, completed Pre-Functional Test forms and Functional Performance Test forms for the commissioned equipment and systems, field reports, and the complete issue log. The report will also include a list of all outstanding non-compliance issues (if applicable).

**END OF SECTION**

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**SECTION 03 0100  
MAINTENANCE OF CONCRETE**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Cleaning and preparation of existing concrete surfaces.
- B. Surface repair and thin resurfacing of exterior concrete canopies.
- C. Patching of localized holes and voids in interior concrete slabs.
- D. Repair of minor spalling and surface deterioration.
- E. Scope of Work: As indicated on drawings.

**1.02 RELATED REQUIREMENTS**

- A. Section 03 3000 - Cast-in-Place Concrete: Finishing of concrete surface to tolerance; floating, troweling, and similar operations; curing.

**1.03 REFERENCE STANDARDS**

- A. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 50 mm [2 in.] Cube Specimens); 2024.
- B. ICRI 310.2R - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair; 2013.

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's product data for each concrete repair material, including performance characteristics, application limitations, mixing instructions, curing requirements, and compatibility with adjacent materials and coatings.
- C. Manufacturer's instructions.
- D. Field quality control submittals.
- E. Installer's qualification statement.
- F. Project Record Documents: Record locations of concrete repairs performed under this Section.

**1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with minimum of 3 years of documented experience.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Comply with manufacturers' instructions for storage, shelf life limitations, and handling of products.
- B. Deliver materials in original factory-sealed containers with manufacturer's labels intact and legible. Verify product nomenclature, manufacturer's name, product identification, batch number, date of manufacture, and shelf life or expiration date.
- C. Store materials in covered, well-ventilated area and according to manufacturer's written storage instructions. Store polymer resins and hardeners separate from construction materials that can absorb odors.

**PART 2 PRODUCTS**

**2.01 CEMENTITIOUS PATCHING AND REPAIR MATERIALS**

- A. Cementitious Resurfacing Mortar (Surface repair and resurfacing of exterior concrete canopies.): One- or two-component, factory-mixed, polymer-modified cementitious mortar designed for continuous thin-coat application.
  - 1. In-place material resistant to freezing conditions.
  - 2. Mixed with water or latex type bonding agent in proportions as recommended by manufacturer.
  - 3. Integral corrosion inhibitor.
  - 4. Recommended Thickness: Feather edge to 1/4 inch.
  - 5. Color: Gray.
  - 6. Manufacturers:
    - a. W. R. Meadows, Inc; Spectrum Re-Kote TF: [www.wrmeadows.com/#sle](http://www.wrmeadows.com/#sle).
    - b. Substitutions: See Section 01 6000 - Product Requirements.
- B. Cementitious Repair Mortar, Trowel Grade (Patching and repair of interior concrete slabs at removed seating locations.) : Factory-mixed, single component cementitious repair mortar, polymer-modified suitable for horizontal applications.
  - 1. Manufacturers:
    - a. W. R. Meadows, Inc; Meadow-Patch 20: [www.wrmeadows.com/#sle](http://www.wrmeadows.com/#sle).
    - b. Substitutions: See Section 01 6000 - Product Requirements.

## **2.02 ACCESSORIES**

- A. Portland Cement: ASTM C150/C150M, Type I, grey.
- B. Sand: ASTM C33/C33M or ASTM C404; uniformly graded, clean.
- C. Water: Clean and potable.
- D. Concrete Curing Compound: W.R. Meadows (or approved equal) curing compounds compatible with cementitious repairs, where permitted by repair material manufacturer and compatible with subsequent finishes.
- E. Crack Repair Epoxy: Rezi-Weld LV by W.R. Meadows (or approved equal) for crack repair only.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that surfaces are ready to receive work.
- B. Beginning of installation means acceptance of substrate.

### **3.02 PREPARATION**

- A. Prepare concrete surfaces to be repaired according to ICRI 310.2R.

### **3.03 CLEANING EXISTING CONCRETE**

- A. Provide enclosures, barricades, and other temporary construction as required to protect adjacent work from damage.
- B. Clean concrete surfaces of dirt or other contamination using the gentlest method that is effective.
  - 1. Try the gentlest method first, then, if not clean enough, use a less gentle method taking care to watch for impending damage.
  - 2. Clean out cracks and voids using same methods.

### **3.04 CRACK REPAIR USING EPOXY ADHESIVE INJECTION**

- A. Use epoxy adhesive injection only for repair of static cracks where indicated and only as a preparatory step prior to cementitious repair
- B. Follow epoxy adhesive manufacturer's written installation instructions.
- C. Provide temporary entry ports spaced to accomplish movement of fluids between ports; no deeper than the depth of the crack to be filled or port size diameter no greater than the

thickness of the crack. Provide temporary seal at concrete surface to prevent leakage of adhesive.

- D. Inject adhesive into ports under pressure using equipment appropriate for particular application.
- E. Begin injection at lower entry port and continue until adhesive appears in adjacent entry port. Continue from port to port until entire crack is filled.
- F. Remove temporary seal and excess adhesive.
- G. Clean surfaces adjacent to repair and blend finish.

**3.05 FIELD QUALITY CONTROL**

- A. See Section 01 4000 - Quality Requirements for additional requirements.

**END OF SECTION**

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**SECTION 03 3000  
CAST-IN-PLACE CONCRETE**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Floors and slabs on grade.
- B. Concrete reinforcement.
- C. Joint devices associated with concrete work.
- D. Concrete curing.

**1.02 RELATED REQUIREMENTS**

- A. Section 03 1000 - Concrete Forming and Accessories: Forms and accessories for formwork.
- B. Section 03 2000 - Concrete Reinforcing.
- C. Section 07 9200 - Joint Sealants: Products and installation for sealants and joint fillers for saw cut joints and isolation joints in slabs.

**1.03 REFERENCE STANDARDS**

- A. ACI CODE-318 - Building Code Requirements for Structural Concrete and Commentary; 2019 (Reapproved 2022).
- B. ACI PRC-211.1 - Selecting Proportions for Normal-Density and High Density-Concrete - Guide; 2022.
- C. ACI PRC-302.1 - Guide to Concrete Floor and Slab Construction; 2015.
- D. ACI PRC-305 - Guide to Hot Weather Concreting; 2020.
- E. ACI PRC-306 - Guide to Cold Weather Concreting; 2016.
- F. ACI SPEC-301 - Specifications for Concrete Construction; 2020.
- G. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2022.
- H. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2022.
- I. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2024a.
- J. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2023.
- K. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2024.
- L. ASTM C150/C150M - Standard Specification for Portland Cement; 2024.
- M. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete; 2020.
- N. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a (Reapproved 2016).
- O. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2019, with Editorial Revision (2022).
- P. ASTM C595/C595M - Standard Specification for Blended Hydraulic Cements; 2021.
- Q. ASTM C618 - Standard Specification for Coal Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2023, with Editorial Revision.
- R. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2020.
- S. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures; 2020.



- T. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Asphalt Types); 2023.
- U. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2017 (Reapproved 2023).

#### **1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
- C. Mix Design: Submit proposed concrete mix design.
  - 1. Indicate proposed mix design complies with requirements of ACI SPEC-301, Section 4 - Concrete Mixtures.
- D. Samples: Submit samples of underslab vapor retarder to be used.
- E. Test Reports: Submit report for each test or series of tests specified.
- F. Test Reports: Submit termite-resistant sheet manufacturer's summary of independent laboratory and field testing for effectiveness in subterranean termite exclusion.
- G. Manufacturer's Installation Instructions: For concrete accessories, indicate installation procedures and interface required with adjacent construction.
- H. Sustainable Design Submittal: If any fly ash, ground granulated blast furnace slag, silica fume, rice hull ash, or other waste material is used in mix designs to replace Portland cement, submit the total volume of concrete cast in place, mix design(s) used showing the quantity of portland cement replaced, reports showing successful cylinder testing, and temperature on day of pour if cold weather mix is used.

#### **1.05 QUALITY ASSURANCE**

- A. No payments will be made for extra concrete needed as a result of unauthorized material removed below the required depth found in the field.
- B. Perform work of this section in accordance with ACI SPEC-301 and ACI CODE-318.
- C. Follow recommendations of ACI PRC-305 when concreting during hot weather.
- D. Follow recommendations of ACI PRC-306 when concreting during cold weather.
- E. Acquire cement from same source and aggregate from same source for the entire project.

### **PART 2 PRODUCTS**

#### **2.01 FORMWORK**

- A. Comply with requirements of Section 03 1000.
- B. Form Materials: Contractor's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.
  - 1. Form Coating: Release agent that will not adversely affect concrete or interfere with application of coatings.
- C. Formwork Fabrication
  - 1. Fabricate formwork mortartight, braced to prevent displacement under vibration and sagging between supports. For surfaces exposed to view in finished work, use new, clean, smooth plywood free from blemishes, square-cut and in sizes as large as practical.
  - 2. Fabricate forms for removal without hammering or prying against concrete.

#### **2.02 REINFORCEMENT MATERIALS**

- A. Comply with requirements of Section 03 2000.
- B. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).
  - 1. Type: Deformed billet-steel bars.

2. Finish: Unfinished, unless otherwise indicated.
- C. Steel Welded Wire Reinforcement (WWR): Plain type, ASTM A1064/A1064M.
  1. Form: Flat Sheets.
  2. WWR Style: As indicated on drawings.
- D. Reinforcement Accessories:
  1. Tie Wire: Annealed, minimum 16 gauge, 0.0508 inch.
  2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.

### **2.03 CONCRETE MATERIALS**

- A. Cement: ASTM C150/C150M, Type I - Normal Portland type.
  1. Acquire cement for entire project from same source.
- B. Blended Hydraulic Cement: ASTM C595/C595M, Type IS(20).
- C. Fine and Coarse Aggregates: ASTM C33/C33M.
  1. Acquire aggregates for entire project from same source.
- D. Fly Ash: ASTM C618, Class C or F.
- E. Ground Granulated Blast Furnace Slag: ASTM C989/C989M.
- F. Silica Fume: ASTM C1240, proportioned in accordance with ACI PRC-211.1.
- G. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.

### **2.04 ADMIXTURES**

- A. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.
- B. Air Entrainment Admixture: ASTM C260/C260M.
- C. Water Reducing Admixture: ASTM C494/C494M Type A.

### **2.05 ACCESSORY MATERIALS**

- A. Underslab Vapor Retarder:
  1. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations.

### **2.06 BONDING AND JOINTING PRODUCTS**

- A. Slab Isolation Joint Filler: 1/2-inch thick, height equal to slab thickness, with removable top section forming 1/2-inch deep sealant pocket after removal.
  1. Material: ASTM D1751, cellulose fiber.
- B. Slab Contraction Joint Device: Preformed linear strip intended for pressing into wet concrete to provide straight route for shrinkage cracking.

### **2.07 CURING MATERIALS**

- A. Curing Compound, Naturally Dissipating: Clear, water-based, liquid membrane-forming compound; complying with ASTM C309.
- B. Moisture-Retaining Sheet: ASTM C171.
- C. Water: Potable, not detrimental to concrete.

### **2.08 CONCRETE MIX DESIGN**

- A. Proportioning Normal Weight Concrete: Comply with ACI PRC-211.1 recommendations.
  1. Replace as much Portland cement as possible with fly ash, ground granulated blast furnace slag, silica fume, or rice hull ash as is consistent with ACI recommendations.
- B. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI SPEC-301.

- C. Admixtures: Add acceptable admixtures as recommended in ACI PRC-211.1 and at rates recommended or required by manufacturer.
- D. Normal Weight Concrete (Interior slab-on-grade):
  - 1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 3500 pounds per square inch.
  - 2. Fly Ash Content: Maximum 15 percent of cementitious materials by weight.
  - 3. Silica Fume Content: Maximum 5 percent of cementitious materials by weight.
  - 4. Water-Cement Ratio: Maximum 45 percent by weight.
  - 5. Maximum Slump: 4 inches.
  - 6. Maximum Aggregate Size: 5/8 inch.

## **2.09 MIXING**

- A. Transit Mixers: Comply with ASTM C94/C94M.
- B. Adding Water: If concrete arrives on-site with slump less than suitable for placement, do not add water that exceeds the maximum water-cement ratio or exceeds the maximum permissible slump.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify lines, levels, and dimensions before proceeding with work of this section.

### **3.02 PREPARATION**

- A. Formwork: Comply with requirements of ACI SPEC-301. Design and fabricate forms to support all applied loads until concrete is cured and for easy removal without damage to concrete.
- B. Verify that forms are clean before applying release agent.
- C. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.
- D. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning and roughening. Applying bonding agent in according to bonding agent manufacturer's instructions.
  - 1. Use epoxy bonding system for bonding to damp surfaces, for structural load-bearing applications, and where curing under humid conditions is required.
- E. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.
- F. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade. Comply with ASTM E1643. Lap joints minimum 6 inches. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions. Repair damaged vapor retarder before covering.
  - 1. Granular Fill Over Vapor Retarder: Cover vapor retarder with compactible granular fill as indicated on drawings. Do not use sand.
  - 2. Vapor Retarder Over Granular Fill: Install compactible granular fill before placing vapor retarder as indicated on drawings. Do not use sand.

### **3.03 INSTALLING REINFORCEMENT AND OTHER EMBEDDED ITEMS**

- A. Comply with requirements of ACI SPEC-301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place using bolsters or chairs to achieve not less than minimum concrete coverage required for protection.
- B. Install welded wire reinforcement in maximum possible lengths, and offset end laps in both directions. Splice laps with tie wire.
- C. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with concrete placement.

### **3.04 PLACING CONCRETE**

- A. Place concrete in accordance with ACI PRC-304.
- B. Place concrete for floor slabs in accordance with ACI PRC-302.1.
- C. Notify Architect not less than 24 hours prior to commencement of placement operations.
- D. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.
- E. Ensure reinforcement, inserts, embedded parts, and dowels will not be disturbed during concrete placement.
- F. Place concrete continuously without construction (cold) joints wherever possible; where construction joints are necessary, before next placement prepare joint surface by removing laitance and exposing the sand and sound surface mortar, by sandblasting or high-pressure water jetting.

### **3.05 SLAB JOINTING**

- A. Locate joints as indicated on drawings.
- B. Anchor joint fillers and devices to prevent movement during concrete placement.
- C. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.
- D. Provide saw-cut contraction joints as indicated or as required to control cracking.
- E. Contraction Joint Devices: Use preformed joint device, with top set flush with top of slab.
- F. Construction Joints: Where not otherwise indicated, use metal combination screed and key form, with removable top section for joint sealant.

### **3.06 CONCRETE FINISHING**

- A. Repair surface defects, including tie holes, immediately after removing formwork.
- B. Concrete Slabs: Finish to requirements of ACI PRC-302.1 and as follows:
  - 1. Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI PRC-302.1; thin floor coverings include carpeting, resilient flooring, seamless flooring, resinous matrix terrazzo, thin set quarry tile, and thin set ceramic tile.
- C. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains at 1:100 nominal.

### **3.07 CURING AND PROTECTION**

- A. Comply with requirements of ACI PRC-308. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
  - 1. Normal concrete: Not less than seven days.
  - 2. High early strength concrete: Not less than four days.
- C. Formed Surfaces: Cure by moist curing with forms in place for full curing period.
- D. Surfaces Not in Contact with Forms:
  - 1. Slabs and Floors To Receive Adhesive-Applied Flooring: Curing compounds and other surface coatings are usually considered unacceptable by flooring and adhesive manufacturers. If such materials must be used, either obtain the approval of the flooring and adhesive manufacturers prior to use or remove the surface coating after curing to flooring manufacturer's satisfaction.
  - 2. Initial Curing: Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by water ponding, water-saturated sand, water-fog spray, or saturated burlap.

3. Final Curing: Begin after initial curing but before surface is dry.
  - a. Moisture-Retaining Sheet: Lap strips not less than 3 inches and seal with waterproof tape or adhesive; secure at edges.

### **3.08 FIELD QUALITY CONTROL**

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000 - Quality Requirements.
- B. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.
- C. Compressive Strength Tests: ASTM C39/C39M, for each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cubic yards or less of each class of concrete placed.
- D. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
- E. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.

### **3.09 DEFECTIVE CONCRETE**

- A. Test Results: The testing agency shall report test results in writing to Architect and Contractor within 24 hours of test.
- B. Defective Concrete: Concrete not complying with required lines, details, dimensions, tolerances or specified requirements.
- C. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.
- D. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect for each individual area.

### **3.10 PROTECTION**

- A. Do not permit traffic over unprotected concrete floor surface until fully cured.

**END OF SECTION**

**SECTION 04 2000  
UNIT MASONRY**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Concrete block.
- B. Mortar and grout.
- C. Reinforcement and anchorage.
- D. Lintels.
- E. Accessories.

**1.02 RELATED REQUIREMENTS**

- A. Section 07 9200 - Joint Sealants: Sealing control and expansion joints.

**1.03 REFERENCE STANDARDS**

- A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- B. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2022.
- C. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire; 2019 (Reapproved 2025).
- D. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement; 2022.
- E. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2022.
- F. ASTM C90 - Standard Specification for Dry-Cast Loadbearing Concrete Masonry Units; 2024a.
- G. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units; 2023.
- H. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2018.
- I. ASTM C150/C150M - Standard Specification for Portland Cement; 2024.
- J. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2018.
- K. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2019a, with Editorial Revision.
- L. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2024.
- M. ASTM C476 - Standard Specification for Grout for Masonry; 2023.
- N. ASTM C1714/C1714M - Standard Specification for Preblended Dry Mortar Mix for Unit Masonry; 2019a.
- O. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2022, with Errata (2024).

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, masonry accessories, and precast concrete lintels.
- C. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.
- D. Installer's Qualification Statement.

**1.05 QUALITY ASSURANCE**

- A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.
  - 1. Maintain one copy of each document on project site.
- B. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section with minimum three years of documented experience.
- C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

#### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

### **PART 2 PRODUCTS**

#### **2.01 CONCRETE MASONRY UNITS**

- A. Concrete Block: Comply with referenced standards and as follows:
  - 1. Size: Standard units with nominal face dimensions of 16 by 8 inches and nominal depths as indicated on drawings for specific locations.
  - 2. Nonloadbearing Units: ASTM C129.
    - a. Hollow block, as indicated.
    - b. Normal weight.
    - c. Exposed Faces: Manufacturer's standard color and texture.
    - d. Manufacturers:
      - 1) York Building Products – [www.yorkbuilding.com](http://www.yorkbuilding.com).
      - 2) Nitterhouse Masonry Products – [www.nitterhousemasonry.com](http://www.nitterhousemasonry.com).
      - 3) Fizzano Brothers Concrete Products - [www.fizzano.com](http://www.fizzano.com).
      - 4) Substitutions: See Section 01 6000 - Product Requirements.

#### **2.02 MORTAR AND GROUT MATERIALS**

- A. Portland Cement: ASTM C150/C150M, Type I.
- B. Hydrated Lime: ASTM C207, Type S.
- C. Mortar Aggregate: ASTM C144.
- D. Grout Aggregate: ASTM C404.
- E. Water: Clean and potable.
- F. Accelerating Admixture: Nonchloride type for use in cold weather.
- G. Packaged Dry Material for Mortar for Unit Masonry: Premixed Portland cement, hydrated lime, and sand; complying with ASTM C1714/C1714M and capable of producing mortar of the specified strength in accordance with ASTM C270 with the addition of water only.
  - 1. Type: Type N.
  - 2. Color: Standard gray.
- H. Packaged Dry Material for Grout for Masonry: Premixed cementitious materials and dried aggregates; capable of producing grout of the specified strength in accordance with ASTM C476 with the addition of water only.

#### **2.03 REINFORCEMENT AND ANCHORAGE**

- A. Manufacturers:
  - 1. Blok-Lok Limited; \_\_\_\_\_: [www.blok-lok.com/#sle](http://www.blok-lok.com/#sle).
  - 2. Hohmann & Barnard, Inc; X-Seal Anchor: [www.h-b.com/#sle](http://www.h-b.com/#sle).
  - 3. Substitutions: See Section 01 6000 - Product Requirements.
- B. Single Wythe Joint Reinforcement: ASTM A951/A951M.
  - 1. Type: Ladder.

2. Material: ASTM A1064/A1064M steel wire, mill galvanized to ASTM A641/A641M Class 3.
3. Size: 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not less than 5/8 inch of mortar coverage on each exposure.
4. Placement: Install every 16 inches vertically, continuous except at control joints. Lap minimum 6 inches.
5. At Openings: Provide additional two courses above and below lintels.

#### **2.04 ACCESSORIES**

- A. Preformed Control Joints: Polyvinyl chloride material. Provide with corner and tee accessories, fused joints.
  1. Manufacturers:
    - a. Blok-Lok Limited; \_\_\_\_\_: [www.blok-lok.com/#sle](http://www.blok-lok.com/#sle).
    - b. Hohmann & Barnard, Inc; \_\_\_\_\_: [www.h-b.com/#sle](http://www.h-b.com/#sle).
    - c. Substitutions: See Section 01 6000 - Product Requirements.
- B. Joint Filler: Closed cell polyvinyl chloride; oversized 50 percent to joint width; self expanding; in maximum lengths available.
- C. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

#### **2.05 LINTELS**

- A. Precast Concrete Lintels: Solid, \_\_\_\_by\_\_\_\_ inch \_\_\_\_by\_\_\_\_ inch size, 3000 psi 3000 psi strength at 28 days.

#### **2.06 MORTAR AND GROUT MIXING**

- A. Mortar for Unit Masonry: ASTM C270, using the Proportion Specification.
  1. Interior, non-loadbearing masonry: Type N.
- B. Grout: ASTM C476; consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches.
- C. Admixtures: Add to mixture at manufacturer's recommended rate and in accordance with manufacturer's instructions; mix uniformly.
- D. Mixing: Use mechanical batch mixer and comply with referenced standards.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that field conditions are acceptable and are ready to receive masonry.
- B. Verify that related items provided under other sections are properly sized and located.

#### **3.02 PREPARATION**

- A. Direct and coordinate placement of metal anchors supplied for installation under other sections.
- B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

#### **3.03 COLD AND HOT WEATHER REQUIREMENTS**

- A. Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

#### **3.04 COURSING**

- A. Establish lines, levels, and coursing indicated. Protect from displacement.
- B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
- C. Concrete Masonry Units:
  1. Bond: Running.



2. Coursing: One unit and one mortar joint to equal 8 inches.
3. Mortar Joints: Concave.

### **3.05 PLACING AND BONDING**

- A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
- B. Lay hollow masonry units with face shell bedding on head and bed joints.
- C. Remove excess mortar and mortar smears as work progresses.
- D. Interlock intersections and exposed corners.
- E. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
- F. Isolate masonry partitions from vertical structural framing members with a control joint as indicated.

### **3.06 REINFORCEMENT AND ANCHORAGE - GENERAL AND SINGLE WYTHE MASONRY**

- A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches on center.
- B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
- C. Place continuous joint reinforcement in first and second joint below top of walls.
- D. Embed longitudinal wires of joint reinforcement in mortar joint with at least 5/8 inch mortar cover on each side.
- E. Lap joint reinforcement ends minimum 6 inches.

### **3.07 LINTELS**

- A. Install precast concrete lintels over openings as indicated on drawings. Set level on full mortar bed with 6 inch bearing each end. Grout cells below bearings solid for 8 inches x 16 inches minimum.

### **3.08 GROUTED COMPONENTS**

- A. Place and consolidate grout fill without displacing reinforcing.

### **3.09 CONTROL AND EXPANSION JOINTS**

- A. Do not continue horizontal joint reinforcement through control or expansion joints.
- B. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.

### **3.10 BUILT-IN WORK**

- A. As work progresses, install built-in metal door frames and other items to be built into the work and furnished under other sections.
- B. Install built-in items plumb, level, and true to line.
- C. Bed anchors of metal door frames in adjacent mortar joints. Fill frame voids solid with grout.
  1. Fill adjacent masonry cores with grout minimum 12 inches from framed openings.

### **3.11 TOLERANCES**

- A. Install masonry within the site tolerances found in TMS 402/602.
- B. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.
- C. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft.
- D. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch.
- E. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.

- F. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch.
- G. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

**3.12 CLEANING**

- A. Remove excess mortar and mortar droppings.
- B. Replace defective mortar. Match adjacent work.
- C. Use non-metallic tools in cleaning operations.

**3.13 PROTECTION**

**END OF SECTION**

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**SECTION 05 5000  
METAL FABRICATIONS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Shop fabricated steel items, including:
  - 1. Loose steel lintels.

**1.02 RELATED REQUIREMENTS**

- A. Section 04 2000 - Unit Masonry: Placement of lintels in masonry.
- B. Section 09 9123 - Interior Painting: Paint finish.

**1.03 REFERENCE STANDARDS**

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- B. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

**1.05 QUALITY ASSURANCE**

- A. The work of this section shall be coordinated with the work of other Sections.
  - 1. Verify the dimensions and work of other trades adjoining items of this Section before fabrication and installation.
- B. Welders' Certificates: Submit certifications for welders employed on the Work, verifying AWS qualification within the previous 12 months.

**1.06 PROJECT SITE REQUIREMENTS**

- A. Field measurement shall be taken at the job site, prior to fabrication of items, to verify or supplement indicated dimensions and to ensure proper fitting of all items.

**PART 2 PRODUCTS**

**2.01 MATERIALS - STEEL**

- A. Steel Sections: ASTM A36/A36M.
- B. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

**2.02 FABRICATION**

- A. Fit and shop assemble items in largest practical sections, for delivery to site.
- B. Fabricate items with joints tightly fitted and secured.
- C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- D. Furnish components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

**2.03 FABRICATED ITEMS**

- A. Lintels: As detailed; prime paint finish.
  - 1. Fabricate loose structural-steel from steel angles and shapes indicated on the drawings.

**2.04 FINISHES - STEEL**

- A. Prime paint steel items.
  - 1. Exceptions: Do not prime surfaces in direct contact with concrete, where field welding is required, and items to be covered with sprayed fireproofing.
- B. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- C. Prime Painting: One coat.

## **2.05 FABRICATION TOLERANCES**

- A. Squareness: 1/8 inch maximum difference in diagonal measurements.
- B. Maximum Offset Between Faces: 1/16 inch.
- C. Maximum Misalignment of Adjacent Members: 1/16 inch.
- D. Maximum Bow: 1/8 inch in 48 inches.
- E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that field conditions are acceptable and are ready to receive work.

### **3.02 INSTALLATION**

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- C. Field weld components as indicated on drawings.
- D. Perform field welding in accordance with AWS D1.1/D1.1M.
- E. Obtain approval prior to site cutting or making adjustments not scheduled.
- F. After erection, prime welds, abrasions, and surfaces not shop primed , except surfaces to be in contact with concrete.

**END OF SECTION**

**SECTION 05 5213  
PIPE AND TUBE RAILINGS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Free-standing railings at steps.

**1.02 RELATED REQUIREMENTS**

- A. Section 03 3000 - Cast-in-Place Concrete: Placement of anchors in concrete.
- B. Section 09 9123 - Interior Painting: Paint finish.

**1.03 REFERENCE STANDARDS**

- A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2024.
- C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.
- D. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2023.
- E. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings; 2020.
- F. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings; 2021.
- G. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings; 2024.
- H. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.
- I. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2021, with Errata (2023).
- J. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).
- K. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.
  - 1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
  - 2. Include the design engineer's seal and signature on each sheet of shop drawings.
- C. Samples: Submit two, 12 inch long samples of handrail. Submit two samples of elbow, wall bracket, and end stop.
- D. Designer's Qualification Statement.
- E. Fabricator's Qualification Statement.

**1.05 QUALITY ASSURANCE**

- A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located, or personnel under direct supervision of such an engineer.

**PART 2 PRODUCTS**

## **2.01 RAILINGS - GENERAL REQUIREMENTS**

- A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of applicable local code.
- B. Distributed Loads: Design railing assembly, wall rails, and attachments to resist distributed force of 75 pounds per linear foot applied to the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E935
- C. Concentrated Loads: Design railing assembly, wall rails, and attachments to resist a concentrated force of 200 pounds applied at any point on the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E935
- D. Allow for expansion and contraction of members and building movement without damage to connections or members.
- E. Dimensions: See drawings for configurations and heights.
  - 1. Top Rails and Wall Rails: 1-1/2 inches diameter, round.
  - 2. Intermediate Rails: 1-1/2 inches diameter, round.
  - 3. Posts: 1-1/2 inches diameter, round.
  - 4. Balusters: 1/2 inch square solid bar.
- F. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.
  - 1. For anchorage to concrete, provide inserts to be cast into concrete, for bolting anchors.
  - 2. Posts: Provide adjustable flanged brackets.
- G. Provide welding fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.

## **2.02 STEEL RAILING SYSTEM**

- A. Steel Tube: ASTM A500/A500M Grade B cold-formed structural tubing.
- B. Steel Pipe: ASTM A53/A53M Grade B Schedule 40, black finish.
- C. Non-Weld Mechanical Fittings: Slip-on, galvanized malleable iron castings, for Schedule 40 pipe, with flush setscrews for tightening by standard hex wrench, no bolts or screw fasteners.
- D. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.
- E. Exposed Fasteners: No exposed bolts or screws.
- F. Straight Splice Connectors: Steel concealed spigots.
- G. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

## **2.03 FABRICATION**

- A. Accurately form components to suit specific project conditions and for proper connection to building structure.
- B. Fit and shop assemble components in largest practical sizes for delivery to site.
- C. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.
- D. Welded Joints:
  - 1. Interior Components: Continuously seal joined pieces by continuous welds.
  - 2. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- E. Weld connections that cannot be shop welded due to size limitations.

1. Weld in accordance with AWS D1.1/D1.1M.
2. Match shop welding and bolting.
3. Clean welds, bolted connections, and abraded areas.
4. Touch up shop primer and factory-applied finishes.
5. Repair galvanizing with galvanizing repair paint per ASTM A780/A780M.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that field conditions are acceptable and are ready to receive work.

#### **3.02 PREPARATION**

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply items required to be cast into concrete with setting templates, for installation as work of other sections.

#### **3.03 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.
- C. Install railings in compliance with ADA Standards for accessible design at applicable locations.
- D. Anchor railings securely to structure.
- E. Field weld anchors as indicated on drawings. Touch-up welds with primer. Grind welds smooth.
- F. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

#### **3.04 TOLERANCES**

- A. Maximum Variation From Plumb: 1/4 inch per floor level, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.
- C. Maximum Out-of-Position: 1/4 inch.

**END OF SECTION**



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**SECTION 06 2000  
FINISH CARPENTRY**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Finish carpentry items.

**1.02 RELATED REQUIREMENTS**

- A. Section 09 9123 - Interior Painting.

**1.03 REFERENCE STANDARDS**

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).
- C. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.
- D. AWPA U1 - Use Category System: User Specification for Treated Wood; 2025.
- E. WDMA I.S. 4 - Industry Specification for Preservative Treatment for Millwork; 2024.

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
  - 1. Provide information as required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).
- C. Samples: Submit two samples of wood trim 6 inch long.
- D. Certificate: Submit labels and certificates required by quality assurance and quality control programs.
- E. Manufacturer's Instructions: Provide manufacturer's installation instructions for factory-fabricated units.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Store finish carpentry items under cover, elevated above grade, and in a dry, well-ventilated area not exposed to heat or sunlight.
- B. Protect from moisture damage.
- C. Handle materials and products to prevent damage to edges, ends, or surfaces.

**PART 2 PRODUCTS**

**2.01 FINISH CARPENTRY ITEMS**

- A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
- B. Surface Burning Characteristics: Provide materials having fire and smoke properties as required by applicable code.
- C. Interior Woodwork Items:
  - 1. Quarter-Round Moldings, Bases, Flooring Transitions, and Miscellaneous Trim: Paint grade hard maple; prepare for paint finish.

**2.02 LUMBER MATERIALS**

- A. Hardwood Lumber: Hard maple species, maximum moisture content of 6 percent , paint grade.

**2.03 ACCESSORIES**

- A. Adhesive: Type recommended by fabricator to suit application.
- B. Lumber for Shimming and Blocking: Softwood lumber.

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION**

- A. Install custom fabrications in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.
- B. Set and secure materials and components in place, plumb and level.
- C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.
- D. Install components with nails at 16 inch on center.

#### **3.02 PREPARATION FOR SITE FINISHING**

- A. Apply wood filler in exposed fastener indentations. Sand work smooth.

#### **3.03 TOLERANCES**

- A. Maximum Variation from True Position: 1/16 inch.
- B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

**END OF SECTION**

**SECTION 08 1113  
HOLLOW METAL DOORS AND FRAMES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Non-fire-rated hollow metal doors and frames.
- B. Fire-rated hollow metal doors and frames.
- C. Accessories, including glazing and louvers.

**1.02 RELATED REQUIREMENTS**

- A. Section 08 7100 - Door Hardware.
- B. Section 08 8000 - Glazing: Glass for doors and borrowed lites.
- C. Section 09 9123 - Interior Painting: Field painting.

**1.03 REFERENCE STANDARDS**

- A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- B. ANSI/SDI A250.3 - Test Procedure and Acceptance Criteria for Factory Applied Finish Coatings for Steel Doors and Frames; 2025.
- C. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2024.
- D. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames; 2024.
- E. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2023.
- F. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2025.
- G. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025.
- H. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2024.
- I. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2023.
- J. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2020.
- K. ASTM C476 - Standard Specification for Grout for Masonry; 2023.
- L. BHMA A156.115 - Hardware Preparation in Steel Doors and Frames; 2016.
- M. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.
- N. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames; 2002.
- O. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2024.
- P. NAAMM HMMA 840 - Guide Specifications for Receipt, Storage and Installation of Hollow Metal Doors and Frames; 2024.
- Q. NAAMM HMMA 850 - Fire-Rated Hollow Metal Doors and Frames; 2014.
- R. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2025.
- S. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2022.
- T. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames; 2023.

- U. UL (DIR) - Online Certifications Directory; Current Edition.
- V. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

#### **1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced standards/guidelines.
- C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.
- D. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.
- E. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.
- F. Installer's Qualification Statement.

#### **1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least five years of documented experience.
- C. Maintain at project site copies of reference standards relating to installation of products specified.

#### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
- B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Hollow Metal Doors and Frames:
  - 1. Ceco Door, an Assa Abloy Group company; \_\_\_\_: [www.assaabloydss.com/#sle](http://www.assaabloydss.com/#sle).
  - 2. Curries, an Assa Abloy Group company; \_\_\_\_: [www.assaabloydss.com/#sle](http://www.assaabloydss.com/#sle).
  - 3. Fleming Door Products, an Assa Abloy Group company; \_\_\_\_: [www.assaabloydss.com/#sle](http://www.assaabloydss.com/#sle).
  - 4. Steelcraft, an Allegion brand; \_\_\_\_: [www.allegion.com/#sle](http://www.allegion.com/#sle).
  - 5. Substitutions: See Section 01 6000 - Product Requirements.

#### **2.02 PERFORMANCE REQUIREMENTS**

- A. Requirements for Hollow Metal Doors and Frames:
  - 1. Steel Sheet: Comply with one or more of the following requirements; galvanized steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
  - 2. Accessibility: Comply with ICC A117.1 and ADA Standards.
  - 3. Door Edge Profile: Manufacturers standard for application indicated.
  - 4. Typical Door Face Sheets: Flush.
  - 5. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings. Style: Manufacturer's standard.

6. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

### **2.03 HOLLOW METAL DOORS**

- A. Door Finish: Factory primed and field finished.
- B. Interior Doors, Non-Fire-Rated:
  1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
    - a. Level 2 - Heavy-duty.
    - b. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.
    - c. Model 2 - Seamless.
    - d. Door Face Metal Thickness: 18 gauge, 0.042 inch, minimum.
    - e. Zinc Coating: A60/ZF180 galvanized coating; ASTM A653/A653M.
  2. Door Thickness: 1-3/4 inches, nominal.
- C. Fire-Rated Doors:
  1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
    - a. Level 2 - Heavy-duty.
    - b. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.
    - c. Model 2 - Seamless.
    - d. Door Face Metal Thickness: 18 gauge, 0.042 inch, minimum.
  2. Fire Rating: As indicated on Door Schedule, tested in accordance with UL 10C and NFPA 252 ("positive pressure fire tests").
  3. Provide units listed and labeled by UL (DIR) or ITS (DIR).
    - a. Attach fire rating label to each fire rated unit.
  4. Door Thickness: 1-3/4 inches, nominal.

### **2.04 HOLLOW METAL FRAMES**

- A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.
- B. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
  1. Frame Metal Thickness: 16 gauge, 0.053 inch, minimum.
  2. Frame Finish: Factory primed and field finished.
- C. Door Frames, Fire-Rated: Full profile/continuously welded type.
  1. Fire Rating: Same as door, labeled.
  2. Frame Metal Thickness: 16 gauge, 0.053 inch, minimum.
  3. Frame Finish: Factory primed and field finished.
- D. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.
- E. Frames Wider than 48 inches: Reinforce with steel channel fitted tightly into frame head, flush with top.

### **2.05 FINISHES**

- A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.
- B. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15 mil, 0.015 inch dry film thickness (DFT) per coat; provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
  1. Fire-Rated Frames: Comply with fire rating requirements indicated.

### **2.06 ACCESSORIES**

- A. Louvers: Roll formed steel with overlapping frame; finish same as door components ; factory-installed.

1. Style: Sightproof inverted Y blade.
  2. Fasteners: Exposed, tamper proof fasteners.
- B. Glazing: As specified in Section 08 8000, factory installed.
- C. Grout for Frames: Mortar grout complying with ASTM C476 with maximum slump of 4 inches as measured in accordance with ASTM C143/C143M for hand troweling in place; plaster grout and thinner pumpable grout are prohibited.
- D. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.
- E. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Verify that finished walls are in plane to ensure proper door alignment.

#### **3.02 PREPARATION**

- A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

#### **3.03 INSTALLATION**

- A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.
- B. Install fire rated units in accordance with NFPA 80.
- C. Coordinate frame anchor placement with wall construction.
- D. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.
- E. Install door hardware as specified in Section 08 7100.
- F. Comply with glazing installation requirements of Section 08 8000.
- G. Coordinate installation of electrical connections to electrical hardware items.
- H. Touch up damaged factory finishes.
- I. Foam insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

#### **3.04 TOLERANCES**

- A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.
- B. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

#### **3.05 ADJUSTING**

- A. Adjust for smooth and balanced door movement.
- B. Adjust sound control doors so that seals are fully engaged when door is closed.
- C. Test sound control doors for force to close, latch, and unlatch; adjust as necessary in compliance with requirements.

### **END OF SECTION**

**SECTION 08 7100  
DOOR HARDWARE**

**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. Mechanical and electrified door hardware for:
    - a. Swinging doors.
  - 2. Field verification, preparation and modification of existing doors and frames to receive new door hardware.
- B. Exclusions: Unless specifically listed in hardware sets, hardware is not specified in this section for:
  - 1. Windows
  - 2. Cabinets (casework), including locks in cabinets
  - 3. Signage
  - 4. Toilet accessories
  - 5. Overhead doors
- C. Related Sections:
  - 1. Division 01 Section "Alternates" for alternates affecting this section.
  - 2. Division 07 Section "Joint Sealants" for sealant requirements applicable to threshold installation specified in this section.
  - 3. Division 09 sections for touchup finishing or refinishing of existing openings modified by this section.
  - 4. Division 13 Section "Radiation Protection" for requirements for lead-lining for door hardware at openings indicated to receive radiation protection.
  - 5. Division 26 sections for connections to electrical power system and for low-voltage wiring.
  - 6. Division 28 sections for coordination with other components of electronic access control system.

**1.3 REFERENCES**

- A. UL - Underwriters Laboratories
  - 1. UL 10B - Fire Test of Door Assemblies
  - 2. UL 10C - Positive Pressure Test of Fire Door Assemblies
  - 3. UL 1784 - Air Leakage Tests of Door Assemblies



4. UL 305 - Panic Hardware
- B. DHI - Door and Hardware Institute
  1. Sequence and Format for the Hardware Schedule
  2. Recommended Locations for Builders Hardware
  3. Key Systems and Nomenclature
- C. ANSI - American National Standards Institute
  1. ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties

#### 1.4 SUBMITTALS

- A. General:
  1. Submit in accordance with Conditions of Contract and Division 01 requirements.
  2. Highlight, encircle, or otherwise specifically identify on submittals deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.
  3. Prior to forwarding submittal, comply with procedures for verifying existing door and frame compatibility for new hardware, as specified in PART 3, "EXAMINATION" article, herein.
- B. Action Submittals:
  1. Product Data: Product data including manufacturers' technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
  2. Riser and Wiring Diagrams: After final approval of hardware schedule, submit details of electrified door hardware, indicating:
    - a. Wiring Diagrams: For power, signal, and control wiring and including:
      - 1) Details of interface of electrified door hardware and building safety and security systems.
      - 2) Schematic diagram of systems that interface with electrified door hardware.
      - 3) Point-to-point wiring.
      - 4) Risers.
  3. Samples for Verification: If requested by Architect, submit production sample or sample installations of each type of exposed hardware unit in finish indicated, and tagged with full description for coordination with schedule.
    - a. Samples will be returned to supplier in like-new condition. Units that are acceptable to Architect may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.
  4. Door Hardware Schedule: Submit schedule with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule as published by the Door and Hardware Institute. Indicate complete designations of each item required for each door or opening, include:
    - a. Door Index; include door number, heading number, and Architects hardware set number.

- b. Opening Lock Function Spreadsheet: List locking device and function for each opening.
- c. Type, style, function, size, and finish of each hardware item.
- d. Name and manufacturer of each item.
- e. Fastenings and other pertinent information.
- f. Location of each hardware set cross-referenced to indications on Drawings.
- g. Explanation of all abbreviations, symbols, and codes contained in schedule.
- h. Mounting locations for hardware.
- i. Door and frame sizes and materials.
- j. Name and phone number for local manufacturer's representative for each product.
- k. Operational Description of openings with any electrified hardware (locks, exits, electromagnetic locks, electric strikes, automatic operators, door position switches, magnetic holders or closer/holder units, and access control components).  
Operational description should include how door will operate on egress, ingress, and fire and smoke alarm connection.
- 1) Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work that is critical in Project construction schedule.

5. Key Schedule:

- a. After Keying Conference, provide keying schedule listing levels of keying as well as explanation of key system's function, key symbols used and door numbers controlled.
- b. Use ANSI/BHMA A156.28 "Recommended Practices for Keying Systems" as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
- c. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
- d. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
- e. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion.
  - 1) Forward bitting list, key cuts and key system schematic directly to Owner, by means as directed by Owner.
- f. Prepare key schedule by or under supervision of supplier, detailing Owner's final keying instructions for locks.

6. Templates: After final approval of hardware schedule, provide templates for doors, frames and other work specified to be factory prepared for door hardware installation.

C. Informational Submittals:

- 1. Qualification Data: For Supplier, Installer and Architectural Hardware Consultant.
- 2. Product Certificates for electrified door hardware, signed by manufacturer:
  - a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
- 3. Certificates of Compliance:
  - a. Certificates of compliance for fire-rated hardware and installation instructions if requested by Architect or Authority Having Jurisdiction.

- b. Installer Training Meeting Certification: Letter of compliance, signed by Contractor, attesting to completion of installer training meeting specified in "QUALITY ASSURANCE" article, herein.
    - c. Electrified Hardware Coordination Conference Certification: Letter of compliance, signed by Contractor, attesting to completion of electrified hardware coordination conference, specified in "QUALITY ASSURANCE" article, herein.
  - 4. Product Test Reports: For compliance with accessibility requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by qualified testing agency, for door hardware on doors located in accessible routes.
  - 5. Warranty: Special warranty specified in this Section.
- D. Closeout Submittals:
- 1. Operations and Maintenance Data : Provide in accordance with Division 01 and include:
    - a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
    - b. Catalog pages for each product.
    - c. Name, address, and phone number of local representative for each manufacturer.
    - d. Parts list for each product.
    - e. Final approved hardware schedule, edited to reflect conditions as-installed.
    - f. Final keying schedule
    - g. Copies of floor plans with keying nomenclature
    - h. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.
    - i. Copy of warranties including appropriate reference numbers for manufacturers to identify project.

## 1.5 QUALITY ASSURANCE

- A. Product Substitutions: Comply with product requirements stated in Division 01 and as specified herein.
- 1. Where specific manufacturer's product is named and accompanied by "No Substitute," including make or model number or other designation, provide product specified. (Note: Certain products have been selected for their unique characteristics and particular project suitability.)
    - a. Where no additional products or manufacturers are listed in product category, requirements for "No Substitute" govern product selection.
  - 2. Where products indicate "acceptable manufacturers" or "acceptable manufacturers and products", provide product from specified manufacturers, subject to compliance with specified requirements and "Single Source Responsibility" requirements stated herein.
- B. Supplier Qualifications and Responsibilities: Recognized architectural hardware supplier with record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that provides certified Architectural Hardware Consultant (AHC) available to Owner, Architect, and Contractor, at reasonable times during the Work for consultation.
- 1. Warehousing Facilities: In Project's vicinity.
  - 2. Scheduling Responsibility: Preparation of door hardware and keying schedules.

3. Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
4. Coordination Responsibility: Coordinate installation of electronic security hardware with Architect and electrical engineers and provide installation and technical data to Architect and other related subcontractors.
  - a. Upon completion of electronic security hardware installation, inspect and verify that all components are working properly.
- C. Installer Qualifications: Qualified tradesmen, skilled in application of commercial grade hardware with record of successful in-service performance for installing door hardware similar in quantity, type, and quality to that indicated for this Project.
- D. Architectural Hardware Consultant Qualifications: Person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and meets these requirements:
  1. For door hardware, DHI-certified, Architectural Hardware Consultant (AHC).
  2. Can provide installation and technical data to Architect and other related subcontractors.
  3. Can inspect and verify components are in working order upon completion of installation.
  4. Capable of producing wiring diagrams.
  5. Capable of coordinating installation of electrified hardware with Architect and electrical engineers.
- E. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.
  1. Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated.
  2. Manufacturers that perform electrical modifications and that are listed by testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.
- F. Fire-Rated Door Openings: Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and are identical to products tested by Underwriters Laboratories, Intertek Testing Services, or other testing and inspecting organizations acceptable to authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.
- G. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets 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. (3 cu. m per minute/sq. m) at tested pressure differential of 0.3-inch wg (75 Pa) of water.
- H. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction.
- I. Means of Egress Doors: Latches do not require more than 15 lbf (67 N) to release latch. Locks do not require use of key, tool, or special knowledge for operation.
- J. Accessibility Requirements: For door hardware on doors in an accessible route, comply with governing accessibility regulations cited in "REFERENCES" article, herein.

1. Provide operating devices that do not require tight grasping, pinching, or twisting of wrist and that operate with force of not more than 5 lbf (22.2 N).
  2. Maximum opening-force requirements:
    - a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
    - b. Sliding or Folding Doors: 5 lbf (22.2 N) applied parallel to door at latch.
    - c. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
  3. Bevel raised thresholds with slope of not more than 1:2. Provide thresholds not more than 1/2 inch (13 mm) high.
  4. Adjust door closer sweep periods so that, from open position of 70 degrees, door will take at least 3 seconds to move to 3 inches (75 mm) from latch, measured to leading edge of door.
- K. Keying Conference: Conduct conference at Project site to comply with requirements in Division 01.
1. Attendees: Owner, Contractor, Architect, Installer and Supplier's Architectural Hardware Consultant.
  2. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:
    - a. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
    - b. Preliminary key system schematic diagram.
    - c. Requirements for key control system.
    - d. Requirements for access control.
    - e. Address for delivery of keys.
- L. Coordination Conferences:
1. Installation Coordination Conference: Prior to hardware installation, schedule and hold meeting to review questions or concerns related to proper installation and adjustment of door hardware.
    - a. Attendees: Door hardware supplier, door hardware installer, Contractor.
    - b. After meeting, provide letter of compliance to Architect, indicating when meeting was held and who was in attendance.
  2. Electrified Hardware Coordination Conference: Prior to ordering electrified hardware, schedule and hold meeting to coordinate door hardware with security, electrical, doors and frames, and other related suppliers.
    - a. Attendees: electrified door hardware supplier, doors and frames supplier, electrified door hardware installer, electrical subcontractor, Owner, Architect and Contractor.
    - b. After meeting, provide letter of compliance to Architect, indicating when coordination conference was held and who was in attendance.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site.

- B. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.
  - 1. Deliver each article of hardware in manufacturer's original packaging.
- C. Project Conditions:
  - 1. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.
  - 2. Provide secure lock-up for door hardware delivered to Project, but not yet installed. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.
- D. Protection and Damage:
  - 1. Promptly replace products damaged during shipping.
  - 2. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work.
  - 3. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.
- E. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.
- F. Deliver keys and permanent cores to Owner by registered mail or overnight package service.

#### 1.7 COORDINATION

- A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete. Concrete, reinforcement, and formwork requirements are specified in Division 03.
- B. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.
- D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.
- E. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.
- F. Direct shipments not permitted, unless approved by Contractor.

## 1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: Years from date of Substantial Completion, for durations indicated.
    - a. Closers:
      - 1) Mechanical: 10 years. Electrified: 2 years.
    - b. Automatic Operators: 1 year.
    - c. Exit Devices:
      - 1) Mechanical: 3 years.
      - 2) Electrified: 1 year.
    - d. Locksets:
      - 1) Mechanical: 3 years.
      - 2) Electrified: 1 year.
    - e. Continuous Hinges: Lifetime warranty
  - 2. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.

## 1.9 MAINTENANCE

- A. Maintenance Tools:
  - 1. Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. The Owner requires use of certain products for their unique characteristics and particular project suitability to insure continuity of existing and future performance and maintenance standards. After investigating available product offerings Awarding Authority has elected to prepare proprietary specifications. These products are specified with the notation: "No Substitute."
  - 1. Where "No Substitute" is noted, submittals and substitution requests for other products will not be considered.
- B. Approval of manufacturers and/or products other than those listed as "Scheduled Manufacturer" or "Acceptable Manufacturers" in the individual article for the product category shall be in accordance with QUALITY ASSURANCE article, herein.
- C. Approval of products from manufacturers indicated in "Acceptable Manufacturers" is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer's product.

- D. Hand of Door: Drawings show direction of slide, swing, or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as shown.
- E. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect's approval.

## 2.2 MATERIALS

### A. Fasteners

- 1. Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation.
- 2. Furnish screws for installation with each hardware item. Finish exposed (exposed under any condition) screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
- 3. Provide concealed fasteners for hardware units exposed when door is closed except when no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work unless thru-bolts are required to fasten hardware securely. Review door specification and advise Architect if thru-bolts are required.
- 4. Install hardware with fasteners provided by hardware manufacturer.

### B. Modification and Preparation of Existing Doors: Where existing door hardware is indicated to be removed and reinstalled.

- 1. Provide necessary fillers, Dutchmen, reinforcements, and fasteners, compatible with existing materials, as required for mounting new opening hardware and to cover existing door and frame preparations.
- 2. Use materials which match materials of adjacent modified areas.
- 3. When modifying existing fire-rated openings, provide materials permitted by NFPA 80 as required to maintain fire-rating.

### C. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.

- 1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.

## 2.3 HINGES

### A. Provide five-knuckle, ball bearing hinges.

#### 1. Manufacturers and Products:

- a. Scheduled Manufacturer and Product: Ives 5BB series
- b. Acceptable Manufacturers and Products: Hager BB series, McKinney TA/T4A series, Stanley FBB Series

### B. Requirements:

- 1. 1-3/4 inch (44 mm) thick doors, up to and including 36 inches (914 mm) wide:



- a. Exterior: Standard weight, bronze or stainless steel, 4-1/2 inches (114 mm) high
  - b. Interior: Standard weight, steel, 4-1/2 inches (114 mm) high
2. 1-3/4 inch (44 mm) thick doors over 36 inches (914 mm) wide:
  - a. Exterior: Heavy weight, bronze/stainless steel, 5 inches (127 mm) high
  - b. Interior: Heavy weight, steel, 5 inches (127 mm) high
3. 2 inches or thicker doors:
  - a. Exterior: Heavy weight, bronze or stainless steel, 5 inches (127 mm) high
  - b. Interior: Heavy weight, steel, 5 inches (127 mm) high
4. Provide three hinges per door leaf for doors 90 inches (2286 mm) or less in height, and one additional hinge for each 30 inches (762 mm) of additional door height.
5. Where new hinges are specified for existing doors or existing frames, provide new hinges of identical size to hinge preparation present in existing door or existing frame.
6. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
  - a. Steel Hinges: Steel pins
  - b. Non-Ferrous Hinges: Stainless steel pins
  - c. Out-Swinging Exterior Doors: Non-removable pins
  - d. Out-Swinging Interior Lockable Doors: Non-removable pins
  - e. Interior Non-lockable Doors: Non-rising pins
7. Width of hinges: 4-1/2 inches (114 mm) at 1-3/4 inch (44 mm) thick doors, and 5 inches (127 mm) at 2 inches (51 mm) or thicker doors. Adjust hinge width as required for door, frame, and wall conditions to allow proper degree of opening.
8. Doors 36 inches (914 mm) wide or less furnish hinges 4-1/2 inches (114 mm) high; doors greater than 36 inches (914 mm) wide furnish hinges 5 inches (127 mm) high, heavy weight or standard weight as specified.
9. Provide hinges with electrified options as scheduled in the hardware sets. Provide with sufficient number and wire gage to accommodate electric function of specified hardware. Locate electric hinge at second hinge from bottom or nearest to electrified locking component.
10. Provide mortar guard for each electrified hinge specified, unless specified in hollow metal frame specification.
11. Provide spring hinges where specified. Provide two spring hinges and one bearing hinge per door leaf for doors 90 inches (2286 mm) or less in height. Provide one additional bearing hinge for each 30 inches (762 mm) of additional door height.

## 2.4 CONTINUOUS HINGES

### A. Aluminum Geared

1. Manufacturers:
  - a. Scheduled Manufacturer: Ives.
  - b. Acceptable Manufacturers: Markar, Stanley.
2. Requirements:
  - a. Provide aluminum geared continuous hinges conforming to ANSI/BHMA A156.25, Grade 2.

- b. Provide aluminum geared continuous hinges, where specified in the hardware sets, fabricated from 6063-T6 aluminum, with 0.25-inch (6 mm) diameter Teflon coated stainless steel hinge pin.
- c. Provide split nylon bearings at each hinge knuckle for quiet, smooth, self-lubricating operation.
- d. Provide hinges capable of supporting door weights up to 450 pounds, and successfully tested for 1,500,000 cycles.
- e. On fire-rated doors, provide aluminum geared continuous hinges that are classified for use on rated doors by testing agency acceptable to authority having jurisdiction.
- f. Provide aluminum geared continuous hinges with electrified option scheduled in the hardware sets. Provide with sufficient number and wire gage to accommodate electric function of specified hardware.
- g. Install hinges with fasteners supplied by manufacturer.
- h. Provide hinges with symmetrical hole pattern.

## 2.5 FLUSH BOLTS

### A. Manufacturers:

- 1. Scheduled Manufacturer: Ives
- 2. Acceptable Manufacturers: Burns, Rockwood

### B. Requirements:

- 1. Provide automatic, constant latching, and manual flush bolts with forged bronze or stainless steel face plates, extruded brass levers, and with wrought brass guides and strikes. Provide 12 inch (305 mm) steel or brass rods at doors up to 90 inches (2286 mm) in height. For doors over 90 inches (2286 mm) in height increase top rods by 6 inches (152 mm) for each additional 6 inches (152 mm) of door height. Provide dust-proof strikes at each bottom flush bolt.

## 2.6 CYLINDRICAL LOCKS – GRADE 1

### A. Manufacturers and Products:

- 1. Scheduled Manufacturer and Product: Schlage ND series
- 2. All are Owner Furnished Contractor Installed

### B. Requirements:

- 1. Provide cylindrical locks conforming to ANSI/BHMA A156.2 Series 4000, Grade 1. Cylinders: Refer to "KEYING" article, herein.
- 2. Provide locks with standard 2-3/4 inches (70 mm) backset, unless noted otherwise, with a 1/2 inch (13 mm) latch throw. Provide proper latch throw for UL listing at pairs.
- 3. Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.
- 4. Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.
- 5. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
- 6. Provide electrified options as scheduled in the hardware sets.
- 7. Lever Trim: Solid cast levers without plastic inserts, and wrought roses on both sides.
  - a. Lever Design: As shown in hardware sets.

## 2.7 MORTISE LOCKS

### A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: Schlage L series
2. All are Owner Furnished Contractor Installed

### B. Requirements:

1. Provide mortise locks conforming to ANSI/BHMA A156.13 Series 1000, Grade 1, and UL Listed for 3 hour fire doors.
2. Provide locks manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance.
3. Provide lock case that is multi-function and field reversible for handing without opening case. Cylinders: Refer to "KEYING" article, herein.
4. Provide locks with standard 2-3/4 inches (70 mm) backset with full 3/4 inch (19 mm) throw stainless steel mechanical anti-friction latchbolt. Provide deadbolt with full 1 inch (25 mm) throw, constructed of stainless steel.
5. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
6. Provide electrified options as scheduled in the hardware sets. Where scheduled, provide a request to exit (RX) switch that is actuated with rotation of inside lever.
7. Lever Trim: Solid brass, bronze, or stainless steel, cast or forged in design specified, with wrought roses and external lever spring cages. Provide thru-bolted levers with 2-piece spindles.
  - a. Lever Design: As shown in hardware sets

## 2.8 EXIT DEVICES

### A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: Von Duprin 98 series
2. All are Owner Furnished Contractor Installed

### B. Requirements:

1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1, and UL listed for Panic Exit or Fire Exit Hardware. Cylinders: Refer to "KEYING" article, herein.
2. Exit Devices: Touchpad type, fabricated of brass, bronze, stainless steel, or aluminum, plated to standard architectural finishes to match balance of door hardware.
3. Touchpad: Extend minimum of one half of door width. Match exit device finish or provide compatible finish. Provide compression springs in devices, latches, and outside trims or controls, tension springs also acceptable.
4. Provide devices with deadlatching feature for security and for future addition of alarm kits and other electrical requirements.
5. Provide manufacturer's standard strikes.
6. Provide exit devices cut to door width and height. Locate exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect.

7. Mount mechanism case flush on face of doors, or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.
8. Provide cylinder dogging at non-fire-rated exit devices.
9. Removable Mullions: 2 inches (51 mm) x 3 inches (76 mm) steel tube. Where scheduled as keyed removable mullion, provide type that can be removed by use of a keyed cylinder, which is self-locking when re-installed.
10. Where lever handles are specified as outside trim for exit devices, provide heavy-duty lever trims with forged or cast escutcheon plates. Provide vandal-resistant levers that will travel to 90-degree down position when more than 35 pounds of torque are applied, and which can easily be re-set.

a. Lever Style: Match lever style of locksets.

11. Provide UL labeled fire exit hardware for fire rated openings.
12. Field drill weep holes per manufacturer's recommendation for exit devices used in full exterior application, highly corrosive areas, and where noted in the hardware sets.
13. Provide electrified options as scheduled in the hardware sets.

## 2.9 ELECTRIC STRIKES

### A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: Von Duprin 6000 series
2. Acceptable Manufacturers and Products: Folger Adam 300 series, HES 1006 series

### B. Requirements:

1. Provide electric strikes designed for use with type of locks shown at each opening.
2. Provide electric strikes UL Listed as burglary-resistant.
3. Where required, provide electric strikes UL Listed for fire doors and frames.
4. Provide fail-secure type electric strikes, unless specified otherwise.
5. Coordinate voltage and provide transformers and rectifiers for each strike as required.

## 2.10 POWER SUPPLIES

### A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: Schlage or Von Duprin PS900 series
2. Acceptable Manufacturers and Products No Substitutions

### B. Requirements:

1. Provide power supplies, recommended and approved by manufacturer of electrified locking component, for operation of electrified locks, electrified exit devices, magnetic locks, electric strikes, and other components requiring power supply.
2. Provide appropriate quantity and size of power supplies necessary for proper operation of electrified locking components as recommended by manufacturer of electrified locking components with consideration for each electrified component using power supply, location of power supply, and approved wiring diagrams. Locate power supplies as directed by Architect.
3. Provide appropriate option boards for power supplies necessary for proper operation of the electrified locking components as recommended by the manufacturer of the electrified

locking components with consideration for each electrified component used in the system.

4. Provide regulated and filtered 24 VDC power supply and UL class 2 listed.
5. Options:
  - a. Provide power supply, where specified, with internal capability of charging sealed backup batteries 24 VDC, in addition to operating DC load.
  - b. Provide sealed batteries for battery back-up at each power supply where specified.
  - c. Provide keyed power supply cabinet.
6. Provide power supply in an enclosure, complete, and requiring 120VAC to fused input.
7. Provide power supply with emergency release terminals, where specified, that allow release of all devices upon activation of fire alarm system complete with fire alarm input for initiating "no delay" exiting mode.

## 2.11 CYLINDERS

### A. Manufacturers:

1. Scheduled Manufacturer: Schlage
2. All are Owner Furnished Contractor Installed

### B. Requirements:

1. Provide cylinders/cores, from the same manufacturer of locksets, compliant with ANSI/BHMA A156.5; latest revision, Section 12, Grade 1; permanent cylinders; cylinder face finished to match lockset, manufacturer's series as indicated. Refer to "KEYING" article, herein.
2. Provide cylinders in the below-listed configuration(s), distributed throughout the Project as indicated.
  - a. High Security: dual-locking cylinder with permanent core requiring, patented keyway.
  - b. Security: dual-locking cylinder with **interchangeable** core requiring restricted, patented keyway.
  - c. Conventional cylinder with **interchangeable** core with open keyway.
3. Patent Protection: Cylinders/cores requiring use of restricted, patented keys, patent-protected.
4. Security Cylinders: Where indicated, provide cylinders/cores with "dual-locking mechanism" with interlocking finger pin(s) to check for patented features on keys.
5. Nickel silver bottom pins.
6. Temporary Construction Cylinder Keying.
  - a. Owner or Owner's Representative will void operation of temporary construction keys.

## 2.12 KEYING

- A. Provide a factory registered keying system, complying with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.
- B. Requirements:

All Locks to be keyed into the owner existing Master Key System as directed by the owner.

1. Provide keys with the following features.
  - a. Material: Solid nickel plated
2. Identification:
  - a. Mark permanent cylinders/cores and keys with applicable blind code per DHI publication "Keying Systems and Nomenclature" for identification. Blind code marks shall not include actual key cuts.
  - b. Identification stamping provisions must be approved by the Architect and Owner.
  - c. Failure to comply with stamping requirements shall be cause for replacement of keys involved at no additional cost to Owner.
  - d. Forward permanent cylinders/cores to Owner, separately from keys, by means as directed by Owner.
3. Quantity: Furnish in the following quantities.
  - a. Change (Day) Keys: 3 per cylinder/core.
  - b. Permanent Control Keys: 3.
  - c. Master Keys: 6.
  - d. Unused balance of key blanks shall be furnished to Owner with the cut keys.
  - e. Extra Keys:
    - 1) **6** Construction Keys

## 2.13 KEY CONTROL SYSTEM

### A. Manufacturers:

1. Scheduled Manufacturer: Telkee
2. Acceptable Manufacturers: HPC, Lund

### B. Requirements:

1. Provide key control system, including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet, all as recommended by system manufacturer, with capacity for 150% of number of locks required for Project.
  - a. Provide complete cross index system set up by hardware supplier, and place keys on markers and hooks in cabinet as determined by final key schedule.
  - b. Provide hinged-panel type cabinet for wall mounting.

## 2.14 DOOR CLOSERS

### A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: LCN 4040XP series.
2. All are Owner Furnished Contractor Installed

### B. Requirements:

1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. ISO 9000 certify closers. Stamp units with date of manufacture code.
2. Provide door closers with fully hydraulic, full rack and pinion action with aluminum cylinder.
3. Closer Body: 1-1/2 inch (38 mm) diameter with 5/8 inch (16 mm) diameter heat-treated pinion journal.
4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck.
7. Pressure Relief Valve (PRV) Technology: Not permitted.
8. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

## 2.15 DOOR TRIM

### A. Manufacturers:

1. Scheduled Manufacturer: Ives
2. Acceptable Manufacturers: Burns, Trimco

### B. Requirements:

1. Provide push plates 4 inches (102 mm) wide by 16 inches (406 mm) high by 0.050 inch (1 mm) thick and beveled 4 edges. Where width of door stile prevents use of 4 inches (102 mm) wide plate, adjust width to fit.
2. Provide push bars of solid bar stock, diameter and length as scheduled. Provide push bars of sufficient length to span from center to center of each stile. Where required, mount back to back with pull.
3. Provide offset pulls of solid bar stock, diameter and length as scheduled. Where required, mount back to back with push bar.
4. Provide flush pulls as scheduled. Where required, provide back-to-back mounted model.
5. Provide pulls of solid bar stock, diameter and length as scheduled. Where required, mount back to back with push bar.
6. Provide pull plates 4 inches (102 mm) wide by 16 inches (406 mm) high by 0.050 inch (1 mm) thick, beveled 4 edges, and prepped for pull. Where width of door stile prevents use of 4 inches (102 mm) wide plate, adjust width to fit.
7. Provide wire pulls of solid bar stock, diameter and length as scheduled.
8. Provide decorative pulls as scheduled. Where required, mount back to back with pull.

## 2.16 PROTECTION PLATES

### A. Manufacturers:

1. Scheduled Manufacturer: Ives
2. Acceptable Manufacturers: Burns, Trimco

### B. Requirements:

1. Provide kick plates, mop plates, and armor plates minimum of 0.050 inch (1 mm) thick as scheduled. Furnish with sheet metal or wood screws, finished to match plates.
2. Sizes of plates:
  - a. Kick Plates: 10 inches (254 mm) high by 2 inches (51 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs
  - b. Mop Plates: 4 inches (102 mm) high by 2 inches (51 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs
  - c. Armor Plates: 36 inches (914 mm) high by 2 inches (51 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs

## 2.17 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS

### A. Manufacturers:

1. Scheduled Manufacturers: Glynn-Johnson
2. Acceptable Manufacturers: Rixson, Sargent

### B. Requirements:

1. Provide heavy duty concealed mounted overhead stop or holder as specified for exterior and interior vestibule single acting doors.
2. Provide heavy duty concealed mounted overhead stop or holder as specified for double acting doors.
3. Provide heavy or medium duty and concealed or surface mounted overhead stop or holder for interior doors as specified. Provide medium duty surface mounted overhead stop for interior doors and at any door that swings more than 140 degrees before striking wall, open against equipment, casework, sidelights, and where conditions do not allow wall stop or floor stop presents tripping hazard.
4. Where overhead holders are specified provide friction type at doors without closer and positive type at doors with closer.

## 2.18 DOOR STOPS AND HOLDERS

### A. Manufacturers:

1. Scheduled Manufacturer: Ives
2. Acceptable Manufacturers: Burns, Trimco

### B. Provide door stops at each door leaf:

1. Provide wall stops wherever possible. Provide convex type where mortise type locks are used and concave type where cylindrical type locks are used.
2. Where a wall stop cannot be used, provide universal floor stops for low or high rise options.
3. Where wall or floor stop cannot be used, provide medium duty surface mounted overhead stop.

## 2.19 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

### A. Manufacturers:



1. Scheduled Manufacturer: Zero International
2. Acceptable Manufacturers: Pemko, Reese

B. Requirements:

1. Provide thresholds, weatherstripping (including door sweeps, seals, astragals) and gasketing systems (including smoke, sound, and light) as specified and per architectural details. Match finish of other items.
2. Size of thresholds:
  - a. Saddle Thresholds: 1/2 inch (13 mm) high by jamb width by door width
  - b. Bumper Seal Thresholds: 1/2 inch (13 mm) high by 5 inches (127 mm) wide by door width
3. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.

## 2.20 SILENCERS

A. Manufacturers:

1. Scheduled Manufacturer: Ives
2. Acceptable Manufacturers: Burns, Trimco

B. Requirements:

1. Provide "push-in" type silencers for hollow metal or wood frames.
2. Provide one silencer per 30 inches (762 mm) of height on each single frame, and two for each pair frame.
3. Omit where gasketing is specified.

## 2.21 MAGNETIC HOLDERS

A. Manufacturers:

1. Scheduled Manufacturer: LCN
2. Acceptable Manufacturers: Rixson, Sargent

B. Requirements:

1. Provide wall or floor mounted electromagnetic door release as specified with minimum of 25 pounds of holding force. Coordinate projection of holder and armature with other hardware and wall conditions to ensure that door sits parallel to wall when fully open. Wire magnetic holders on fire-rated doors into the fire control panel for fail-safe operation.

## 2.22 FINISHES

A. Finish: BHMA 626/652 (US26D); except:

1. Hinges at Exterior Doors: BHMA 630 (US32D)
2. Continuous Hinges: BHMA 628 (US28)
3. Push Plates, Pulls, and Push Bars: BHMA 630 (US32D)
4. Protection Plates: BHMA 630 (US32D)

5. Overhead Stops and Holders: BHMA 630 (US32D)
6. Door Closers: Powder Coat to Match
7. Wall Stops: BHMA 630 (US32D)
8. Latch Protectors: BHMA 630 (US32D)
9. Weatherstripping: Clear Anodized Aluminum
10. Thresholds: Mill Finish Aluminum

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Existing Door and Frame Compatibility: Field verify existing doors and frames receiving new hardware and existing conditions receiving new openings. Verify that new hardware is compatible with existing door and frame preparation and existing conditions.
- C. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Where on-site modification of doors and frames is required:
  1. Carefully remove existing door hardware and components being reused. Clean, protect, tag, and store in accordance with storage and handling requirements specified herein.
  2. Field modify and prepare existing door and frame for new hardware being installed.
  3. When modifications are exposed to view, use concealed fasteners, when possible.
  4. Prepare hardware locations and reinstall in accordance with installation requirements for new door hardware and with:
    - a. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
    - b. Wood Doors: DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."
    - c. Doors in rated assemblies: NFPA 80 for restrictions on on-site door hardware preparation.

### 3.3 INSTALLATION

- A. Mounting Heights: Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.
  1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
  2. Custom Steel Doors and Frames: HMMA 831.
  3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

- B. Install each hardware item in compliance with manufacturer's instructions and recommendations, using only fasteners provided by manufacturer.
- C. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.
- D. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.
- E. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- F. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.
- G. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated or one hinge for every 30 inches (750 mm) of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.
- H. Intermediate Offset Pivots: Where offset pivots are indicated, provide intermediate offset pivots in quantities indicated in door hardware schedule but not fewer than one intermediate offset pivot per door and one additional intermediate offset pivot for every 30 inches (750 mm) of door height greater than 90 inches (2286 mm).
- I. Lock Cylinders: Install construction cores to secure building and areas during construction period.
  - 1. Replace construction cores with permanent cores as indicated in keying section.
- J. Wiring: Coordinate with Division 26, ELECTRICAL sections for:
  - 1. Conduit, junction boxes and wire pulls.
  - 2. Connections to and from power supplies to electrified hardware.
  - 3. Connections to fire/smoke alarm system and smoke evacuation system.
  - 4. Connection of wire to door position switches and wire runs to central room or area, as directed by Architect.
  - 5. Testing and labeling wires with Architect's opening number.
- K. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.
- L. Door Closers: Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Closers shall not be visible in corridors, lobbies and other public spaces unless approved by Architect.
- M. Closer/Holders: Mount closer/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.
- N. Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings or in equipment room, or alternate location as directed by Architect.
  - 1. Configuration: Provide least number of power supplies required to adequately serve doors with electrified door hardware.

- O. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."
- P. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.
- Q. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
- R. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
- S. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

### 3.4 FIELD QUALITY CONTROL

- A. Architectural Hardware Consultant: Engage qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.
  - 1. Architectural Hardware Consultant will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed 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.
  - 1. Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 30 degrees.
  - 2. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
  - 3. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.
- B. Occupancy Adjustment: Approximately three months after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors, door hardware, and electrified door hardware.

### 3.6 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

### 3.7 DEMONSTRATION

- A. Provide training for Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes. Refer to Division 01 Section "Demonstration and Training."

### 3.8 DOOR HARDWARE SCHEDULE

- A. Locksets, exit devices, and other hardware items are referenced in the following hardware sets for series, type and function. Refer to the above-specifications for special features, options, cylinders/keying, and other requirements.

#### B. Hardware Sets:

Hardware Group No. 00

For use on Door #(s):

A121          B104          G105          G205

Provide each SGL door(s) with the following:

| QTY | DESCRIPTION | CATALOG NUMBER                  | FINISH | MFR |
|-----|-------------|---------------------------------|--------|-----|
|     | NOTE        | ALL HARDWARE EXISTING TO REMAIN |        |     |

Hardware Group No. 01 - Not Used

Hardware Group No. 02 - Not Used

Hardware Group No. 03 - Not Used

Hardware Group No. 04

For use on Door #(s):

A109E          A117D          A120E          C102T          M116T          M118T

Provide each SGL door(s) with the following:

| QTY     | DESCRIPTION         | CATALOG NUMBER                                                                                       | FINISH | MFR |
|---------|---------------------|------------------------------------------------------------------------------------------------------|--------|-----|
| 3    EA | HINGE               | 5BB1 4.5 X 4.5 (NRP AS REQUIRED)                                                                     | 652    | IVE |
| 1    EA | PRIVACY LOCK        | ND40S SPA (OWNER FURNISHED CONTRACTOR INSTALLED)                                                     | 626    | SCH |
| 1    EA | WALL STOP           | WS406/407CVX                                                                                         | 630    | IVE |
| 3    EA | SILENCER            | SR64/65 AS REQ'D                                                                                     | GRY    | IVE |
|         | NOTE - field verify | GC & Hardware Provider to field verify all specified hardware is compatible with existing conditions |        |     |

Hardware Group No. 05 - Not Used

Hardware Group No. 06

For use on Door #(s):  
M115B

Provide each SGL door(s) with the following:

| QTY |    | DESCRIPTION         | CATALOG NUMBER                                                                                             | FINISH | MFR |
|-----|----|---------------------|------------------------------------------------------------------------------------------------------------|--------|-----|
| 1   | EA | CONT. HINGE         | 224XY                                                                                                      | 628    | IVE |
| 1   | EA | CLASSROOM DEAD LOCK | L463L (OWNER FURNISHED<br>CONTRACTOR INSTALLED)                                                            | 626    | SCH |
| 1   | EA | FSIC CORE           | CYLINDER AS REQUIRED<br>(OWNER FURNISHED<br>CONTRACTOR INSTALLED)                                          | 626    | SCH |
| 1   | EA | PUSH PLATE          | 8200 4" X 16"                                                                                              | 630    | IVE |
| 1   | EA | PULL PLATE          | 8303 10" 4" X 16"                                                                                          | 630    | IVE |
| 1   | EA | SURFACE CLOSER      | 4040XP SHCUSH (OWNER<br>FURNISHED CONTRACTOR<br>INSTALLED)                                                 | 689    | LCN |
| 1   | EA | KICK PLATE          | 8400 10" X 2" LDW B-CS                                                                                     | 630    | IVE |
| 1   | EA | MOP PLATE           | 8400 4" X 1" LDW B-CS                                                                                      | 630    | IVE |
| 1   | EA | GASKETING           | 488FSBK PSA                                                                                                | BK     | ZER |
|     |    | NOTE - field verify | GC & Hardware Provider to field<br>verify all specified hardware is<br>compatible with existing conditions |        |     |

Hardware Group No. 07

For use on Door #(s):

|         |       |      |      |      |      |
|---------|-------|------|------|------|------|
| C112C.2 | C112E | M112 | M114 | M117 | M119 |
| M203    | M205  | M221 | M223 |      |      |

Provide each SGL door(s) with the following:

| QTY |    | DESCRIPTION         | CATALOG NUMBER                                                                                             | FINISH | MFR |
|-----|----|---------------------|------------------------------------------------------------------------------------------------------------|--------|-----|
| 1   | EA | HINGE               | 5BB1 4.5 X 4.5 (NRP AS<br>REQUIRED)                                                                        | 652    | IVE |
| 1   | EA | CLASSROOM DEAD LOCK | L463L (OWNER FURNISHED<br>CONTRACTOR INSTALLED)                                                            | 626    | SCH |
| 1   | EA | FSIC CORE           | CYLINDER AS REQUIRED<br>(OWNER FURNISHED<br>CONTRACTOR INSTALLED)                                          | 626    | SCH |
| 1   | EA | PUSH PLATE          | 8200 4" X 16"                                                                                              | 630    | IVE |
| 1   | EA | PULL PLATE          | 8303 10" 4" X 16"                                                                                          | 630    | IVE |
| 1   | EA | SURFACE CLOSER      | 4040XP SCUSH (OWNER<br>FURNISHED CONTRACTOR<br>INSTALLED)                                                  | 689    | LCN |
| 1   | EA | KICK PLATE          | 8400 10" X 2" LDW B-CS                                                                                     | 630    | IVE |
| 1   | EA | MOP PLATE           | 8400 4" X 1" LDW B-CS                                                                                      | 630    | IVE |
| 1   | EA | GASKETING           | 488FSBK PSA                                                                                                | BK     | ZER |
|     |    | NOTE - field verify | GC & Hardware Provider to field<br>verify all specified hardware is<br>compatible with existing conditions |        |     |

Hardware Group No. 08

For use on Door #(s):

A111                      A119

Provide each SGL door(s) with the following:

| QTY |    | DESCRIPTION         | CATALOG NUMBER                                                 | FINISH | MFR |
|-----|----|---------------------|----------------------------------------------------------------|--------|-----|
| 3   | EA | HINGE               | 5BB1 4.5 X 4.5 (NRP AS REQUIRED)                               | 652    | IVE |
| 1   | EA | CLASSROOM DEAD LOCK | L463L (OWNER FURNISHED CONTRACTOR INSTALLED)                   | 626    | SCH |
| 1   | EA | FSIC CORE           | CYLINDER AS REQUIRED (OWNER FURNISHED CONTRACTOR INSTALLED)    | 626    | SCH |
| 1   | EA | PUSH PLATE          | 8200 4" X 16"                                                  | 630    | IVE |
| 1   | EA | PULL PLATE          | 8303 10" 4" X 16"                                              | 630    | IVE |
| 1   | EA | SURFACE CLOSER      | 4040XP REG OR PA AS REQ (OWNER FURNISHED CONTRACTOR INSTALLED) | 689    | LCN |
| 1   | EA | KICK PLATE          | 8400 10" X 2" LDW B-CS                                         | 630    | IVE |
| 1   | EA | MOP PLATE           | 8400 4" X 1" LDW B-CS                                          | 630    | IVE |
| 1   | EA | WALL STOP           | WS406/407CVX                                                   | 630    | IVE |
| 1   | EA | GASKETING           | 488FSBK PSA                                                    | BK     | ZER |

NOTE - field verify

GC & Hardware Provider to field verify all specified hardware is compatible with existing conditions

Hardware Group No. 09

For use on Door #(s):

C112C.1 C112F

Provide each SGL door(s) with the following:

| QTY |    | DESCRIPTION         | CATALOG NUMBER                                                    | FINISH | MFR |
|-----|----|---------------------|-------------------------------------------------------------------|--------|-----|
| 1   | EA | HINGE               | 5BB1 4.5 X 4.5 (NRP AS<br>REQUIRED)                               | 652    | IVE |
| 1   | EA | CLASSROOM DEAD LOCK | L463L (OWNER FURNISHED<br>CONTRACTOR INSTALLED)                   | 626    | SCH |
| 1   | EA | FSIC CORE           | CYLINDER AS REQUIRED<br>(OWNER FURNISHED<br>CONTRACTOR INSTALLED) | 626    | SCH |
| 1   | EA | PUSH PLATE          | 8200 4" X 16"                                                     | 630    | IVE |
| 1   | EA | PULL PLATE          | 8303 10" 4" X 16"                                                 | 630    | IVE |
| 1   | EA | SURFACE CLOSER      | 4040XP EDA (OWNER<br>FURNISHED CONTRACTOR<br>INSTALLED)           | 689    | LCN |
| 1   | EA | KICK PLATE          | 8400 10" X 2" LDW B-CS                                            | 630    | IVE |
| 1   | EA | MOP PLATE           | 8400 4" X 1" LDW B-CS                                             | 630    | IVE |
| 1   | EA | WALL STOP           | WS406/407CVX                                                      | 630    | IVE |
| 1   | EA | GASKETING           | 488FSBK PSA                                                       | BK     | ZER |

NOTE - field verify

GC & Hardware Provider to field  
verify all specified hardware is  
compatible with existing conditions



Hardware Group No. 10

For use on Door #(s):  
A100B

Provide each SGL door(s) with the following:

| QTY |    | DESCRIPTION         | CATALOG NUMBER                                                                                       | FINISH | MFR |
|-----|----|---------------------|------------------------------------------------------------------------------------------------------|--------|-----|
| 1   | EA | HINGE               | 5BB1 4.5 X 4.5 (NRP AS REQUIRED)                                                                     | 652    | IVE |
| 1   | EA | CLASSROOM DEAD LOCK | L463L (OWNER FURNISHED CONTRACTOR INSTALLED)                                                         | 626    | SCH |
| 1   | EA | FSIC CORE           | CYLINDER AS REQUIRED (OWNER FURNISHED CONTRACTOR INSTALLED)                                          | 626    | SCH |
| 1   | EA | PUSH PLATE          | 8200 4" X 16"                                                                                        | 630    | IVE |
| 1   | EA | PULL PLATE          | 8303 10" 4" X 16"                                                                                    | 630    | IVE |
| 1   | EA | SURF. AUTO OPERATOR | 4642 TBWMS 120 VAC                                                                                   | ⚡ 689  | LCN |
| 2   | EA | ACTUATOR PKG        | 8310-3857TW                                                                                          | ⚡      | LCN |
| 1   | EA | KICK PLATE          | 8400 10" X 2" LDW B-CS                                                                               | 630    | IVE |
| 1   | EA | MOP PLATE           | 8400 4" X 1" LDW B-CS                                                                                | 630    | IVE |
| 1   | EA | GASKETING           | 488FSBK PSA                                                                                          | BK     | ZER |
| 1   | EA | KEY SWITCH          | 653-04 L2 ATS CYL 12/24 VDC                                                                          | ⚡ 630  | SCE |
|     |    | NOTE - field verify | GC & Hardware Provider to field verify all specified hardware is compatible with existing conditions |        |     |

TO OPERATE AUTO OPERATOR FIRST UNLOCK DOOR AND THEN USE KEYSWITCH TO TURN ON OPERATOR.

Hardware Group No. 11 - Not Used

Hardware Group No. 12 - Not Used

Hardware Group No. 13

For use on Door #(s):

E200B                      E205B                      E206B

Provide each SGL door(s) with the following:

| QTY |    | DESCRIPTION         | CATALOG NUMBER                                                                                             | FINISH | MFR |
|-----|----|---------------------|------------------------------------------------------------------------------------------------------------|--------|-----|
| 3   | EA | HINGE               | 5BB1 4.5 X 4.5 (NRP AS<br>REQUIRED)                                                                        | 652    | IVE |
| 1   | EA | CLASSROOM SECURITY  | ND78CD SPA (OWNER<br>FURNISHED CONTRACTOR<br>INSTALLED)                                                    | 626    | SCH |
| 2   | EA | FSIC CORE           | CYLINDER AS REQUIRED<br>(OWNER FURNISHED<br>CONTRACTOR INSTALLED)                                          | 626    | SCH |
| 1   | EA | SURFACE CLOSER      | 4040XP EDA (OWNER<br>FURNISHED CONTRACTOR<br>INSTALLED)                                                    | 689    | LCN |
| 1   | EA | KICK PLATE          | 8400 10" X 2" LDW B-CS                                                                                     | 630    | IVE |
| 1   | EA | MOP PLATE           | 8400 4" X 1" LDW B-CS                                                                                      | 630    | IVE |
| 1   | EA | WALL STOP           | WS406/407CVX                                                                                               | 630    | IVE |
|     |    | NOTE - field verify | GC & Hardware Provider to field<br>verify all specified hardware is<br>compatible with existing conditions |        |     |

Hardware Group No. 14 - Not Used

Hardware Group No. 15

For use on Door #(s):  
A109C

Provide each SGL door(s) with the following:

| QTY |    | DESCRIPTION          | CATALOG NUMBER                                                                                       | FINISH | MFR |
|-----|----|----------------------|------------------------------------------------------------------------------------------------------|--------|-----|
| 1   | EA | CONT. HINGE          | 224XY                                                                                                | 628    | IVE |
| 1   | EA | ENTRANCE/OFFICE LOCK | ND53LD SPA (OWNER FURNISHED CONTRACTOR INSTALLED)                                                    | 626    | SCH |
| 1   | EA | FSIC CORE            | CYLINDER AS REQUIRED (OWNER FURNISHED CONTRACTOR INSTALLED)                                          | 626    | SCH |
| 1   | EA | ELECTRIC STRIKE      | 6211 FSE 12/16/24/28 VAC/VDC                                                                         | ✓ 630  | VON |
| 1   | EA | SURF. AUTO OPERATOR  | 4642 TBWMS 120 VAC                                                                                   | ✓ 689  | LCN |
| 2   | EA | ACTUATOR PKG         | 8310-3857TW                                                                                          | ✓      | LCN |
| 1   | EA | KICK PLATE           | 8400 10" X 2" LDW B-CS                                                                               | 630    | IVE |
| 1   | EA | MOP PLATE            | 8400 4" X 1" LDW B-CS                                                                                | 630    | IVE |
| 1   | EA | WALL STOP            | WS406/407CVX                                                                                         | 630    | IVE |
| 1   | EA | GASKETING            | 488FSBK PSA                                                                                          | BK     | ZER |
| 1   | EA | KEY SWITCH           | 653-04 L2 ATS CYL 12/24 VDC                                                                          | ✓ 630  | SCE |
|     |    | NOTE - field verify  | GC & Hardware Provider to field verify all specified hardware is compatible with existing conditions |        |     |

Hardware Group No. 16

For use on Door #(s):  
002

Provide each SGL door(s) with the following:

| QTY |    | DESCRIPTION         | CATALOG NUMBER                                                                                       | FINISH | MFR |
|-----|----|---------------------|------------------------------------------------------------------------------------------------------|--------|-----|
| 3   | EA | HINGE               | 5BB1 4.5 X 4.5 (NRP AS REQUIRED)                                                                     | 652    | IVE |
| 1   | EA | PANIC HARDWARE      | 98-L-NL-17 (OWNER FURNISHED CONTRACTOR INSTALLED)                                                    | 630    | VON |
| 1   | EA | FSIC CORE           | CYLINDER AS REQUIRED (OWNER FURNISHED CONTRACTOR INSTALLED)                                          | 626    | SCH |
| 1   | EA | SURFACE CLOSER      | 4040XP SCUSH (OWNER FURNISHED CONTRACTOR INSTALLED)                                                  | 689    | LCN |
| 1   | EA | KICK PLATE          | 8400 10" X 2" LDW B-CS                                                                               | 630    | IVE |
| 1   | EA | MOP PLATE           | 8400 4" X 1" LDW B-CS                                                                                | 630    | IVE |
| 3   | EA | SILENCER            | SR64/65 AS REQ'D                                                                                     | GRY    | IVE |
|     |    | NOTE - field verify | GC & Hardware Provider to field verify all specified hardware is compatible with existing conditions |        |     |

Hardware Group No. 17

For use on Door #(s):  
S3

Provide each SGL door(s) with the following:

| QTY |    | DESCRIPTION         | CATALOG NUMBER                                                                                             | FINISH | MFR |
|-----|----|---------------------|------------------------------------------------------------------------------------------------------------|--------|-----|
| 3   | EA | CONT. HINGE         | 157XY                                                                                                      | 628    | IVE |
| 1   | EA | PANIC HARDWARE      | 98-L-NL-17 (OWNER FURNISHED<br>CONTRACTOR INSTALLED)                                                       | 630    | VON |
| 1   | EA | FSIC CORE           | CYLINDER AS REQUIRED<br>(OWNER FURNISHED<br>CONTRACTOR INSTALLED)                                          | 626    | SCH |
| 1   | EA | SURFACE CLOSER      | 4040XP SCUSH (OWNER<br>FURNISHED CONTRACTOR<br>INSTALLED)                                                  | 689    | LCN |
| 1   | EA | KICK PLATE          | 8400 10" X 2" LDW B-CS                                                                                     | 630    | IVE |
| 1   | EA | MOP PLATE           | 8400 4" X 1" LDW B-CS                                                                                      | 630    | IVE |
| 3   | EA | GASKETING           | 488FSBK PSA                                                                                                | BK     | ZER |
|     |    | NOTE - field verify | GC & Hardware Provider to field<br>verify all specified hardware is<br>compatible with existing conditions |        |     |

Hardware Group No. 18

For use on Door #(s):  
A100A

Provide each SGL door(s) with the following:

| QTY |    | DESCRIPTION         | CATALOG NUMBER                                                                                             | FINISH | MFR |
|-----|----|---------------------|------------------------------------------------------------------------------------------------------------|--------|-----|
| 1   | EA | SURFACE CLOSER      | 4040XP SCUSH (OWNER<br>FURNISHED CONTRACTOR<br>INSTALLED)                                                  | 689    | LCN |
| 1   | EA | FLOOR STOP          | FS439                                                                                                      | 630    | IVE |
| 3   | EA | SILENCER            | SR64/65 AS REQ'D                                                                                           | GRY    | IVE |
|     |    | NOTE                | BALANCE OF HARDWARE<br>EXISTING TO REMAIN                                                                  |        |     |
|     |    | NOTE - field verify | GC & Hardware Provider to field<br>verify all specified hardware is<br>compatible with existing conditions |        |     |

Hardware Group No. 19

For use on Door #(s):

A109                      C101                      M203A

Provide each SGL door(s) with the following:

| QTY |    | DESCRIPTION         | CATALOG NUMBER                                                                                       | FINISH | MFR |
|-----|----|---------------------|------------------------------------------------------------------------------------------------------|--------|-----|
| 3   | EA | HINGE               | 5BB1 4.5 X 4.5 (NRP AS REQUIRED)                                                                     | 652    | IVE |
| 1   | EA | SURFACE CLOSER      | 4040XP SCUSH (OWNER FURNISHED CONTRACTOR INSTALLED)                                                  | 689    | LCN |
| 3   | EA | SILENCER<br>NOTE    | SR64/65 AS REQ'D<br>BALANCE OF HARDWARE<br>EXISTING TO REMAIN                                        | GRY    | IVE |
|     |    | NOTE - field verify | GC & Hardware Provider to field verify all specified hardware is compatible with existing conditions |        |     |

Hardware Group No. 20

For use on Door #(s):

M200A                      M223A

Provide each SGL door(s) with the following:

| QTY |    | DESCRIPTION         | CATALOG NUMBER                                                                                       | FINISH | MFR |
|-----|----|---------------------|------------------------------------------------------------------------------------------------------|--------|-----|
| 1   | EA | SURFACE CLOSER      | 4040XP SCUSH (OWNER FURNISHED CONTRACTOR INSTALLED)                                                  | 689    | LCN |
| 3   | EA | SILENCER<br>NOTE    | SR64/65 AS REQ'D<br>BALANCE OF HARDWARE<br>EXISTING TO REMAIN                                        | GRY    | IVE |
|     |    | NOTE - field verify | GC & Hardware Provider to field verify all specified hardware is compatible with existing conditions |        |     |

Hardware Group No. 21

For use on Door #(s):  
C105.2

Provide each SGL door(s) with the following:

| QTY |    | DESCRIPTION         | CATALOG NUMBER                                                                                                                                          | FINISH | MFR |
|-----|----|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|--------|-----|
| 3   | EA | HINGE               | 5BB1 4.5 X 4.5 (NRP AS<br>REQUIRED)                                                                                                                     | 652    | IVE |
| 1   | EA | SURFACE CLOSER      | 4040XP SCUSH (OWNER<br>FURNISHED CONTRACTOR<br>INSTALLED)                                                                                               | 689    | LCN |
| 3   | EA | GASKETING<br>NOTE   | 488FSBK PSA                                                                                                                                             | BK     | ZER |
|     |    | NOTE - field verify | BALANCE OF HARDWARE<br>EXISTING TO REMAIN<br>GC & Hardware Provider to field<br>verify all specified hardware is<br>compatible with existing conditions |        |     |

Hardware Group No. 22

For use on Door #(s):  
C107.2 M127

Provide each SGL door(s) with the following:

| QTY |    | DESCRIPTION         | CATALOG NUMBER                                                                                             | FINISH | MFR |
|-----|----|---------------------|------------------------------------------------------------------------------------------------------------|--------|-----|
| 1   | EA | SURFACE CLOSER      | 4040XP EDA (OWNER<br>FURNISHED CONTRACTOR<br>INSTALLED)                                                    | 689    | LCN |
|     |    | NOTE                | BALANCE OF HARDWARE<br>EXISTING TO REMAIN                                                                  |        |     |
|     |    | NOTE - field verify | GC & Hardware Provider to field<br>verify all specified hardware is<br>compatible with existing conditions |        |     |

Hardware Group No. 23 - Not Used

Hardware Group No. 24

For use on Door #(s):

A109J                      A117I

Provide each SGL door(s) with the following:

| QTY |    | DESCRIPTION         | CATALOG NUMBER                                                                                       | FINISH | MFR |
|-----|----|---------------------|------------------------------------------------------------------------------------------------------|--------|-----|
| 3   | EA | HINGE               | 5BB1 4.5 X 4.5 (NRP AS REQUIRED)                                                                     | 652    | IVE |
| 1   | EA | STOREROOM LOCK      | ND80LD SPA (OWNER FURNISHED CONTRACTOR INSTALLED)                                                    | 626    | SCH |
| 1   | EA | FSIC CORE           | CYLINDER AS REQUIRED (OWNER FURNISHED CONTRACTOR INSTALLED)                                          | 626    | SCH |
| 1   | EA | OH STOP             | 450S                                                                                                 | 630    | GLY |
| 1   | EA | SURFACE CLOSER      | 4040XP REG OR PA AS REQ (OWNER FURNISHED CONTRACTOR INSTALLED)                                       | 689    | LCN |
| 1   | EA | KICK PLATE          | 8400 10" X 2" LDW B-CS                                                                               | 630    | IVE |
| 1   | EA | MOP PLATE           | 8400 4" X 1" LDW B-CS                                                                                | 630    | IVE |
| 1   | EA | GASKETING           | 488FSBK PSA                                                                                          | BK     | ZER |
|     |    | NOTE - field verify | GC & Hardware Provider to field verify all specified hardware is compatible with existing conditions |        |     |

Hardware Group No. 25

For use on Door #(s):

C109                      F105J                      M112A                      M123

Provide each SGL door(s) with the following:

| QTY |    | DESCRIPTION         | CATALOG NUMBER                                                                                       | FINISH | MFR |
|-----|----|---------------------|------------------------------------------------------------------------------------------------------|--------|-----|
| 1   | EA | CONT. HINGE         | 224XY                                                                                                | 628    | IVE |
| 1   | EA | STOREROOM LOCK      | ND80LD SPA (OWNER FURNISHED CONTRACTOR INSTALLED)                                                    | 626    | SCH |
| 1   | EA | FSIC CORE           | CYLINDER AS REQUIRED (OWNER FURNISHED CONTRACTOR INSTALLED)                                          | 626    | SCH |
| 1   | EA | OH STOP             | 450S                                                                                                 | 630    | GLY |
| 1   | EA | SURFACE CLOSER      | 4040XP REG OR PA AS REQ (OWNER FURNISHED CONTRACTOR INSTALLED)                                       | 689    | LCN |
| 1   | EA | KICK PLATE          | 8400 10" X 2" LDW B-CS                                                                               | 630    | IVE |
| 1   | EA | MOP PLATE           | 8400 4" X 1" LDW B-CS                                                                                | 630    | IVE |
| 1   | EA | GASKETING           | 488FSBK PSA                                                                                          | BK     | ZER |
|     |    | NOTE - field verify | GC & Hardware Provider to field verify all specified hardware is compatible with existing conditions |        |     |

Hardware Group No. 26

For use on Door #(s):

A113E                      A113F

Provide each SGL door(s) with the following:

| QTY |    | DESCRIPTION         | CATALOG NUMBER                                                                                       | FINISH | MFR |
|-----|----|---------------------|------------------------------------------------------------------------------------------------------|--------|-----|
| 3   | EA | HINGE               | 5BB1 4.5 X 4.5 (NRP AS REQUIRED)                                                                     | 652    | IVE |
| 1   | EA | STOREROOM LOCK      | ND80LD SPA (OWNER FURNISHED CONTRACTOR INSTALLED)                                                    | 626    | SCH |
| 1   | EA | FSIC CORE           | CYLINDER AS REQUIRED (OWNER FURNISHED CONTRACTOR INSTALLED)                                          | 626    | SCH |
| 1   | EA | SURFACE CLOSER      | 4040XP EDA (OWNER FURNISHED CONTRACTOR INSTALLED)                                                    | 689    | LCN |
| 1   | EA | KICK PLATE          | 8400 10" X 2" LDW B-CS                                                                               | 630    | IVE |
| 1   | EA | MOP PLATE           | 8400 4" X 1" LDW B-CS                                                                                | 630    | IVE |
| 1   | EA | WALL STOP           | WS406/407CVX                                                                                         | 630    | IVE |
| 1   | EA | GASKETING           | 488FSBK PSA                                                                                          | BK     | ZER |
|     |    | NOTE - field verify | GC & Hardware Provider to field verify all specified hardware is compatible with existing conditions |        |     |

Hardware Group No. 27

For use on Door #(s):

M114A

Provide each SGL door(s) with the following:

| QTY |    | DESCRIPTION         | CATALOG NUMBER                                                                                       | FINISH | MFR |
|-----|----|---------------------|------------------------------------------------------------------------------------------------------|--------|-----|
| 1   | EA | STOREROOM LOCK      | ND80LD SPA (OWNER FURNISHED CONTRACTOR INSTALLED)                                                    | 626    | SCH |
| 1   | EA | FSIC CORE           | CYLINDER AS REQUIRED (OWNER FURNISHED CONTRACTOR INSTALLED)                                          | 626    | SCH |
| 1   | EA | GASKETING           | 488FSBK PSA                                                                                          | BK     | ZER |
|     |    | NOTE - field verify | GC & Hardware Provider to field verify all specified hardware is compatible with existing conditions |        |     |



Hardware Group No. 28

For use on Door #(s):  
M126A

Provide each SGL door(s) with the following:

| QTY |    | DESCRIPTION         | CATALOG NUMBER                                                                                       | FINISH | MFR |
|-----|----|---------------------|------------------------------------------------------------------------------------------------------|--------|-----|
| 1   | EA | STOREROOM LOCK      | ND80LD SPA (OWNER FURNISHED CONTRACTOR INSTALLED)                                                    | 626    | SCH |
| 1   | EA | FSIC CORE           | CYLINDER AS REQUIRED (OWNER FURNISHED CONTRACTOR INSTALLED)                                          | 626    | SCH |
| 1   | EA | FLOOR STOP          | FS439                                                                                                | 630    | IVE |
| 1   | EA | GASKETING           | 488FSBK PSA                                                                                          | BK     | ZER |
|     |    | NOTE                | BALANCE OF HARDWARE EXISTING TO REMAIN                                                               |        |     |
|     |    | NOTE - field verify | GC & Hardware Provider to field verify all specified hardware is compatible with existing conditions |        |     |

Hardware Group No. 29

For use on Door #(s):  
A121 C111B C111E

Provide each SGL door(s) with the following:

| QTY |    | DESCRIPTION         | CATALOG NUMBER                                                                                       | FINISH | MFR |
|-----|----|---------------------|------------------------------------------------------------------------------------------------------|--------|-----|
| 1   | EA | CONT. HINGE         | 157XY                                                                                                | 628    | IVE |
| 1   | EA | STOREROOM LOCK      | ND80LD SPA (OWNER FURNISHED CONTRACTOR INSTALLED)                                                    | 626    | SCH |
| 1   | EA | FSIC CORE           | CYLINDER AS REQUIRED (OWNER FURNISHED CONTRACTOR INSTALLED)                                          | 626    | SCH |
| 1   | EA | OH STOP             | 450S                                                                                                 | 630    | GLY |
| 1   | EA | SURFACE CLOSER      | 4040XP REG OR PA AS REQ (OWNER FURNISHED CONTRACTOR INSTALLED)                                       | 689    | LCN |
| 1   | EA | Wrap Around         | 14-2-CW                                                                                              | 630    | DON |
| 1   | EA | KICK PLATE          | 8400 10" X 2" LDW B-CS                                                                               | 630    | IVE |
| 1   | EA | MOP PLATE           | 8400 4" X 1" LDW B-CS                                                                                | 630    | IVE |
| 1   | EA | GASKETING           | 488FSBK PSA                                                                                          | BK     | ZER |
|     |    | NOTE - field verify | GC & Hardware Provider to field verify all specified hardware is compatible with existing conditions |        |     |

Hardware Group No. 30

For use on Door #(s):

C100 M106 M116C

Provide each SGL door(s) with the following:

| QTY | EA | DESCRIPTION | CATALOG NUMBER                            | FINISH | MFR |
|-----|----|-------------|-------------------------------------------|--------|-----|
| 1   | EA | GASKETING   | 488FSBK PSA                               | BK     | ZER |
|     |    | NOTE        | BALANCE OF HARDWARE<br>EXISTING TO REMAIN |        |     |

Hardware Group No. 31 - Not Used

Hardware Group No. 32

For use on Door #(s):

B101 C100A F102 F104A M205A M228

Provide each SGL door(s) with the following:

| QTY | EA | DESCRIPTION         | CATALOG NUMBER                                                                                             | FINISH | MFR |
|-----|----|---------------------|------------------------------------------------------------------------------------------------------------|--------|-----|
| 3   | EA | HINGE               | 5BB1 4.5 X 4.5 (NRP AS<br>REQUIRED)                                                                        | 652    | IVE |
| 3   | EA | SILENCER            | SR64/65 AS REQ'D                                                                                           | GRY    | IVE |
|     |    | NOTE                | BALANCE OF HARDWARE<br>EXISTING TO REMAIN                                                                  |        |     |
|     |    | NOTE - field verify | GC & Hardware Provider to field<br>verify all specified hardware is<br>compatible with existing conditions |        |     |

Hardware Group No. 33

For use on Door #(s):

C105.1

Provide each SGL door(s) with the following:

| QTY | EA | DESCRIPTION         | CATALOG NUMBER                                                                                             | FINISH | MFR |
|-----|----|---------------------|------------------------------------------------------------------------------------------------------------|--------|-----|
| 3   | EA | HINGE               | 5BB1 4.5 X 4.5 (NRP AS<br>REQUIRED)                                                                        | 652    | IVE |
| 1   | EA | PUSH PLATE          | 8200 4" X 16"                                                                                              | 630    | IVE |
| 1   | EA | PULL PLATE          | 8303 10" 4" X 16"                                                                                          | 630    | IVE |
| 1   | EA | SURF. AUTO OPERATOR | 4642 TBWMS 120 VAC                                                                                         | ✓ 689  | LCN |
| 2   | EA | ACTUATOR PKG        | 8310-3857TW                                                                                                | ✓      | LCN |
| 1   | EA | FILLER PLATE        | EF-161                                                                                                     |        | DON |
| 1   | EA | KEY SWITCH          | 653-04 L2 ATS CYL 12/24 VDC                                                                                | ✓ 630  | SCE |
|     |    | NOTE                | BALANCE OF HARDWARE<br>EXISTING TO REMAIN                                                                  |        |     |
|     |    | NOTE - field verify | GC & Hardware Provider to field<br>verify all specified hardware is<br>compatible with existing conditions |        |     |

REPLACE EXISTING LOCK/LATCH WITH PUSH/PULLS BEFORE ADDING AUTO OPERATOR

Hardware Group No. 34

For use on Door #(s):  
C107.1

Provide each SGL door(s) with the following:

| QTY |    | DESCRIPTION         | CATALOG NUMBER                                                                                             | FINISH | MFR |
|-----|----|---------------------|------------------------------------------------------------------------------------------------------------|--------|-----|
| 1   | EA | PUSH PLATE          | 8200 4" X 16"                                                                                              | 630    | IVE |
| 1   | EA | PULL PLATE          | 8303 10" 4" X 16"                                                                                          | 630    | IVE |
| 1   | EA | GASKETING           | 488FSBK PSA                                                                                                | BK     | ZER |
|     |    | NOTE                | BALANCE OF HARDWARE<br>EXISTING TO REMAIN                                                                  |        |     |
|     |    | NOTE - field verify | GC & Hardware Provider to field<br>verify all specified hardware is<br>compatible with existing conditions |        |     |

Hardware Group No. 35

For use on Door #(s):  
A106.1

Provide each PR door(s) with the following:

| QTY |    | DESCRIPTION         | CATALOG NUMBER                                                                                             | FINISH | MFR |
|-----|----|---------------------|------------------------------------------------------------------------------------------------------------|--------|-----|
| 2   | EA | SURFACE CLOSER      | 4040XP SHCUSH (OWNER<br>FURNISHED CONTRACTOR<br>INSTALLED)                                                 | 689    | LCN |
| 1   | EA | GASKETING           | 488FSBK PSA                                                                                                | BK     | ZER |
|     |    | NOTE                | BALANCE OF HARDWARE<br>EXISTING TO REMAIN                                                                  |        |     |
|     |    | NOTE - field verify | GC & Hardware Provider to field<br>verify all specified hardware is<br>compatible with existing conditions |        |     |

Hardware Group No. 36

For use on Door #(s):  
A106.2

Provide each PR door(s) with the following:

| QTY |    | DESCRIPTION         | CATALOG NUMBER                                                                                             | FINISH | MFR |
|-----|----|---------------------|------------------------------------------------------------------------------------------------------------|--------|-----|
| 2   | EA | PULL PLATE          | 8303 10" 4" X 16"                                                                                          | 630    | IVE |
| 1   | EA | GASKETING           | 488FSBK PSA                                                                                                | BK     | ZER |
|     |    | NOTE                | BALANCE OF HARDWARE<br>EXISTING TO REMAIN                                                                  |        |     |
|     |    | NOTE - field verify | GC & Hardware Provider to field<br>verify all specified hardware is<br>compatible with existing conditions |        |     |

Hardware Group No. 37

For use on Door #(s):  
A106.3

Provide each PR door(s) with the following:

| QTY |    | DESCRIPTION         | CATALOG NUMBER                                                                                                                                          | FINISH | MFR |
|-----|----|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|--------|-----|
| 2   | EA | CONT. HINGE         | 224XY                                                                                                                                                   | 628    | IVE |
| 2   | EA | SURFACE CLOSER      | 4040XP SHCUSH (OWNER<br>FURNISHED CONTRACTOR<br>INSTALLED)                                                                                              | 689    | LCN |
| 1   | EA | GASKETING<br>NOTE   | 488FSBK PSA                                                                                                                                             | BK     | ZER |
|     |    | NOTE - field verify | BALANCE OF HARDWARE<br>EXISTING TO REMAIN<br>GC & Hardware Provider to field<br>verify all specified hardware is<br>compatible with existing conditions |        |     |

Hardware Group No. 38

For use on Door #(s):  
C112.1 F100

Provide each PR door(s) with the following:

| QTY |    | DESCRIPTION         | CATALOG NUMBER                                                                                                                                          | FINISH | MFR |
|-----|----|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|--------|-----|
| 2   | EA | MANUAL FLUSH BOLT   | FB458 12"                                                                                                                                               | 626    | IVE |
| 1   | EA | DUST PROOF STRIKE   | DP2                                                                                                                                                     | 626    | IVE |
| 2   | EA | SURFACE CLOSER      | 4040XP SCUSH (OWNER<br>FURNISHED CONTRACTOR<br>INSTALLED)                                                                                               | 689    | LCN |
| 1   | EA | GASKETING<br>NOTE   | 488FSBK PSA                                                                                                                                             | BK     | ZER |
|     |    | NOTE - field verify | BALANCE OF HARDWARE<br>EXISTING TO REMAIN<br>GC & Hardware Provider to field<br>verify all specified hardware is<br>compatible with existing conditions |        |     |

Hardware Group No. 39

For use on Door #(s):  
C112.1 C112.2

Provide each PR door(s) with the following:

| QTY |    | DESCRIPTION       | CATALOG NUMBER                            | FINISH | MFR |
|-----|----|-------------------|-------------------------------------------|--------|-----|
| 1   | EA | THRESHOLD<br>NOTE | 102A-223                                  | A      | ZER |
|     |    |                   | BALANCE OF HARDWARE<br>EXISTING TO REMAIN |        |     |

Hardware Group No. 40

For use on Door #(s):

A115A                      A115B                      A115E

Provide each PR door(s) with the following:

| QTY |    | DESCRIPTION         | CATALOG NUMBER                                                                                             | FINISH | MFR |
|-----|----|---------------------|------------------------------------------------------------------------------------------------------------|--------|-----|
| 2   | EA | CONT. HINGE         | 224XY                                                                                                      | 628    | IVE |
| 1   | EA | AUTO FLUSH BOLT     | FB32                                                                                                       | 630    | IVE |
| 1   | EA | DBL CYL DEAD LOCK   | L462L (OWNER FURNISHED<br>CONTRACTOR INSTALLED)                                                            | 626    | SCH |
| 2   | EA | PUSH PLATE          | 8200 4" X 16"                                                                                              | 630    | IVE |
| 2   | EA | PULL PLATE          | 8303 10" 4" X 16"                                                                                          | 630    | IVE |
| 1   | EA | COORDINATOR         | COR X FL (MB AS REQ'D)                                                                                     | 628    | IVE |
| 2   | EA | SURFACE CLOSER      | 4040XP SHCUSH (OWNER<br>FURNISH CONTRACTOR<br>INSTALLED)                                                   | 689    | LCN |
| 2   | EA | KICK PLATE          | 8400 10" X 1" LDW B-CS                                                                                     | 630    | IVE |
| 2   | EA | MOP PLATE           | 8400 4" X 1" LDW B-CS                                                                                      | 630    | IVE |
| 1   | EA | SILENCER            | SR64/65 AS REQ'D                                                                                           | GRY    | IVE |
|     |    | NOTE - field verify | GC & Hardware Provider to field<br>verify all specified hardware is<br>compatible with existing conditions |        |     |

Hardware Group No. 41

For use on Door #(s):

A115F

Provide each PR door(s) with the following:

| QTY |    | DESCRIPTION         | CATALOG NUMBER                                                                                             | FINISH | MFR |
|-----|----|---------------------|------------------------------------------------------------------------------------------------------------|--------|-----|
| 2   | EA | CONT. HINGE         | 224XY                                                                                                      | 628    | IVE |
| 1   | EA | AUTO FLUSH BOLT     | FB32                                                                                                       | 630    | IVE |
| 1   | EA | STOREROOM LOCK      | ND80LD SPA (OWNER<br>FURNISHED CONTRACTOR<br>INSTALLED)                                                    | 626    | SCH |
| 1   | EA | COORDINATOR         | COR X FL (MB AS REQ'D)                                                                                     | 628    | IVE |
| 2   | EA | SURFACE CLOSER      | 4040XP SHCUSH (OWNER<br>FURNISH CONTRACTOR<br>INSTALLED)                                                   | 689    | LCN |
| 2   | EA | KICK PLATE          | 8400 10" X 1" LDW B-CS                                                                                     | 630    | IVE |
| 2   | EA | MOP PLATE           | 8400 4" X 1" LDW B-CS                                                                                      | 630    | IVE |
| 1   | EA | ASTRAGAL            | OVERLAPPING "Z" ASTRAGAL BY<br>DOOR MANUFACTURE                                                            |        |     |
| 1   | EA | SILENCER            | SR64/65 AS REQ'D                                                                                           | GRY    | IVE |
|     |    | NOTE - field verify | GC & Hardware Provider to field<br>verify all specified hardware is<br>compatible with existing conditions |        |     |

Hardware Group No. 42

For use on Door #(s):

A115C                      A115D

Provide each SGL door(s) with the following:

| QTY |    | DESCRIPTION         | CATALOG NUMBER                                                                                             | FINISH | MFR |
|-----|----|---------------------|------------------------------------------------------------------------------------------------------------|--------|-----|
| 1   | EA | CONT. HINGE         | 224XY                                                                                                      | 628    | IVE |
| 1   | EA | FIRE EXIT HARDWARE  | 98-L-F-2SI-17 (OWNER<br>FURNISHED CONTRACTOR<br>INSTALLED)                                                 | 630    | VON |
| 2   | EA | FSIC CORE           | CYLINDER AS REQUIRED<br>(OWNER FURNISHED<br>CONTRACTOR INSTALLED)                                          | 626    | SCH |
| 1   | EA | SURFACE CLOSER      | 4040XP SCUSH (OWNER<br>FURNISHED CONTRACTOR<br>INSTALLED)                                                  | 689    | LCN |
| 1   | EA | KICK PLATE          | 8400 10" X 2" LDW B-CS                                                                                     | 630    | IVE |
| 1   | EA | MOP PLATE           | 8400 4" X 1" LDW B-CS                                                                                      | 630    | IVE |
| 3   | EA | GASKETING           | 488FSBK PSA                                                                                                | BK     | ZER |
|     |    | NOTE - field verify | GC & Hardware Provider to field<br>verify all specified hardware is<br>compatible with existing conditions |        |     |

**END OF SECTION**

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## **SECTION 08 8000 GLAZING**

### **PART 1 GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Glazing units for interior hollow metal door vision panels.

#### **1.02 RELATED REQUIREMENTS**

- A. Section 08 1113 - Hollow Metal Doors and Frames: Glazed lites in doors.

#### **1.03 REFERENCE STANDARDS**

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.
- B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015 (Reaffirmed 2020).
- C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018 (Reapproved 2024).
- D. ASTM C1036 - Standard Specification for Flat Glass; 2025.
- E. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2024.
- F. GANA (GM) - GANA Glazing Manual; 2022.
- G. GANA (SM) - GANA Sealant Manual; 2008.
- H. GANA (LGRM) - Laminated Glazing Reference Manual; 2019.
- I. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

#### **1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data on Glazing Unit Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.
- C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.
- D. Samples: Submit two samples 12 by 12 inch in size of glass units.
- E. Certificate: Certify that products of this section meet or exceed specified requirements.
- F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

#### **1.05 QUALITY ASSURANCE**

- A. Perform Work in accordance with GANA (GM), GANA (SM), GANA (LGRM), and IGMA TM-3000 for glazing installation methods.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years of documented experience.
- C. Installer Qualifications: Company specializing in performing work of the type specified and with at least five years documented experience.

#### **1.06 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Laminated Glass: Provide a five (5) year manufacturer warranty to include coverage for delamination, including providing products to replace failed units.

### **PART 2 PRODUCTS**



## **2.01 MANUFACTURERS**

- A. Laminated Glass Manufacturers:
  - 1. Cardinal Glass Industries; \_\_\_\_\_: [www.cardinalcorp.com/#sle](http://www.cardinalcorp.com/#sle).
  - 2. Trulite Glass & Aluminum Solutions
  - 3. Oldcastle Building Envelope
  - 4. Vitro Architectural Glass
  - 5. Substitutions: See Section 01 6000 - Product Requirements.

## **2.02 GLASS MATERIALS**

- A. Laminated Glass: Float glass laminated in accordance with ASTM C1172.
  - 1. Laminated Safety Glass: Complies with ANSI Z97.1 - Class B or 16 CFR 1201 - Category II impact test requirements.
  - 2. Construction:
    - a. Two plies of clear float glass laminated with one of the following interlayers:
      - 1) Polyvinyl Butyral (PVB) Interlayer: 0.030 inch thick, minimum.
      - 2) Ionoplast Interlayer: 0.035 inch thick, minimum.
  - 3. Total nominal thickness: 1/4 inch, unless otherwise indicated.
  - 4. Color: Clear
  - 5. Edge Quality: Factory-sealed edges; polished where exposed.

## **2.03 GLAZING COMPOUNDS**

- A. Type GC-5 - Silicone Sealant: Single component; neutral curing; capable of water immersion without loss of properties; nonbleeding, nonstaining; ASTM C920 Type S, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; color as selected from manufacturers standard colors.

## **2.04 ACCESSORIES**

- A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch by width of glazing rabbet space minus 1/16 inch by height to suit glazing method and pane weight and area.
- B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Minimum 3 inch long by one half the height of the glazing stop by thickness to suit application, self adhesive on one face.
- C. Glazing Tape, Back Bedding Mastic Type: Preformed, butyl-based, 100 percent solids compound with integral resilient spacer rod applicable to application indicated; 5 to 30 cured Shore A durometer hardness; coiled on release paper; black color.
- D. Glazing Splines: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.

## **PART 3 EXECUTION**

### **3.01 VERIFICATION OF CONDITIONS**

- A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.
- B. Verify that the minimum required face and edge clearances are being provided.
- C. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.
- D. Verify that sealing between joints of glass framing members has been completed effectively.
- E. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

### **3.02 PREPARATION**

- A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.

### **3.03 INSTALLATION, GENERAL**

- A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.
- B. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.

### **3.04 CLEANING**

- A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.
- B. Remove nonpermanent labels immediately after glazing installation is complete.
- C. Clean glass and adjacent surfaces in accordance with manufacturer's written recommendations and the GANA Glazing Manual.

### **3.05 PROTECTION**

- A. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

**END OF SECTION**

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**SECTION 09 0130.91  
TILE RESTORATION**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Restorative bonding of porcelain tile floors.
- B. Restorative bonding of ceramic wall tile and cove base tile.

**1.02 RELATED REQUIREMENTS**

- A. Section 03 0100 - Maintenance of Concrete.
- B. Section 03 3000 - Cast-in-Place Concrete.
- C. Section 09 3000 - Tiling.

**1.03 REFERENCE STANDARDS**

- A. ASTM F2508 - Standard Practice for Validation, Calibration, and Certification of Walkway Tribometers Using Reference Surfaces; 16e1.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by affected installers.

**1.05 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide manufacturer's complete and current product information and technical information.
- C. Shop Drawings: Indicate restorative bonding locations, types, and details.
- D. Samples: Two samples on tile of each type, 12 by 12 inches in size, indicating color and finish.
- E. Certificate: Certify products of this section meet or exceed specified requirements.
- F. Manufacturer's qualification statement.
- G. Installer's qualification statement.
- H. Operation and Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning..
- I. Executed warranty.

**1.06 QUALITY ASSURANCE**

- A. Restoration of existing, interior tiled floors and walls, areas to a "like new" appearance and integrity.
- B. Installation shall result in a floor, wall, and ceiling treatment that will produce a moisture barrier and condition so that the appearance can be maintained using conventional cleaning processes.
- C. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with minimum 5 years of documented experience.
- D. Installer Qualifications: Company specializing in performing work of type specified, with minimum 5 years of documented experience.

**1.07 MOCK-UPS**

- A. See Section 01 4000 - Quality Requirements for additional requirements.
- B. Construct floor, base, and wall mock-ups, incorporating all components specified for the location, for each type of restorative bonding specified.

- C. Minimum size of five feetlong by five feetwide.
- D. Locate where directed by Architect.
- E. Approved mock-up may remain as part of work.

#### **1.08 DELIVERY, STORAGE, AND HANDLING**

- A. See Section 01 7419 - Construction Waste Management and Disposal for packaging waste requirements.
- B. Deliver and store packaged materials in accordance with manufacturer's written instructions and recommendations, in original containers with seals unbroken and labels intact until time of use. Prevent damage or contamination to materials by water, freezing, foreign matter or other causes.
- C. Store items in a stable and secure manner, off of floor, within an area which has ambient temperature controlled within acceptable range required for each product

#### **1.09 FIELD CONDITIONS**

- A. Maintain environmental conditions and protect work during and after installation to comply with manufacturer's current printed instructions and recommendations
- B. Vent any temporary heaters to the exterior to prevent damage to restorative bonding work from carbon dioxide buildup.
- C. Maintain temperatures at not less than 50 degrees F (10 degrees C) in work areas during installation and for 7-days after completion unless higher temperatures are required by manufacturers' current printed instructions and recommendations.

#### **1.10 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide 2-year manufacturer warranty for labor and materials, that the restorative bonding system shall remain adhered, intact (without perceptible deformation) and completely leak free commencing on Date of Substantial Completion. Complete forms in Owner's name and register with manufacturer.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. SaniGLAZE International, LLC: [www.saniglaze.com/#sle](http://www.saniglaze.com/#sle).
- B. Sherwin-Williams High-Performance Flooring: <https://industrial.sherwin-williams.com/na/us/en/resin-flooring.html/#sle>.
- C. Substitutions: Not permitted.

#### **2.02 RESTORATIVE BONDING PROCESS FOR WALLS**

- A. Products, General:
  - 1. Restorative bonding system specified is proprietary in nature, and all materials utilized in completion of the work shall be either manufactured or approved in writing for use by the system manufacturer.
  - 2. All products and installation shall comply with restorative bonding system manufacturer's current written instructions, recommendations, and restrictions.
- B. Materials:
  - 1. Strippers: If Sealer Exists: SaniGLAZE Eradicate, StripTASTIC stripper, Seal Remover, or system manufacturer approved equivalent.
  - 2. Tile Cleaning Compound: SaniGLAZE Extra Strength Contaminant Remover.
  - 3. Grout Etching and Cleaning Compound: SaniGLAZE Tile & Grout Prep compound that is specifically formulated to leave a grout surface conducive to micro anchor bonding, or system manufacturer approved equivalents.

- a. The grout preparation gel shall be a maximum strength, non-fuming product comprised of organic and inorganic chelating, scale removing compounds, suspending agents, penetrating detergents, water soluble solvent compounds, viscosity control agents, and odor suppressants.
  - b. It shall remove embedded soils, dissolve micro-scale and mineral deposits, neutralize iron, rust, and mineral and urine stains without attacking the substrate or excessively dissolving cementitious grout or mortar joints, or having a deleterious effect on metal, fiberglass, porcelain or ceramic fixtures.
  - c. The grout preparation gel shall promote maximum contacting time and applicator control of the process and reduce contact hazards to a minimum.
  - d. The grout preparation gel shall leave no residue, chalk, or grit when properly rinsed.
  - e. The grout preparation gel shall possess a minimum shelf life of one year and its age shall be within that time limitation period at the time of application.
4. Shielding Sealer:
- a. Porous and Nonporous Tile: SaniMAX-C (a solvent borne) tile surface moisture, grease, oil and chemical barrier, providing an impermeable moisture seal over the entire treated area, with a semi-gloss finish, as selected. This sealer shall be resistant to urine, disinfectants, bleach, acid bowl cleaner, high pH cleaners, and other chemicals typically used in cleaning rest rooms and other tile and grout areas.
  - b. Finished Appearance: Clear, transparent and invisible when it has dried and cured, with sufficient particle size of the emulsion and surfactant package to allow deep penetration of porous tile substrates, and a chemical adhesion component. Gloss level as selected.
  - c. Maintenance: This compound must be able to recoat itself when maintenance needs arise.
- C. Color: As indicated on the drawings.
- D. Products:
1. SaniGLAZE International, LLC; SaniMAX-C: [www.saniglaze.com/#sle](http://www.saniglaze.com/#sle).
  2. Substitutions: Not permitted.

### **2.03 RESTORATIVE BONDING PROCESS FOR FLOORS AND BASE**

- A. Products, General:
1. All products and installation shall comply with restorative bonding system manufacturer's current written instructions, recommendations, and restrictions.
- B. Materials:
1. Strippers: If Sealer or Floor Finish Exists: SaniGLAZE Polymer Remover, Eradicate, StripTASTIC stripper, Seal Remover, or system manufacturer approved equivalent.
  2. Tile Cleaning Compound: SaniGLAZE Extra Strength Contaminant Remover.
  3. Grout Etching and Cleaning Compound: SaniGLAZE Tile & Grout Prep compound that is specifically formulated to leave a grout surface conducive to micro anchor bonding with SaniGLAZE SaniMAX-C, or system manufacturer approved equivalents.
    - a. The grout preparation gel shall be a maximum strength, non-fuming product comprised of organic and inorganic chelating, scale removing compounds, suspending agents, penetrating detergents, water soluble solvent compounds, viscosity control agents, and odor suppressants.
    - b. It shall remove embedded soils, dissolve micro-scale and mineral deposits, neutralize iron, rust, and mineral and urine stains without attacking the substrate or excessively dissolving cementitious grout or mortar joints, or having a deleterious effect on metal, fiberglass, porcelain or ceramic fixtures
    - c. The grout preparation gel shall promote maximum contacting time and applicator control of the process, and reduce contact hazards to a minimum.
    - d. The grout preparation gel shall leave no residue, chalk, or grit.

- e. The grout preparation gel shall possess a minimum shelf life of one year and its age shall be within that time limitation period at the time of application.
- 4. Eliminate grout line appearance on all floors and base. Entire surface must be coated with a flooring leveling system:
  - a. System compatible with SaniGLAZE International, LLC; VariGLAZE MAX:
    - 1) Primer Coat: Fast-drying, ultra-low VOC, water based, film-forming primer applied to non-absorbent surfaces in preparation for skim coat.
      - (a) Product: UZIN PE 280 Premium Plus - Super-Fast Primer.
    - 2) Skim Coat: Polymer-modified compound of portland and select hydraulic cement, mix according to manufacturers instructions.
      - (a) Product: UZIN NC 888 Premium Plus - Turbo Patching Compound.
    - 3) Infill for Areas up to 1 inch Thick: Portland-based self-leveling compound for use up to 1 inch depth application.
      - (a) Product: UZIN NC 150 Premium - Self-Leveling Compound.
    - 4) Infill for Areas Greater than 1 inch Thick: Portland-based self-leveling compound for use without depth limitation.
      - (a) Product UZIN NC 170 - Premium Plus - Floor Leveling Compound.
  - b. System compatible with Sherwin-Williams High-Performance Flooring; Resufloor DecoFlake II:
    - 1) Skim Coat: Epoxy mixture of resin, hardner, and f-60 sand as recommended by the manufacturer.
- 5. Base Coat Sealer:
  - a. Tile, Concrete, and Hard Flooring Surfaces: SaniPOXY or equivalent. A two-component, 100% non-volatile, odor free, high gloss solvent-free colored epoxy system with maximum durability and chemical resistance.
  - b. Base Coat Sealer shall be resistant to urine, disinfectants, bleach, acid bowl cleaner, high pH cleaners, and other chemicals typically used in cleaning rest rooms and other tile and grout areas.
- 6. Encapsulate: SaniPOXY or equivalent. A two-component, 100% non-volatile, odor free, high gloss solvent-free epoxy system with maximum durability and chemical resistance.
- 7. Decorative Color Flakes: SaniCHIPS or equivalent, vinyl color flakes with dry film thickness of 4-5 mils, size 1/8-inch, random shape, smooth surface texture, with visual opacity hiding power of at least 98%.
- 8. Top Coat: Polyaspartic HS or equivalent. High solids fast-curing aliphatic polyaspartic polyurea, non-yellowing.
  - a. Two coats.
  - b. Top Coat Slip Resistance: Static Coefficient of Friction or at least 0.70 dry and 0.50 wet when tested with the test method. ASTM F2508.
- C. Colors: As indicated on the drawings; custom flake combination as required.
- D. Finish: As approved in the mock-up by the Architect and the Owner.
- E. Products:
  - 1. SaniGLAZE International, LLC; VariGLAZE MAX: [www.saniglaze.com/#sle](http://www.saniglaze.com/#sle).
  - 2. Sherwin-Williams High-Performance Flooring; Resufloor DecoFlake II (formerly Dur-A-Chip by Dur-A-Flex): <https://industrial.sherwin-williams.com/na/us/en/resin-flooring.html/#sle>.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Examine surfaces to receive restorative bonding work and conditions under which the system will be installed.
- B. Do not proceed with restorative bonding work until surfaces and conditions comply with requirements indicated in manufacturer's current written instructions and recommendations.

### 3.02 PREPARATION

- A. Remove all existing surface-applied polymer based coatings and/or sealers with either SaniGLAZE Polymer Remover, Eradicate stripper, StripTASTIC, Seal Remover, or preapproved equivalent.
- B. Agitate the floor, wall and ceiling surfaces to be restored to ensure loosening and emulsification of such matter. Remove all emulsified and deleterious matter by suction.
- C. Floor, and any vertical surfaces to be restored shall be mechanically scrubbed utilizing SaniGLAZE Extra Strength Contaminant Remover or preapproved equivalent to remove any remaining embedded contaminants from tile and grout surfaces. Remove scrubbing residue by suction and rinse with clean water flood rinse. Remove rinse solution by suction. Test floor, wall and ceiling surfaces to be restored using hydrion method, and verify that existing pH level will not neutralize chemicals used in the preparation, sealing and finishing processes.
  - 1. Test floor, wall and ceiling surfaces to be restored using hydrion method, at least one test per 100 square feet of tile surface, and verify that existing pH level will not neutralize chemicals used in the preparation, sealing and finishing processes. Correct any deficiencies prior to continuing with joint treatment applications.
- D. Grout Preparation Procedures: Grout preparation gel shall be applied to the entire surface of the floor, wall and ceiling surfaces to be restored.
  - 1. Grout lines shall be chemically etched and cleaned using SaniGLAZE Tile & Grout Preparation compound or preapproved equivalent that is specifically formulated to leave a grout surface conducive to micro anchor bonding with SaniGLAZE High Build Glazing Compound or preapproved equivalent.
  - 2. A clear water flood rinse shall be applied to the floor and the residue removed by suction. The grout preparation gel shall leave no residue, chalk, or grit after having been properly rinsed
  - 3. Test floor, wall and ceiling surfaces to be restored using hydrion method, at least one test per 100 square feet of tile surface, and verify that existing pH level will not neutralize chemicals used in the preparation, sealing and finishing processes. Correct any deficiencies prior to continuing with joint treatment applications.
  - 4. Grout Line Elimination: Eliminate grout line appearance on all floors and base. Entire surface must be coated with a floor leveling compound such as Schonox US or equivalent.

### 3.03 INSTALLATION

- A. Install in accordance with manufacturer's written instructions.
- B. Initial Sealing: Apply SaniMAX-C or SaniPOXY, as indicated, to the entire tile surface to provide an impermeable moisture seal over the entire treated area(s).
- C. Decorating: Apply SaniCHIPS decorative flakes, or preapproved equivalent system, to the entire tile surface while the initial sealer is still wet. Use manual or mechanical application method to achieve a consistent and uniform coverage pattern.
- D. Encapsulating: Apply SaniPOXY or equivalent using the trowel down method to encapsulate the flake decorative materials.
- E. Final Sealing: Apply SaniTECH II with textile anti-slip additive, or pre-approved equivalent, to the entire tile surface to provide an impermeable moisture seal over the entire treated area(s). Minimum COF (coefficient of friction) of finished product to be at least .7 dry and .5 wet as tested with ASTM Test Method F-2508.
- F. Drying and Curing: Provide drying and curing procedures in accordance with manufacturer's current written instructions and recommendations, or if not indicated, by means of a mechanically generated air flow.

### 3.04 CLEANING

- A. See Section 01 7000 - Execution and Closeout Requirements for additional requirements.



- B. Upon completion of restorative bonding applications, clean all new and adjacent existing tile surfaces so they are free of foreign matter. Remove any residue, splatter and similar materials from adjacent and other surfaces, wherever occurs.
- C. Remove all trash, containers, cartons, debris, excess materials, etc., which results from work under this Section.

### **3.05 CLOSEOUT ACTIVITIES**

- A. Training: Train Owner's personnel on operation and maintenance of system.
  - 1. Training Reference: Operation and maintenance manual and additional training materials as required.
  - 2. Provide minimum of two hours of training.

### **3.06 PROTECTION**

- A. Advise Contractor in writing of protections necessary from completion of restorative bonding work and project Substantial Completion.

**END OF SECTION**

**SECTION 09 0561  
COMMON WORK RESULTS FOR FLOORING PREPARATION**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. This section applies to floors identified in Contract Documents that are receiving the following types of floor coverings:
  - 1. Resilient flooring.
  - 2. Broadloom carpet.
  - 3. Ceramic tile and stone tile.
  - 4. Wood flooring.
- B. Removal of existing floor coverings.
- C. Preparation of new and existing concrete floor slabs for installation of floor coverings.
- D. Testing of concrete floor slabs for moisture and alkalinity (pH).
- E. Remediation of concrete floor slabs due to unsatisfactory moisture or alkalinity (pH) conditions.
  - 1. Contractor shall perform all specified remediation of concrete floor slabs.
- F. Patching compound.
- G. Remedial floor sheet membrane.

**1.02 RELATED REQUIREMENTS**

- A. Section 01 4000 - Quality Requirements: Additional requirements relating to testing agencies and testing.
- B. Section 01 7419 - Construction Waste Management and Disposal: Handling of existing floor coverings removed.
- C. Section 03 3000 - Cast-in-Place Concrete: Concrete admixture for slabs to receive adhered flooring, to prevent moisture content-related flooring failures.

**1.03 REFERENCE STANDARDS**

- A. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 50 mm [2 in.] Cube Specimens); 2024.
- B. ASTM C472 - Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters, and Gypsum Concrete; 2020.
- C. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2022.
- D. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2023.
- E. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2019a.
- F. RFCI (RWP) - Recommended Work Practices for Removal of Resilient Floor Coverings; 2018.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordinate scheduling of cleaning and testing, so that preliminary cleaning has been completed for at least 24 hours prior to testing.

**1.05 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Visual Observation Report: For existing floor coverings to be removed.
- C. Floor Covering and Adhesive Manufacturers' Product Literature: For each specific combination of substrate, floor covering, and adhesive to be used; showing:

1. Moisture and alkalinity (pH) limits and test methods.
2. Manufacturer's required bond/compatibility test procedure.
- D. Testing Agency's Report:
  1. Description of areas tested; include floor plans and photographs if helpful.
  2. Summary of conditions encountered.
  3. Moisture and alkalinity (pH) test reports.
  4. Copies of specified test methods.
  5. Recommendations for remediation of unsatisfactory surfaces.
  6. Submit report to Architect.
  7. Submit report not more than two business days after conclusion of testing.
- E. Adhesive Bond and Compatibility Test Report.
- F. Copy of RFCI (RWP).

#### **1.06 QUALITY ASSURANCE**

- A. Moisture and alkalinity (pH) testing shall be performed by an independent testing agency employed and paid by Contractor.
- B. Testing Agency Qualifications: Independent testing agency experienced in the types of testing specified.
  1. Submit evidence of experience consisting of at least 3 test reports of the type required, with project Owner's project contact information.
- C. Contractor's Responsibility Relating to Independent Agency Testing:
  1. Provide access for and cooperate with testing agency.
  2. Confirm date of start of testing at least 10 days prior to actual start.
  3. Allow at least 4 business days on site for testing agency activities.
  4. Achieve and maintain specified ambient conditions.
  5. Notify Architect when specified ambient conditions have been achieved and when testing will start.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver, store, handle, and protect products in accordance with manufacturer's instructions and recommendations.
- B. Deliver materials in manufacturer's packaging; include installation instructions.
- C. Keep materials from freezing.

#### **1.08 FIELD CONDITIONS**

- A. Maintain ambient temperature in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 65 degrees F or more than 85 degrees F.
- B. Maintain relative humidity in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 40 percent and not more than 60 percent.

### **PART 2 PRODUCTS**

#### **2.01 MATERIALS**

- A. Patching Compound: Floor covering manufacturer's recommended product, suitable for conditions, and compatible with adhesive and floor covering. In the absence of any recommendation from flooring manufacturer, provide a product with the following characteristics:
  1. Cementitious moisture-, mildew-, and alkali-resistant compound, compatible with floor, floor covering, and floor covering adhesive, and capable of being feathered to nothing at edges.
  2. Compressive Strength: 3000 psi, minimum, after 28 days, when tested in accordance with ASTM C109/C109M or ASTM C472, whichever is appropriate.

3. Products:
  - a. ARDEX Engineered Cements; ARDEX Feather Finish:  
[www.ardexamericas.com/#sle](http://www.ardexamericas.com/#sle).
  - b. LATICRETE International, Inc; SKIM LITE: [www.laticrete.com/#sle](http://www.laticrete.com/#sle).
  - c. USG Corporation; Durock Brand Advanced Skim Coat Floor Patch:  
[www.usg.com/#sle](http://www.usg.com/#sle).
  - d. Substitutions: See Section 01 6000 - Product Requirements.
- B. Remedial Floor Sheet Membrane: Pre-formed multi-ply sheet membrane installed over concrete subfloor, resistant to water vapor transmission meeting flooring manufacturer's emission limits, resistant to alkalinity (pH) level found, and suitable for flooring adhesion without further treatment.
  1. Thickness: 28 mil (0.028 inch).
  2. Tape: Types recommended by underlayment manufacturer to install membrane and cover seams.

### **PART 3 EXECUTION**

#### **3.01 CONCRETE SLAB PREPARATION**

- A. Perform following operations in the order indicated:
  1. Preliminary cleaning.
  2. Moisture vapor emission tests; 3 tests in the first 1000 square feet and one test in each additional 1000 square feet, unless otherwise indicated or required by flooring manufacturer.
  3. Internal relative humidity tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
  4. Alkalinity (pH) tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
  5. Specified remediation, if required.
  6. Patching, smoothing, and leveling, as required.
  7. Other preparation specified.
  8. Adhesive bond and compatibility test.
  9. Protection.
- B. Remediations:
  1. Excessive Moisture Emission or Relative Humidity: If an adhesive that is resistant to the level of moisture present is available and acceptable to flooring manufacturer, use that adhesive for installation of the flooring; if not, apply remedial floor coating or remedial sheet membrane over entire suspect floor area.

#### **3.02 REMOVAL OF EXISTING FLOOR COVERINGS**

- A. Comply with local, State, and federal regulations and recommendations of RFCI (RWP), as applicable to floor covering being removed.
- B. Dispose of removed materials in accordance with local, State, and federal regulations and as specified.

#### **3.03 PRELIMINARY CLEANING**

- A. Clean floors of dust, solvents, paint, wax, oil, grease, asphalt, residual adhesive, adhesive removers, film-forming curing compounds, sealing compounds, alkaline salts, excessive laitance, mold, mildew, and other materials that might prevent adhesive bond.
- B. Do not use solvents or other chemicals for cleaning.

#### **3.04 MOISTURE VAPOR EMISSION TESTING**

- A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

- B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.
- C. Test in accordance with ASTM F1869 and as follows.
- D. Plastic sheet test and mat bond test may not be substituted for the specified ASTM test method, as those methods do not quantify the moisture content sufficiently.
- E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if test values exceed 3 pounds per 1000 square feet per 24 hours.
- F. Report: Report the information required by the test method.

### **3.05 INTERNAL RELATIVE HUMIDITY TESTING**

- A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.
- B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.
- C. Test in accordance with ASTM F2170 Procedure A and as follows.
- D. Testing with electrical impedance or resistance apparatus may not be substituted for the specified ASTM test method, as the values determined are not comparable to the ASTM test values and do not quantify the moisture content sufficiently.
- E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if any test value exceeds 75 percent relative humidity.
- F. Report: Report the information required by the test method.

### **3.06 ALKALINITY TESTING**

- A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.
- B. Where this specification conflicts with the reference test method, comply with the requirements of this section.
- C. Test in accordance with ASTM F710.
- D. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if alkalinity (pH) test value is over 10.
- E. Report: Report the information required by the test method.

### **3.07 PREPARATION**

- A. See individual floor covering section(s) for additional requirements.
- B. Comply with requirements and recommendations of floor covering manufacturer.
- C. Fill and smooth surface cracks, grooves, depressions, control joints and other non-moving joints, and other irregularities with patching compound.
- D. Do not fill expansion joints, isolation joints, or other moving joints.

### **3.08 ADHESIVE BOND AND COMPATIBILITY TESTING**

- A. Comply with requirements and recommendations of floor covering manufacturer.

### **3.09 INSTALLATION OF REMEDIAL FLOOR SHEET MEMBRANE**

- A. Install in accordance with sheet membrane manufacturer's instructions.

### **3.10 PROTECTION**

- A. Cover prepared floors with building paper or other durable covering.

**END OF SECTION**

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**SECTION 09 2116  
GYPSUM BOARD ASSEMBLIES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Performance criteria for gypsum board assemblies.
- B. Acoustic insulation.
- C. Gypsum wallboard.
- D. Joint treatment and accessories.

**1.02 RELATED REQUIREMENTS**

- A. Section 06 1000 - Rough Carpentry: Building framing and sheathing.
- B. Section 06 1000 - Rough Carpentry: Wood blocking product and execution requirements.
- C. Section 07 8400 - Firestopping: Top-of-wall assemblies at fire-resistance-rated walls.
- D. Section 07 9200 - Joint Sealants: Sealing acoustical gaps in construction other than gypsum board or plaster work.
- E. Section 09 2216 - Non-Structural Metal Framing.
- F. Section 09 3000 - Tiling: Tile backing board.
- G. Section 09 9123 - Interior Painting.

**1.03 REFERENCE STANDARDS**

- A. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 2023, with Editorial Revision (2024).
- B. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2017 (Reapproved 2022).
- C. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2020.
- D. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2024.
- E. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2022.
- F. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base; 2019.
- G. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2024.
- H. ASTM C1629/C1629M - Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels; 2024.
- I. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2021.
- J. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- K. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2023.
- L. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2024.
- M. ASTM E413 - Classification for Rating Sound Insulation; 2022.
- N. ASTM E1414/E1414M - Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum; 2021a.



- O. GA-216 - Application and Finishing of Gypsum Panel Products; 2024.
- P. GA-226 - Application of Gypsum Board to Form Curved Surfaces; 2025.
- Q. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- R. UL (DIR) - Online Certifications Directory; Current Edition.
- S. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.
- T. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems; Current Edition, Including All Revisions.

#### **1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination: Coordinate the installation of gypsum board assemblies with size, location, and installation of service utilities.
- B. Sequencing: Install service utilities in an orderly and expeditious manner.

#### **1.05 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data:
  - 1. Provide data on gypsum board, accessories, and joint finishing system.
  - 2. Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.
- C. Shop Drawings: Indicate special details associated with fireproofing and acoustic seals.
- D. Installer's Qualification Statement.

#### **1.06 QUALITY ASSURANCE**

- A. Installer Qualifications: Company specializing in performing work of the type specified and with at least five years of documented experience.
- B. Documents at Project Site: Maintain at the project site a copy of manufacturer's instructions, erection drawings, and shop drawings.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. See Section 01 7419 - Construction Waste Management and Disposal for packaging waste requirements.
- B. Store gypsum products and accessories indoors and keep above freezing. Elevate boards above floor, on nonwicking supports, in accordance with manufacturer's recommendations.

#### **1.08 PROJECT CONDITIONS**

- A. Environmental Conditions, General: Establish and maintain environmental conditions for applying and finishing gypsum board with ASTM C 840 requirements or gypsum board manufacturer's recommendations, whichever is more stringent.
- B. Room Temperatures: For nonadhesive attachment of gypsum board to framing, maintain not less than 40 deg F. For adhesive attachment and finishing of gypsum board, maintain not less than 50 deg F for 48 hours before application and continuously after until dry. Do not exceed 95 deg F when using temporary heat sources.
- C. Ventilation: Ventilate building spaces as required to dry joint treatment materials.
- D. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
- E. If the application of gypsum board and gypsum shaft wall liner starts prior to the building being made weather-tight, the gypsum wallboard and/ or shaft wall liner specified shall be changed to glass-mat interior gypsum board and/ or glass mat gypsum shaft wall liner.

## **PART 2 PRODUCTS**

### **2.01 GYPSUM BOARD ASSEMBLIES**

- A. Provide completed assemblies complying with ASTM C840 and GA-216.
  - 1. See PART 3 for finishing requirements.
- B. Interior Partitions: Provide completed assemblies with the following characteristics:
  - 1. Acoustic Attenuation: Calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

### **2.02 METAL FRAMING MATERIALS**

- A. Nonstructural Steel Framing for Application of Gypsum Board: See Section 09 2216.

### **2.03 BOARD MATERIALS**

- A. Manufacturers - Gypsum-Based Board:
  - 1. CertainTeed Corporation: [www.certainteed.com/#sle](http://www.certainteed.com/#sle).
  - 2. Georgia-Pacific Gypsum; \_\_\_\_: [www.gpgypsum.com/#sle](http://www.gpgypsum.com/#sle).
  - 3. Gold Bond Building Products, LLC provided by National Gypsum Company: [www.goldbondbuilding.com/#sle](http://www.goldbondbuilding.com/#sle).
  - 4. USG Corporation: [www.usg.com/#sle](http://www.usg.com/#sle).
  - 5. Substitutions: See Section 01 6000 - Product Requirements.
- B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
  - 1. Application: Use as indicated on the drawings.
  - 2. Mold/Moisture Resistance: Score of 10, when tested in accordance with ASTM D3273.
    - a. Mold/Mildew resistant board is required where indicated on the drawings.
  - 3. At Assemblies Indicated with Fire-Resistance Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
  - 4. Thickness:
    - a. Vertical Surfaces: 5/8 inch, unless noted otherwise.
    - b. Ceilings: 5/8 inch, unless noted otherwise.
    - c. Multi-Layer Assemblies: Thicknesses as indicated on drawings.
  - 5. Paper-Faced Products:
    - a. CertainTeed Corporation; Type X Drywall: [www.certainteed.com/#sle](http://www.certainteed.com/#sle).
    - b. Georgia-Pacific Gypsum; ToughRock Fireguard X: [www.gpgypsum.com/#sle](http://www.gpgypsum.com/#sle).
    - c. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond Fire-Shield Gypsum Board: [www.goldbondbuilding.com/#sle](http://www.goldbondbuilding.com/#sle).
    - d. USG Corporation; Sheetrock Brand Firecode X Panels: [www.usg.com/#sle](http://www.usg.com/#sle).
    - e. Substitutions: See Section 01 6000 - Product Requirements.
  - 6. Mold/Moisture-Resistant, Paper-Faced Products:
    - a. CertainTeed Corporation; M2Tech Type X Moisture & Mold Resistant Drywall: [www.certainteed.com/#sle](http://www.certainteed.com/#sle).
    - b. Georgia-Pacific Gypsum; ToughRock Fireguard X Mold-Guard: [www.gpgypsum.com/#sle](http://www.gpgypsum.com/#sle).
    - c. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond XP Fire-Shield Gypsum Board: [www.goldbondbuilding.com/#sle](http://www.goldbondbuilding.com/#sle).
    - d. USG Corporation; Sheetrock Brand Mold Tough Firecode SCX Panels: [www.usg.com/#sle](http://www.usg.com/#sle).
    - e. Substitutions: See Section 01 6000 - Product Requirements.
- C. Abuse Resistant Wallboard:
  - 1. Application: as indicated on the drawings.
  - 2. Mold/Moisture Resistance: Score of 10, when tested in accordance with ASTM D3273.
    - a. Mold/Moisture resistant board is required where indicated on the drawings.

3. Paper-Faced Type: Gypsum wallboard, as defined in ASTM C1396/C1396M.
  4. At Assemblies Indicated with Fire-Resistance Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
  5. Thickness: as indicated on the drawings.
  6. Edges: Tapered.
  7. Paper-Faced Products:
    - a. CertainTeed Corporation; Extreme Abuse Resistant Drywall with M2Tech: [www.certainteed.com/#sle](http://www.certainteed.com/#sle).
    - b. Georgia-Pacific Gypsum; ToughRock Fireguard X Mold Guard Abuse-Resistant: [www.gpgypsum.com/#sle](http://www.gpgypsum.com/#sle).
    - c. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond XP Hi-Abuse Gypsum Board: [www.goldbondbuilding.com/#sle](http://www.goldbondbuilding.com/#sle).
    - d. USG Corporation; Sheetrock Brand AR Firecode X Panels: [www.usg.com/#sle](http://www.usg.com/#sle).
    - e. Substitutions: See Section 01 6000 - Product Requirements.
- D. Impact Resistant Wallboard:
1. Application: as indicated on the drawings..
  2. Mold/Moisture Resistance: Score of 10, when tested in accordance with ASTM D3273.
    - a. Mold/Moisture resistant board is required where indicated on the drawings.
  3. Paper-Faced Type: Gypsum wallboard, as defined in ASTM C1396/C1396M.
  4. At Assemblies Indicated with Fire-Resistance Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
  5. Thickness: as indicated on the drawings..
  6. Edges: Tapered.
  7. Paper-Faced Products:
    - a. CertainTeed Corporation; Extreme Impact Resistant Drywall with M2Tech: [www.certainteed.com/#sle](http://www.certainteed.com/#sle).
    - b. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond XP Hi-Impact Gypsum Board: [www.goldbondbuilding.com/#sle](http://www.goldbondbuilding.com/#sle).
    - c. USG Corporation; Sheetrock Brand Mold Tough VHI Firecode X Panels 5/8 in. (15.9 mm): [www.usg.com/#sle](http://www.usg.com/#sle).
    - d. Substitutions: See Section 01 6000 - Product Requirements.

## **2.04 GYPSUM BOARD ACCESSORIES**

- A. Sound Attenuation Insulation: Provide unfaced, friction-fit glass fiber insulation within metal stud partitions. See drawings for locations.
1. Thickness to match stud depth unless otherwise indicated.
  2. STC Performance: Provide type and density required to meet the specified assembly sound rating.
- B. Beads, Joint Accessories, and Other Trim: ASTM C1047, galvanized steel or rolled zinc, unless noted otherwise.
1. Corner Beads: Low profile, for 90 degree outside corners.
- C. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
1. Fiberglass Tape: 2 inch wide, coated glass fiber tape for joints and corners, except as otherwise indicated.
  2. Joint Compound: Setting type, field-mixed.
- D. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that project conditions are appropriate for work of this section to commence.

### **3.02 FRAMING INSTALLATION**

- A. Metal Framing: Refer to 09 2216 - Non-Structural Metal Framing.
- B. Suspended Ceilings and Soffits: Space framing and furring members at 24 inches on center.
  - 1. Level ceiling system to a tolerance of 1/1200.
  - 2. Laterally brace entire suspension system.
  - 3. Install bracing as required at exterior locations to resist wind uplift.

### **3.03 ACOUSTIC ACCESSORIES INSTALLATION**

- A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.
- B. Acoustic Sealant: Install in accordance with manufacturer's instructions.

### **3.04 BOARD INSTALLATION**

- A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.
- B. Exposed Gypsum Board in Interior Wet Areas: Seal joints, cut edges, and holes with water-resistant sealant.
- C. Exterior Soffits: Install exterior soffit board perpendicular to framing, with staggered end joints over framing members or other solid backing.
  - 1. Seal joints, cut edges, and holes with water-resistant sealant.
- D. Installation on Metal Framing: Use screws for attachment of gypsum board except face layer of nonrated double-layer assemblies, which may be installed by means of adhesive lamination.
- E. Curved Surfaces: Apply gypsum board to curved substrates in accordance with GA-226.

### **3.05 INSTALLATION OF TRIM AND ACCESSORIES**

- A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
- B. Corner Beads: Install at external corners, using longest practical lengths.

### **3.06 JOINT TREATMENT**

- A. Glass Mat Faced Gypsum Board and Exterior Glass Mat Faced Sheathing: Use fiberglass joint tape, embed and finish with setting type joint compound.
- B. Paper Faced Gypsum Board: Use paper joint tape, embed with drying type joint compound and finish with drying type joint compound.
- C. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
  - 1. Level 5: Walls and ceilings to receive semi-gloss or gloss paint finish and other areas specifically indicated.
  - 2. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
  - 3. Level 1: Fire-resistance-rated wall areas above finished ceilings, whether or not accessible in the completed construction.
- D. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
  - 1. Feather coats of joint compound so that camber is maximum 1/32 inch.
- E. Where Level 5 finish is indicated, spray apply high build drywall surfer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.

### **3.07 TOLERANCES**

- A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

**3.08 CLEANING**

- A. See Section 01 7000 - Execution and Closeout Requirements for additional requirements.

**3.09 PROTECTION**

- A. Protect installed gypsum board assemblies from subsequent construction operations.

**END OF SECTION**

**SECTION 09 2216  
NON-STRUCTURAL METAL FRAMING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Metal partition framing.
- B. Framing accessories.

**1.02 RELATED REQUIREMENTS**

- A. Section 05 5000 - Metal Fabrications: Shop fabricated steel items.
- B. Section 09 2116 - Gypsum Board Assemblies: Execution requirements for anchors for attaching work of this section.

**1.03 REFERENCE STANDARDS**

- A. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members; 2016, with Supplement (2020).
- B. AISI S201 - North American Standard for Cold-Formed Steel Framing - Product Data; 2017.
- C. AISI S220 - North American Standard for Cold-Formed Steel Nonstructural Framing; 2020.
- D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025.
- E. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members; 2015.
- F. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2020.
- G. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2022.
- H. UL (FRD) - Fire Resistance Directory; Current Edition.
- I. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Shop Drawings:
  - 1. Indicate prefabricated work, component details, stud layout, framed openings, anchorage to structure, acoustic details, type and location of fasteners, accessories, and items of other related work.
  - 2. Describe method for securing studs to tracks, splicing, and for blocking and reinforcement of framing connections.
- C. Product Data: Provide data describing framing member materials and finish, product criteria, load charts, and limitations.
- D. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.
- E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

**1.05 QUALITY ASSURANCE**

- A. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience and approved by manufacturer.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Metal Framing, Connectors, and Accessories:
  - 1. ClarkDietrich: [www.clarkdietrich.com/#sle](http://www.clarkdietrich.com/#sle).
  - 2. MarinoWARE: [www.marinoware.com/#sle](http://www.marinoware.com/#sle).
  - 3. Super Stud Building Products, Inc: [www.buysuperstud.com/#sle](http://www.buysuperstud.com/#sle).
  - 4. Telling Industries: [www.tellingindustries.com/#sle](http://www.tellingindustries.com/#sle).
  - 5. The Steel Network, Inc: [www.SteelNetwork.com/#sle](http://www.SteelNetwork.com/#sle).
  - 6. Substitutions: See Section 01 6000 - Product Requirements.

## **2.02 FRAMING MATERIALS**

- A. Steel Sheet: ASTM A1003/A1003M, subject to the ductility limitations indicated in AISI S220.
  - 1. Structural Grade: As required to meet design criteria.
  - 2. Corrosion Protection Coating Designation: G40, or equivalent in accordance with AISI S220.
- B. Material and Product Requirements Criteria: AISI S201.
- C. Non-Loadbearing Framing System Components: AISI S220; sheet steel, of size and properties necessary for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf.
  - 1. Studs: C-shaped with flat faces.
    - a. Products:
      - 1) ClarkDietrich; ProSTUD: [www.clarkdietrich.com/#sle](http://www.clarkdietrich.com/#sle).
      - 2) MarinoWARE; ViperStud Drywall Framing: [www.marinoware.com/#sle](http://www.marinoware.com/#sle).
      - 3) Super Stud Building Products, Inc; The EDGE: [www.buysuperstud.com/#sle](http://www.buysuperstud.com/#sle).
      - 4) Substitutions: See Section 01 6000 - Product Requirements.
  - 2. Runners: U-shaped, sized to match studs.
  - 3. Ceiling Channels: U-shaped.
  - 4. Furring: Hat-shaped sections, minimum depth of 7/8 inch.
- D. Partition Head to Structure Connections: Provide mechanical anchorage devices that accommodate deflection using slotted holes, screws, and anti-friction bushings, preventing rotation of studs while maintaining structural performance of partition.
  - 1. Structural Performance: Maintain lateral load resistance and vertical movement capacity required by applicable code when evaluated in accordance with AISI S100.
  - 2. Material: ASTM A653/A653M steel sheet, SS Grade 50.
  - 3. Provide components UL-listed for use in UL-listed fire-resistance-rated head of partition joint systems indicated on drawings.
- E. Non-Loadbearing Framing Accessories:
  - 1. Bracing and Bridging: ASTM A653/A653M G90 galvanized steel; for lateral bracing of wall studs with slots for engaging on-module studs.
  - 2. Framing Connectors: ASTM A653/A653M steel clips; secures cold rolled channel to wall studs for lateral bracing.
    - a. Products:
      - 1) ClarkDietrich; FastBridge Clip (FB33): [www.clarkdietrich.com/#sle](http://www.clarkdietrich.com/#sle).
      - 2) Substitutions: See Section 01 6000 - Product Requirements.
  - 3. Fasteners: ASTM C1002 self-piercing self-tapping screws.
  - 4. Anchorage Devices: Powder actuated.
  - 5. Acoustic Insulation: See Section 09 2116 .
  - 6. Touch-Up Primer for Corrosion Protected Surfaces: SSPC-Paint 20 Type I - Inorganic.

## **2.03 FABRICATION**

- A. Fabricate assemblies of framed sections to sizes and profiles required.
- B. Fit, reinforce, and brace framing members to suit design requirements.
- C. Fit and assemble in largest practical sections for delivery to site, ready for installation.

## **2.04 FINISHES**

- A. Studs, tracks, headers, channels and furring: Galvanize to G60 coating class.
- B. Accessories: Same finish as framing members.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify conditions before starting work.
- B. Verify that rough-in utilities are in proper location.

### **3.02 INSTALLATION OF STUD FRAMING**

- A. Install non-structural members in accordance with ASTM C754.
- B. Extend partition framing to structure in all locations.
- C. Partitions Terminating at Structure: Attach top runner to structure, maintain clearance between top of studs and structure, and connect studs to track using specified mechanical devices in accordance with manufacturer's instructions; verify free movement of top of stud connections; do not leave studs unattached to track.
- D. Align and secure top and bottom runners at 24 inches on center.
- E. Fit runners under and above openings; secure intermediate studs to same spacing as wall studs.
- F. Install studs vertically at spacing indicated on drawings.
- G. Align stud web openings horizontally.
- H. Secure studs to tracks using fastener method. Do not weld.
- I. Stud splicing is not permissible.
- J. Fabricate corners using a minimum of three studs.
- K. Install double studs at wall openings, door and window jambs, not more than 2 inches from each side of openings.
- L. Brace stud framing system rigid.
- M. Coordinate erection of studs with requirements of door frames; install supports and attachments.
- N. Coordinate installation of bucks, anchors, and blocking with electrical, mechanical, and other work to be placed within or behind stud framing.
- O. Blocking: Use wood blocking or steel channels secured to studs. Provide blocking for support of plumbing fixtures, toilet partitions, toilet accessories, opening frames, and other construction requiring the same..
- P. Furring: Install at spacing and locations shown on drawings. Lap splices a minimum of 6 inches.
- Q. Coordinate placement of insulation in stud spaces made inaccessible after stud framing erection.

### **3.03 TOLERANCES**

- A. Maximum Variation From True Position: 1/8 inch in 10 feet.
- B. Maximum Variation From Plumb: 1/16 inch in 10 feet.

**END OF SECTION**



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**SECTION 09 3000  
TILING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Tile for floor applications.
- B. Tile for wall applications.
- C. Cementitious backer board as tile substrate.
- D. Stone thresholds.
- E. Ceramic accessories.
- F. Ceramic trim.

**1.02 RELATED REQUIREMENTS**

- A. Section 07 9200 - Joint Sealants: Sealing joints between tile work and adjacent construction and fixtures.
- B. Section 09 0561 - Common Work Results for Flooring Preparation: Concrete slab moisture and alkalinity testing and remediation procedures.
- C. Division 22: Plumbing Fixtures and Floor Drains.

**1.03 REFERENCE STANDARDS**

- A. ANSI A108/A118/A136 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium); 2024.
- B. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units; 2023.
- C. ANSI A118.6 - American National Standard Specifications for Standard Cement Grouts for Tile Installation; 2019.
- D. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; 2023.
- E. ANSI A118.12 - American National Standard Specifications for Crack Isolation Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation; 2014 (Reaffirmed 2024).
- F. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2022.
- G. ASTM C150/C150M - Standard Specification for Portland Cement; 2024.
- H. ASTM C373 - Standard Test Methods for Determination of Water Absorption and Associated Properties by Vacuum Method for Pressed Ceramic Tiles and Glass Tiles and Boil Method for Extruded Ceramic Tiles and Non-tile Fired Ceramic Whiteware Products; 2018 (Reapproved 2023).
- I. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2025.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by affected installers.

**1.05 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.

- C. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.
  - 1. Proceeding with the installation prior to receiving shop drawing approval shall result in the Contractor bearing the full financial responsibility for any tile failures that occur.
- D. Samples:
  - 1. Tile: No less than two of each size, color and texture to demonstrate the maximum range of sizes, colors and textures.
  - 2. Trim Shapes and Base: No less than two of each type, color and shape.
  - 3. Trim, Thresholds and Transition Strips: No less than two of each type, color and shape.
  - 4. Grout: No less than two of each complete color chart or sample set.
- E. Certificate: Certify products of this section meet or exceed specified requirements.
- F. Installer's qualification statement.
  - 1. Submit documentation of National Tile Contractors Association (NTCA) or Tile Contractors' Association of America (TCAA) accreditation; [www.tile-assn.com/#sle](http://www.tile-assn.com/#sle)
- G. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.
- H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01 6000 - Product Requirements, for additional provisions.
  - 2. Extra Tile: 1 percent of each size, color, and surface finish combination, but not less than 1 box of each type.
  - 3. Extra Grout: No less than 5 pounds of each type and color of grout installed.

#### **1.06 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum five years of documented experience.
  - 1. Provide all bonding mortars and grouts from a single manufacturer.
- B. Installer Qualifications:
  - 1. Company specializing in performing tile installation, with minimum of five years of documented experience.
  - 2. Installer Certification:
    - a. Ceramic Tile Education Foundation (CTEF): Certified Tile Installer (CTI).

#### **1.07 MOCK-UPS**

- A. See Section 01 4000 - Quality Requirements for additional requirements.
- B. Construct floor and wall tile mock-ups where directed by Architect, incorporating all components specified for the location, for each type of tile specified.
  - 1. Minimum size of 5 feet long by 5 feet wide.
  - 2. Mock-up may remain as part of work.

#### **1.08 DELIVERY, STORAGE, AND HANDLING**

- A. See Section 01 7419 - Construction Waste Management and Disposal for packaging waste requirements.
- B. See Section 01 6000 - Product Requirements for general transportation, handling, storage, and protection information.
- C. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

#### **1.09 FIELD CONDITIONS**

- A. Do not install solvent-based products in an unventilated environment.
- B. Maintain ambient and substrate temperature above 50 degrees F and below 100 degrees F during installation and curing of setting materials.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Tile:
  - 1. Dal-Tile Corporation: [www.daltile.com/#sle](http://www.daltile.com/#sle).
  - 2. Substitutions: See Section 01 6000 - Product Requirements.
- B. Setting Materials:
  - 1. ARDEX Engineered Cements: [www.ardexamericas.com/#sle](http://www.ardexamericas.com/#sle).
  - 2. Custom Building Products: [www.custombuildingproducts.com/#sle](http://www.custombuildingproducts.com/#sle).
  - 3. LATICRETE International, Inc: [www.laticrete.com/#sle](http://www.laticrete.com/#sle).
  - 4. Mapei Corporation: [www.mapei.com/#sle](http://www.mapei.com/#sle).
  - 5. Substitutions: See Section 01 6000 - Product Requirements.
  - 6. Source Limitations: Furnish products produced by single manufacturer.
- C. Grout:
  - 1. ARDEX Engineered Cements: [www.ardexamericas.com/#sle](http://www.ardexamericas.com/#sle).
  - 2. Custom Building Products: [www.custombuildingproducts.com/#sle](http://www.custombuildingproducts.com/#sle).
  - 3. LATICRETE International, Inc: [www.laticrete.com/#sle](http://www.laticrete.com/#sle).
  - 4. Mapei Corporation: [www.mapei.com/#sle](http://www.mapei.com/#sle).
  - 5. Substitutions: See Section 01 6000 - Product Requirements.
  - 6. Source Limitations: Furnish products produced by single manufacturer.

### **2.02 TILE**

- A. Ceramic Mosaic Tile: ANSI A137.1 standard grade.
  - 1. Size: As required to match existing.
  - 2. Shape: As required to match existing.
  - 3. Surface Finish: As required to match existing.
  - 4. Color: As selected by Architect from manufacturer's standard range.
- B. Glazed Wall Tile: ANSI A137.1 standard grade.
  - 1. Moisture Absorption: 7.0 to 20.0 percent as tested in accordance with ASTM C373.
  - 2. Size: As required to match existing and 4" by 4" where indicated on the drawings.
  - 3. Surface Finish: As required to match existing.
  - 4. Color: As indicated on the drawings and as selected by Architect from manufacturer's standard range where tile will be covered with restorative bonding.
  - 5. Trim Units: Matching bullnose, cove, and base shapes in sizes coordinated with field tile and as required to match existing.
  - 6. Products:
    - a. Dal-Tile Corporation; Color Wheel Classic: [www.daltile.com/#sle](http://www.daltile.com/#sle).
    - b. Substitutions: See Section 01 6000 - Product Requirements.
- C. Porcelain Tile: ANSI A137.1 standard grade.
  - 1. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
  - 2. Size: 12 by 12 inch, nominal.
  - 3. Thickness: 5/16 inch.
  - 4. Edges: Interlocking shape.
  - 5. Surface Finish: Glazed.
  - 6. Color: As indicated on drawings.
  - 7. Pattern: As indicated on drawings.
  - 8. Trim Units: Matching cove base shapes in sizes coordinated with field tile.
  - 9. Products:
    - a. Dal-Tile Corporation; Volume 1.0: [www.daltile.com/#sle](http://www.daltile.com/#sle).
    - b. Substitutions: See Section 01 6000 - Product Requirements.

### **2.03 TRIM AND ACCESSORIES**

- A. Ceramic Trim: Matching bullnose, double bullnose, and cove base ceramic shapes in sizes coordinated with field tile.
  - 1. Manufacturers: Same as for tile.
- B. Thresholds: Width as indicated on drawings and as required by accessibility requirements. Custom widths as required due to work. Full length of wall or frame opening; beveled and hollywood edges as required; without holes, cracks, or open seams.
  - 1. Thickness: thickness to fit application.
  - 2. Material: Marble, honed finish.
  - 3. Applications:
    - a. As indicated on drawings.

#### **2.04 SETTING MATERIALS**

- A. Provide setting and grout materials from same manufacturer.
- B. Latex-Portland Cement Mortar Bond Coat: ANSI A118.4.
  - 1. Applications: Use this type of bond coat where indicated, and where no other type of bond coat is indicated.
  - 2. Products:
    - a. ARDEX Engineered Cements; ARDEX X 5: [www.ardexamericas.com/#sle](http://www.ardexamericas.com/#sle).
    - b. Custom Building Products; ProLite Premium Rapid Setting Large Format Tile Mortar, with Multi-Surface Bonding Primer: [www.custombuildingproducts.com/#sle](http://www.custombuildingproducts.com/#sle).
    - c. LATICRETE International, Inc; TRI-LITE: [www.laticrete.com/#sle](http://www.laticrete.com/#sle).
    - d. Mapei Corporation; Adesilex P10 Mosaic & Glass Tile: [www.mapei.com/#sle](http://www.mapei.com/#sle).
    - e. Substitutions: See Section 01 6000 - Product Requirements.

#### **2.05 GROUTS**

- A. Provide setting and grout materials from same manufacturer.
- B. Standard Grout: ANSI A118.6 standard cement grout.
  - 1. Applications: Use where indicated on drawings and where no other type of grout is indicated.
  - 2. Use sanded grout for joints 1/8 inch wide and larger; use unsanded grout for joints less than 1/8 inch wide.
  - 3. Products:
    - a. Custom Building Products; Polyblend Non-Sanded Grout: [www.custombuildingproducts.com/#sle](http://www.custombuildingproducts.com/#sle).
    - b. LATICRETE International, Inc; LATICRETE 1600 Unsanded Grout: [www.laticrete.com/#sle](http://www.laticrete.com/#sle).
    - c. Mapei Corporation; Keracolor U Unsanded Grout: [www.mapei.com/#sle](http://www.mapei.com/#sle).
    - d. Substitutions: See Section 01 6000 - Product Requirements.

#### **2.06 ACCESSORY MATERIALS**

- A. Concrete Floor Slab Crack Isolation Membrane: Material complying with ANSI A118.12; not intended as waterproofing.
  - 1. Crack Resistance: No failure at 1/8 inch gap, minimum.
  - 2. Fluid or Trowel Applied Type:
    - a. Material: Synthetic rubber or Acrylic.
    - b. Thickness: 20 mils, maximum.
    - c. Products:
      - 1) TEC Specialty Products LLC; TEC HydraFlex Waterproofing Crack Isolation Membrane: [www.tecspecialty.com/#sle](http://www.tecspecialty.com/#sle).
      - 2) LATICRETE International, Inc; LATICRETE FRACTURE BAN SC: [www.laticrete.com/#sle](http://www.laticrete.com/#sle).
      - 3) Mapei Corporation; Mapelastic CI: [www.mapei.com/#sle](http://www.mapei.com/#sle).

- 4) Substitutions: See Section 01 6000 - Product Requirements.
- B. Waterproofing Membrane at Floors and Shower Walls: Specifically designed for bonding to cementitious substrate under thick mortar bed or thin-set tile; complying with ANSI A118.10.
  1. Crack Resistance: No failure at 1/16-inch gap, minimum; comply with ANSI A118.12.
  2. Fluid or Trowel Applied Type:
    - a. Material: Synthetic rubber or Acrylic.
    - b. Thickness: 25 mils, minimum, dry film thickness.
    - c. Products:
      - 1) ARDEX Engineered Cements; ARDEX 8+9: [www.ardexamericas.com/#sle](http://www.ardexamericas.com/#sle).
      - 2) Custom Building Products; RedGard Crack Prevention and Waterproofing Membrane: [www.custombuildingproducts.com/#sle](http://www.custombuildingproducts.com/#sle).
      - 3) LATICRETE International, Inc; LATICRETE HYDRO BAN: [www.laticrete.com/#sle](http://www.laticrete.com/#sle).
      - 4) Mapei Corporation; Mapelastic AquaDefense: [www.mapei.com/#sle](http://www.mapei.com/#sle).
      - 5) Substitutions: See Section 01 6000 - Product Requirements.
- C. Backer Board: Cementitious type complying with ANSI A118.9; high density, glass fiber reinforced, 7/16 inch thick; 2-inch wide coated glass fiber tape for joints and corners.
  1. Products:
    - a. Custom Building Products; WonderBoard Lite Backerboard: [www.custombuildingproducts.com/#sle](http://www.custombuildingproducts.com/#sle).
    - b. Substitutions: See Section 01 6000 - Product Requirements.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify subfloor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive tile.
- B. Verify wall surfaces are smooth and flat within tolerances specified for that type of work, are dust-free, and are ready to receive tile.
- C. Verify that subfloor surfaces are dust free and free of substances that could impair bonding of setting materials to subfloor surfaces.
- D. Cementitious Subfloor Surfaces: Verify that substrates are ready for tiling installation by testing for moisture and alkalinity (pH).
  1. Obtain instructions if test results are not within limits recommended by tiling material manufacturer and setting material manufacturer.
- E. Verify that required wall-mounted and floor-mounted utilities are in correct location.

#### **3.02 PREPARATION**

- A. Vacuum clean surfaces and damp clean.
- B. Seal substrate surface cracks with filler.
- C. Install cementitious backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of setting material to feather edge.

#### **3.03 INSTALLATION - GENERAL**

- A. Install tile and thresholds and grout in accordance with applicable requirements of ANSI A108.1a through ANSI A108.20, manufacturer's instructions, and TCNA (HB) or TCNA (HB-GP) recommendations, as applicable.
- B. Lay tile to pattern indicated on drawings. Do not interrupt tile pattern through openings.
- C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.

- D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.
- E. Form internal angles square and external angles with trim.
- F. Install thresholds where indicated on drawings.
- G. Sound tile after setting. Replace hollow sounding units.
- H. Keep control and expansion joints free of mortar, grout, and adhesive.
- I. Prior to grouting, allow installation to completely cure; minimum of 48 hours.
- J. Grout tile joints unless otherwise indicated.
- K. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

#### **3.04 INSTALLATION - FLOORS - THIN-SET METHODS**

- A. Over interior concrete substrates, install in accordance with TCNA (HB) Method F113, dry-set or latex-Portland cement bond coat, on ground, with standard grout, unless otherwise indicated on drawings.
  - 1. Use uncoupling membrane under tile unless other underlayment is indicated on drawings.
  - 2. Install waterproofing membrane in accordance with TCNA (HB) Method F122, with latex-Portland cement grout, on ground.
  - 3. Install crack isolation membrane in accordance with TCNA (HB) Method F125-Partial, with latex-Portland cement grout.
- B. Install tile-to-tile floor movement joints in accordance with TCNA (HB) Method EJ171F.

#### **3.05 INSTALLATION - WALL TILE**

- A. Over cementitious backer units on studs, install in accordance with TCNA (HB) Method W244C.
- B. Over gypsum wallboard on wood or metal studs, install in accordance with TCNA (HB) Method W243, thin-set with dry-set or latex-Portland cement bond coat.
- C. Over interior concrete and masonry, install in accordance with TCNA (HB) Method W202I, thin-set with dry-set or latex-Portland cement bond coat.

#### **3.06 CLEANING**

- A. Clean tile and grout surfaces.

#### **3.07 PROTECTION**

- A. Do not permit traffic over finished floor surface for 4 days after installation.

**END OF SECTION**

**SECTION 09 5100  
ACOUSTICAL CEILINGS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Suspended metal grid ceiling system.
- B. Acoustical units.

**1.02 RELATED REQUIREMENTS**

- A. Division 21 - Fire Suppression: Sprinkler heads in ceiling system.
- B. Division 23 - HVAC: Air diffusion devices in ceiling system.
- C. Division 26 - Electrical: Light fixtures and equipment in ceiling system.
- D. Division 27 - Communications: Speakers in ceiling system.
- E. Division 28 - Electronic Safety and Security

**1.03 REFERENCE STANDARDS**

- A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025.
- B. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 2023, with Editorial Revision (2024).
- C. ASTM C635/C635M - Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2022.
- D. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2019.
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- F. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2023.
- G. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth; 2024.
- H. UL (FRD) - Fire Resistance Directory; Current Edition.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Sequence work to ensure acoustical ceilings are not installed until dust generating activities have terminated and overhead work is completed, tested, and approved.
- B. Do not install acoustical units until after interior wet work is dry.

**1.05 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate grid layout and related dimensioning, junctions with other ceiling finishes, and mechanical and electrical items installed in the ceiling.
- C. Product Data: Provide data on suspension system components and acoustical units.
- D. Samples: Submit two samples, 6 by 6 inch in size, illustrating material and finish of acoustical units.
- E. Samples: Submit two samples each, 6 inches long, of suspension system main runner, cross runner, and perimeter molding.
- F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- G. Manufacturer's qualification statement.



- H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01 6000 - Product Requirements, for additional provisions.
  - 2. Extra Acoustical Units: Quantity equal to 5 percent of total installed.

## **1.06 QUALITY ASSURANCE**

- A. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.
- B. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.

## **1.07 FIELD CONDITIONS**

- A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Acoustic Tiles/Panels:
  - 1. Armstrong World Industries, Inc: [www.armstrongceilings.com/#sle](http://www.armstrongceilings.com/#sle).
  - 2. Certainteed Architectural: [www.certainteed.com/ceilings-and-walls/#sle](http://www.certainteed.com/ceilings-and-walls/#sle).
  - 3. USG Corporation: [www.usg.com/ceilings/#sle](http://www.usg.com/ceilings/#sle).
  - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Suspension Systems:
  - 1. Same as for acoustical units.
  - 2. Substitutions: See Section 01 6000 - Product Requirements.

### **2.02 ACOUSTICAL UNITS**

- A. Acoustical Units - General: ASTM E1264, Class A.
- B. Acoustical Panels, Type ACT-1: Painted mineral fiber, with the following characteristics:
  - 1. Application(s): Where indicated on the drawings.
  - 2. Classification: ASTM E1264 Type A.
    - a. Form: A1.2
    - b. Pattern: "D" - fissured.
  - 3. Size: 24 by 48 inches.
  - 4. Thickness: 5/8 inch minimum.
  - 5. Light Reflectance: 82 percent minimum, determined in accordance with ASTM E1264.
  - 6. NRC Range: 0.55, determined in accordance with ASTM E1264.
  - 7. Ceiling Attenuation Class (CAC): 35, determined in accordance with ASTM E1264.
  - 8. Panel Edge: Square.
  - 9. Color: White.
  - 10. Suspension System: Exposed grid.
  - 11. Products:
    - a. Armstrong World Industries, Inc; Fine Fissured #1729: [www.armstrongceilings.com/#sle](http://www.armstrongceilings.com/#sle).
    - b. Certainteed Architectural; Fine Fissured HHF-197: [www.certainteed.com/ceilings-and-walls/#sle](http://www.certainteed.com/ceilings-and-walls/#sle).
    - c. USG Corporation; Radar #2410: [www.usg.com/ceilings/#sle](http://www.usg.com/ceilings/#sle).
    - d. Substitutions: See Section 01 6000 - Product Requirements.

### **2.03 SUSPENSION SYSTEMS**

- A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold-down clips, stabilizer bars, clips, and splices as required.

1. Materials:
  - a. Steel Grid: ASTM A653/A653M, G30 coating, unless otherwise indicated.
- B. Exposed Suspension System: Hot-dip galvanized steel grid.
  1. Application(s): Use this type of suspension system where no other type is indicated.
  2. Structural Classification: Intermediate-duty, when tested in accordance with ASTM C635/C635M.
  3. Profile: Tee; 15/16 inch face width.
  4. Finish: Baked enamel.
  5. Color: White.
  6. Products:
    - a. Armstrong World Industries, Inc; Prelude XL: [www.armstrongceilings.com/#sle](http://www.armstrongceilings.com/#sle).
    - b. Certainteed Architectural; 15/16" EZ Stab Classic System: [www.certainteed.com/ceilings-and-walls/#sle](http://www.certainteed.com/ceilings-and-walls/#sle).
    - c. USG Corporation; Donn Brand ZXLA 15/16 inch Acoustical Suspension System: [www.usg.com/#sle](http://www.usg.com/#sle).
    - d. Substitutions: See Section 01 6000 - Product Requirements.

## **2.04 ACCESSORIES**

- A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.
- B. Hanger Wire: 12 gauge, 0.08 inch galvanized steel wire.
- C. Hold-Down Clips: Manufacturer's standard clips to suit application within 20 ft of an exterior door and other areas as indicated.
- D. Perimeter Moldings: Same metal and finish as grid.
  1. Size: As required for installation conditions.
  2. Angle Molding: L-shaped, for mounting at same elevation as face of grid.
- E. Touch-up Paint: Type and color to match acoustical and grid units.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify conditions before starting work.
- B. Verify that layout of hangers will not interfere with other work.

### **3.02 PREPARATION**

- A. Install after major above-ceiling work is complete.
- B. Coordinate the location of hangers with other work.

### **3.03 INSTALLATION - SUSPENSION SYSTEM**

- A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions, as supplemented in this section.
- B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.
- C. Lay out system to a balanced grid design to minimize edge units that are less than 50 percent of acoustical unit size. Refer to the drawings for grid and lighting fixture layout.
- D. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
  1. Use longest practical lengths.
- E. Suspension System: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

- F. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.
- G. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.
- H. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.
- I. Do not eccentrically load system or induce rotation of runners.

### **3.04 INSTALLATION - ACOUSTICAL UNITS**

- A. Install acoustical units in accordance with manufacturer's instructions.
- B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.
- C. Fit border trim neatly against abutting surfaces.
- D. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.
- E. Cutting Acoustical Units:
  - 1. Cut to fit irregular grid and perimeter edge trim.
  - 2. Make field cut edges of same profile as factory edges.
- F. Where round obstructions and bullnose concrete block corners occur, provide preformed closures to match perimeter molding.
- G. Install hold-down clips on panels within 20 ft of an exterior door.

### **3.05 TOLERANCES**

- A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.
- B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

### **3.06 CLEANING**

- A. See Section 01 7000 - Execution and Closeout Requirements for additional requirements.
- B. Clean surfaces.
- C. Replace damaged or abraded components.

**END OF SECTION**

**SECTION 09 6419**  
**WOOD COMPOSITION FLOORING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Installation of hardboard stage flooring overlay over existing hardwood stage flooring.

**1.02 RELATED REQUIREMENTS**

- A. Section 06 2000 - Finish Carpentry: Wood trim and thresholds.
- B. Section 09 9300 - Staining and Transparent Finishing: Stain and transparent surface materials for application in this section.
- C. Section 09 9600 - High-Performance Coatings: Finish coating on hardboard flooring.

**1.03 REFERENCE STANDARDS**

- A. ASTM D1037 - Standard Test Methods for Evaluating Properties of Wood-Base Fiber and Particle Panel Materials; 2012 (Reapproved 2020).
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- C. NWFA (IG) - Installation Guidelines; Current Edition.

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data for hardboard panels and recommended adhesives/fasteners.
- C. Shop Drawings:
  - 1. Indicate floor joint pattern and termination details.
  - 2. Indicate provisions for expansion and contraction, base and base corner details.
- D. Manufacturer's Instructions: Indicate standard and special installation procedures.
- E. Samples: Submit two samples 12 by 12 inch in size illustrating floor material, color, and sheen.
- F. Maintenance Data: Include maintenance procedures and recommended maintenance materials.

**1.05 QUALITY ASSURANCE**

- A. Perform work of this section in accordance with NWFA/NOFMA.
  - 1. Maintain one copy of each document on site.
- B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum five years documented experience.
- C. Installer Qualifications: Company specializing in performing work of the type specified and with at least five years of documented experience.

**1.06 FIELD CONDITIONS**

- A. Do not install hardboard overlay until HVAC system is operational and maintained at occupancy conditions.
- B. Verify existing flooring is structurally sound, level, clean, and free from excessive deflection or damage.
- C. Provide heat, light, and ventilation prior to installation.
- D. Store materials in area of installation for minimum period of 24 hours prior to installation.
- E. Maintain minimum room temperature of 65 degrees F for a period of two days prior to delivery of materials to installation space, during installation, and after installation.

## **PART 2 PRODUCTS**

### **2.01 MATERIALS**

- A. Hardboard Floor Panels:
  - 1. Type: Conform to ANSI A135.4, Class 1 Tempered, smooth one side.
  - 2. Composition: Wood fibers consolidated under heat and pressure, oil-tempered for hardness; no added urea-formaldehyde resin.
  - 3. Size: 4-feet x 8-feet nominal sheets.
  - 4. Density: Minimum 50 lb/ft<sup>3</sup>.
  - 5. Moisture Content: 4–7 percent at manufacture.
  - 6. Edges: Square cut.
  - 7. Thickness: 1/4 inch.

### **2.02 ACCESSORIES**

- A. Fasteners:
  - 1. Countersunk flathead screws or ring shank nails as approved.
  - 2. Spacing: 8-inch on-center at panel edges and 12-inch on-center in the field.
- B. Adhesive:
  - 1. Low-VOC construction adhesive suitable for bonding wood to wood.
- C. Joint Sealer:
  - 1. Black latex wood filler or sealant at panel joints for seamless appearance.
- D. Floor Finish: See Section 09 9600 - High-Performance Coatings.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify existing conditions before starting this work.
- B. Verify existing wood stage floor is properly secured, smooth, clean, dry, and flat to plus or minus 1/4 inch in 10 feet.
- C. Notify Architect if conditions are unsuitable for overlay installation.
- D. Verify that required floor-mounted utilities are in correct location.

### **3.02 PREPARATION**

- A. Prepare existing wood stage floor to receive wood flooring in accordance with manufacturer's and NWFA instructions.
- B. Clean floor to remove dust, wax, debris, or adhesives.
- C. Remove any protrusions or nails from existing wood floor.

### **3.03 INSTALLATION**

- A. Layout hardboard panels perpendicular to existing floorboards to minimize telegraphing of joints.
- B. Stagger joints; maintain 1/16" gap at panel edges to accommodate movement.
- C. Fasten hardboard panels securely using specified fasteners and pattern.
- D. Avoid raised edges or trip hazards; countersink fasteners below surface.
- E. Sand any panel edge lips as needed.
- F. Seal joints.

### **3.04 FINISHING:**

- A. Apply finish coating as specified in 09 9600 - High-Performance Coatings.

### **3.05 CLEANING**

- A. See Section 01 7000 - Execution and Closeout Requirements for additional requirements.
- B. Clean floor and remove debris in accordance with floor finish manufacturer's instructions.

**3.06 PROTECTION**

- A. Protect installed flooring from damage until acceptance.
- B. Do not allow heavy equipment or lifts until final finish is applied and cured, if applicable.

**END OF SECTION**

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**SECTION 09 6500  
RESILIENT FLOORING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Resilient tile flooring.
- B. Resilient base.
- C. Installation accessories.

**1.02 RELATED REQUIREMENTS**

- A. Section 03 3000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied resilient flooring.
- B. Section 09 0561 - Common Work Results for Flooring Preparation: Removal of existing floor coverings, cleaning, and preparation.
- C. Section 09 0561 - Common Work Results for Flooring Preparation: Concrete slab moisture and alkalinity testing and remediation procedures.

**1.03 REFERENCE STANDARDS**

- A. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2025.
- B. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2022.
- C. ASTM F1066 - Standard Specification for Vinyl Composition Floor Tile; 2025.
- D. ASTM F1861 - Standard Specification for Resilient Wall Base; 2021 (Reapproved 2025).
- E. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2023.
- F. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2019a.
- G. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2023.

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- C. Shop Drawings: Indicate seaming plans and floor patterns.
- D. Verification Samples: Submit two samples, 6 by 6 inch in size illustrating color and pattern for each resilient flooring product specified.
- E. Certification: Prior to installation of flooring, submit written certification by flooring manufacturer and adhesive manufacturer that condition of subfloor is acceptable.
- F. Manufacturer's Qualification Statement.
- G. Installer's Qualification Statement.
- H. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.
- I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01 6000 - Product Requirements, for additional provisions.
  - 2. Extra Flooring Material: 5% of each type and color.
  - 3. Extra Wall Base: 5% of each type and color.



### **1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing specified flooring with minimum five years documented experience.
- B. Installer Qualifications: Company specializing in installing specified flooring with minimum five years documented experience.

### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Store all materials off of the floor in an acclimatized, weather-tight space.
- B. Maintain temperature in storage area between 55 degrees F and 90 degrees F.

### **1.07 FIELD CONDITIONS**

- A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

### **1.08 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide manufacturer's warranty from Date of Substantial Completion, covering the following:
  - 1. Vinyl Composition Tile: 20 years.
  - 2. Resilient Base: 2 years.

## **PART 2 PRODUCTS**

### **2.01 TILE FLOORING**

- A. Vinyl Composition Tile: Homogeneous, with color extending throughout thickness.
  - 1. Manufacturers:
    - a. Armstrong Flooring; Standard Excelon Imperial Texture: [www.armstrongflooring.com/#sle](http://www.armstrongflooring.com/#sle).
    - b. Substitutions: See Section 01 6000 - Product Requirements.
  - 2. Minimum Requirements: Comply with ASTM F1066, of Class corresponding to type specified.
  - 3. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648 or NFPA 253.
  - 4. Size: 12 by 12 inch.
  - 5. Thickness: 0.125 inch.
  - 6. Pattern: As indicated on the drawings.
  - 7. Color: As indicated on drawings.

### **2.02 RESILIENT BASE**

- A. Resilient Base: ASTM F1861, Type TP, rubber, thermoplastic; style as indicated on the drawings.
  - 1. Manufacturers:
    - a. Roppe Corporation: [www.roppe.com/#sle](http://www.roppe.com/#sle).
    - b. Substitutions: See Section 01 6000 - Product Requirements.
  - 2. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648 or NFPA 253.
  - 3. Height: 4 inches.
  - 4. Thickness: 0.125 inch.
  - 5. Length: Continuous rolls.
    - a. Cut lengths are not permitted.
  - 6. Color: As indicated on drawings.

### **2.03 ACCESSORIES**

- A. Subfloor Filler: Type recommended by flooring manufacturer.

- B. Primers and Adhesives: Types recommended by flooring manufacturer.
- C. Adhesives: Type recommended by flooring manufacturer.
- D. Moldings, Transition and Edge Strips: Rubber transition strips, as recommended by flooring manufacturer and approved by the Architect, to make smooth transition from flooring material to adjacent dissimilar type of flooring material.
- E. Sealer and Wax: Types recommended by flooring manufacturer.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.
- B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.
- C. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
  - 1. Test in accordance with Section 09 0561.
  - 2. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.
  - 3. Follow moisture and alkalinity remediation procedures in Section 09 0561.
- D. Verify that required floor-mounted utilities are in correct location.

### **3.02 PREPARATION**

- A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.
- B. Remove subfloor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with subfloor filler to achieve smooth, flat, hard surface.
- C. Prohibit traffic until filler is fully cured.
- D. Clean substrate.

### **3.03 INSTALLATION - GENERAL**

- A. Starting installation constitutes acceptance of subfloor conditions.
- B. Install in accordance with manufacturer's written instructions.
- C. Adhesive-Applied Installation:
  - 1. Use adhesive recommended by manufacturer for conditions at the time of installation.
  - 2. Fit joints and butt seams tightly.
- D. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.
- E. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.
- F. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.
- G. Install flooring in recessed floor access covers, maintaining floor pattern.
- H. At movable partitions, install flooring under partitions without interrupting floor pattern.

### **3.04 INSTALLATION - TILE FLOORING**

- A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.

- B. Install square tile to basket weave pattern. Allow minimum 1/2 full size tile width at room or area perimeter.

**3.05 INSTALLATION - RESILIENT BASE**

- A. Fit joints tightly and make vertical. Maintain minimum dimension of 36 inches between joints.
- B. Install base on solid backing. Bond tightly to wall and floor surfaces.
- C. Scribe and fit to door frames and other interruptions.

**3.06 CLEANING**

- A. Remove excess adhesive from floor, base, and wall surfaces without damage.

**3.07 PROTECTION**

- A. Prohibit traffic on resilient flooring for 48 hours after installation.

**END OF SECTION**

**SECTION 09 6816  
SHEET CARPETING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Carpet, direct-glued.

**1.02 RELATED REQUIREMENTS**

- A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 7419 - Construction Waste Management and Disposal: Reclamation/Recycling of new carpet scrap and removed carpet.
- C. Section 03 3000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied carpet.
- D. Section 09 0561 - Common Work Results for Flooring Preparation: Testing of concrete slabs, removal of existing floor coverings, cleaning, and preparation.
- E. Section 09 0561 - Common Work Results for Flooring Preparation: Concrete slab moisture and alkalinity testing and remediation procedures.

**1.03 REFERENCE STANDARDS**

- A. ASTM D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials; 2016 (Reapproved 2021).
- B. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2025.
- C. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2022.
- D. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2023.
- E. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2019a.
- F. CRI 104 - Standard for Installation of Commercial Carpet; 2015.
- G. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2023.

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors, and method of installation.
- C. Shop Drawings: Indicate seaming plan, method of joining seams, direction of carpet pile and pattern, location of edge moldings and edge bindings.
- D. Samples: Submit two samples 18 by 18 inch in size illustrating color and pattern for each carpet material specified.
- E. Accessory Samples: Submit two 6 inch long samples of edge strip for each color specified.
- F. Sustainable Design Submittal: Submit VOC content documentation for adhesives.
- G. Manufacturer's Installation Instructions: Indicate special procedures.
- H. Operation and Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.
- I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01 6000 - Product Requirements, for additional requirements.

2. Extra Carpet: Quantity equal to 5 percent of total installed of each type, color, and pattern.

### **1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet with minimum five years documented experience.
- B. Installer Qualifications: Company specializing in installing carpet with minimum five years documented experience.

### **1.06 FIELD CONDITIONS**

- A. Store materials in area of installation for minimum period of 24 hours prior to installation.
- B. Maintain minimum 70 degrees F ambient temperature 24 hours prior to, during and 24 hours after installation.
- C. Ventilate installation area during installation and for 72 hours after installation.

### **1.07 WARRANTY**

- A. Provide manufacturers written lifetime wear and backing commercial warranty, 15-year stain resistant warranty, and 15-year bleach resistant warranty.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Carpet:
  1. Mannington Commercial: [www.manningtoncommercial.com#sle](http://www.manningtoncommercial.com#sle).
  2. Substitutions: See Section 01 6000 - Product Requirements.

### **2.02 CARPET**

- A. Broadloom Carpet, Type CP-1: Tufted, nylon.
  1. Critical Radiant Flux: Class 1; minimum of 0.45 watts/sq cm, when tested in accordance with ASTM E648 or NFPA 253.
  2. Surface Flammability Ignition: Pass ASTM D2859 (the "pill test").
  3. Color: As indicated on drawings.
  4. Pattern: Multiplexer Broadloom.
  5. Roll Width: 12 feet - 6 inches.
  6. Construction: Patterned loop.
  7. Face Fiber: Type 6,6 nylon.
  8. Gauge: 5/64 inch.
  9. Stitches: 10.33 per inch.
  10. Pile Weight: 20 oz/sq yd.
  11. Dye Method: Solution/Yarn.
  12. Primary Backing: UltraBac® RE
    - a. Material: Polypropylene.
    - b. Weight: 32 oz/sq yd.

### **2.03 ACCESSORIES**

- A. Subfloor Filler: Type recommended by carpet manufacturer.
- B. Adhesives:
  1. Compatible with materials being adhered; maximum VOC content as specified in Section 01 6116.
- C. Carpet Adhesive: Recommended by carpet manufacturer.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that subfloor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive carpet.
- B. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of adhesives to subfloor surfaces.
- C. Cementitious Subfloor Surfaces: Verify that substrates are ready for flooring installation by testing for moisture and alkalinity (pH).
  - 1. Test in accordance with Section 09 0561.
  - 2. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.
  - 3. Follow moisture and alkalinity remediation procedures in Section 09 0561.

### **3.02 PREPARATION**

- A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.
- B. Remove subfloor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with subfloor filler.
- C. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.
- D. Clean substrate.

### **3.03 INSTALLATION - GENERAL**

- A. Starting installation constitutes acceptance of subfloor conditions.
- B. Install carpet in accordance with manufacturer's instructions and CRI 104 (Commercial).
- C. Verify carpet match before cutting to ensure minimal variation between dye lots.
- D. Lay out carpet and locate seams in accordance with shop drawings.
  - 1. Locate seams in area of least traffic, out of areas of pivoting traffic, and parallel to main traffic.
  - 2. Do not locate seams perpendicular through door openings.
  - 3. Align run of pile in same direction as anticipated traffic and in same direction on adjacent pieces.
  - 4. Locate change of color or pattern between rooms under door centerline.
  - 5. Provide monolithic color, pattern, and texture match within any one area.
- E. Install carpet tight and flat on subfloor, well fastened at edges, with a uniform appearance.

### **3.04 DIRECT-GLUED CARPET**

- A. Double cut carpet seams, with accurate pattern match. Make cuts straight, true, and unfrayed. Apply seam adhesive to cut edges of woven carpet immediately.
- B. Apply contact adhesive to floor uniformly at rate recommended by manufacturer. After sufficient open time, press carpet into adhesive.
- C. Apply seam adhesive to the base of the edge glued down. Lay adjoining piece with seam straight, not overlapped or peaked, and free of gaps.
- D. Roll with appropriate roller for complete contact of adhesive to carpet backing.
- E. Trim carpet neatly at walls and around interruptions.
- F. Complete installation of edge strips, concealing exposed edges.

### **3.05 CLEANING**

- A. See Section 01 7000 - Execution and Closeout Requirements for additional requirements.
- B. Remove excess adhesive from floor and wall surfaces without damage.
- C. Clean and vacuum carpet surfaces.

**END OF SECTION**

**SECTION 09 8433  
SOUND-ABSORBING WALL AND CEILING UNITS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Sound-absorbing panels.
- B. Mounting accessories.

**1.02 REFERENCE STANDARDS**

- A. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 2023, with Editorial Revision (2024).
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- C. ASTM E795 - Standard Practices for Mounting Test Specimens during Sound Absorption Tests; 2023.

**1.03 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's printed data sheets for products specified.
- C. Shop Drawings: Fabrication and installation details, panel layout and fabric orientation.
- D. Verification Samples: Fabricated samples of each type of panel specified; 12 by 12 inch, showing construction, edge details, and fabric covering.
- E. Test Reports: Certified test data from an independent test agency verifying that panels meet specified requirements for acoustical and fire performance.

**1.04 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with at least five years of documented experience.
- B. Preinstallation Meeting: Prior to the start of installation, the Contractor responsible for this section of work shall conduct a preinstallation meeting in accordance with Section 01 3000 - Administrative Requirements. Those in attendance shall include:
  - 1. General Contractor.
  - 2. Subcontractor/Installer.
  - 3. Installation Crew Leader.
  - 4. Owner's Representative.
  - 5. Architect.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Protect acoustical units from moisture during shipment, storage, and handling. Deliver in factory-wrapped bundles; do not open bundles until units are needed for installation.
- B. Store units flat, in dry, well-ventilated space; do not stand on end.
- C. Protect edges from damage.

**PART 2 PRODUCTS**

**2.01 FABRIC-COVERED SOUND-ABSORBING UNITS**

- A. Manufacturers:
  - 1. Conwed Designscape/Wall Technology: [www.conweddesignscape.com/#sle](http://www.conweddesignscape.com/#sle).
  - 2. Kinetics Noise Control, Inc: [www.kineticsnoise.com/#sle](http://www.kineticsnoise.com/#sle).
  - 3. Sound Seal: [www.soundseal.com/#sle](http://www.soundseal.com/#sle).
  - 4. Substitutions: See Section 01 6000 - Product Requirements.



- B. General:
  - 1. Prefinished, factory assembled fabric-covered panels.
  - 2. Surface Burning Characteristics: Flame spread index of 25 or less and smoke developed index of 450 or less, Class A, when tested in accordance with ASTM E84.
- C. Fabric-Covered Acoustical Panels for Walls - Type AP-1 :
  - 1. Panel Core: Manufacturer's standard fiberglass core.
  - 2. Core Density: 6 to 7 lb/cu ft.
  - 3. Sound Absorption: Noise Reduction Coefficient (NRC) of 1.05 minimum when tested in accordance with ASTM C423 for Type A mounting, per ASTM E795.
  - 4. Panel Size: As indicated on drawings.
  - 5. Panel Thickness: 2 inches.
  - 6. Edges: Perimeter edges reinforced by a formulated resin hardener.
  - 7. Corners: Square.
  - 8. Fabric: As indicated on drawings.
  - 9. Mounting Method: Impaling clips with adhesive.
  - 10. Products:
    - a. Kinetics Noise Control, Inc; HardSide Acoustical Panels: [www.kineticsnoise.com/#sle](http://www.kineticsnoise.com/#sle).
    - b. Conwed Designscape/Wall Technology; Fabric-A Wall Panels: [www.conweddesignscape.com/#sle](http://www.conweddesignscape.com/#sle).
    - c. Sound Seal; Sound Quality S-2000 Acoustic Wall Panels: [www.soundseal.com/#sle](http://www.soundseal.com/#sle).
    - d. Substitutions: See Section 01 6000 - Product Requirements.

## **2.02 FABRICATION**

- A. Fabric Wrapped, General: Fabricate panels to sizes and configurations as indicated, with fabric facing installed without sagging, wrinkles, blisters, or visible seams.
- B. Tolerances: Fabricate to finished tolerance of plus or minus 1/16 inch for thickness, overall length and width, and squareness from corner to corner.

## **2.03 ACCESSORIES**

- A. Back-Mounting Accessories: Manufacturer's standard accessories for concealed support, designed to allow panel removal, and as follows:
  - 1. Metal impaling clips designed to support full weight of panels, mechanically attached to substrate and adhesively bonded to back of panels.
- B. Panel Adhesive: Acceptable to acoustical panel manufacturer for application as indicated.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Examine substrates for conditions detrimental to installation of acoustical units. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.02 INSTALLATION**

- A. Install acoustical units in locations as indicated, following manufacturer's installation instructions.
- B. Install mounting accessories and supports in accordance with manufacturer's installation instructions.
- C. Align panels accurately, with edges plumb and top edges level. Scribe to fit accurately at adjoining work and penetrations.
- D. Install acoustical units to construction tolerances of plus or minus 1/16 inch for the following:
  - 1. Plumb and level.
  - 2. Flatness.

**3.03 CLEANING**

- A. Clean sound-absorptive panels upon completion of installation from dust and other foreign materials, following manufacturer's instructions.

**3.04 PROTECTION**

- A. Provide protection of installed acoustical panels until Date of Substantial Completion.
- B. Replace panels that cannot be cleaned and repaired to satisfaction of the Architect.

**END OF SECTION**

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**SECTION 09 8439  
SOUND-DIFFUSING WALL AND CEILING UNITS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Sound-diffusing wall panels.
- B. Sound-diffusing, custom-fabricated wood wall units.
- C. Mounting accessories.

**1.02 RELATED REQUIREMENTS**

- A. Section 09 9123 - Interior Painting.

**1.03 REFERENCE STANDARDS**

- A. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 2023, with Editorial Revision (2024).
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- C. ASTM E795 - Standard Practices for Mounting Test Specimens during Sound Absorption Tests; 2023.

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's printed data sheets for products specified.
- C. Shop Drawings: Fabrication and installation details, panel layout, fabric orientation, and wood grain orientation.
- D. Verification Samples: Fabricated samples of each type of panel specified; 12 by 12 inch, showing construction, edge details, and finish.
- E. Test Reports: Certified test data from an independent test agency verifying that panels meet specified requirements for acoustical and fire performance.

**1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with at least five years of documented experience.
- B. Preinstallation Meeting: Prior to the start of installation, the Contractor responsible for this section of work shall conduct a preinstallation meeting in accordance with Section 01 3000 - Administrative Requirements. Those in attendance shall include:
  - 1. General Contractor.
  - 2. Subcontractor/Installer.
  - 3. Installation Crew Leader.
  - 4. Owner's Representative.
  - 5. Architect.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- B. Store materials protected from exposure to harmful environmental conditions and at manufacturer's recommended temperature and humidity conditions. Environmental conditions required for storage are the same as for installation.

**1.07 PROJECT CONDITIONS**

- A. Environmental Requirements: Do not install diffusers until wet work is complete, the building is enclosed, and the temperature and relative humidity are stabilized at 60 - 80 degrees F (16 - 27 degrees C) and 40 - 50%, respectively.

## **PART 2 PRODUCTS**

### **2.01 GEOMETRIC DIFFUSERS**

- A. Manufacturers:
1. Conwed Designscape/Wall Technology: [www.conweddesignscape.com/#sle](http://www.conweddesignscape.com/#sle).
  2. Kinetics Noise Control, Inc: [www.kineticsnoise.com/#sle](http://www.kineticsnoise.com/#sle).
  3. Sound Seal: [www.soundseal.com/#sle](http://www.soundseal.com/#sle).
  4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Performance Requirements:
1. Surface Burning Characteristics: Flame spread index of 25 or less and smoke developed index of 450 or less, Class A, when tested in accordance with ASTM E84.
- C. Geometric Diffuser Sound-Diffusing Panels for Walls - Type PD-1:
1. Panel Shape: Offset pyramidal.
  2. Panel Size: 4 feet x 4 feet x 9.75 inches.
  3. Sound Absorption: Noise Reduction Coefficient (NRC) shall be no greater than 0.10 for Type A mounting (direct mount) when tested in accordance with ASTM C423.
  4. Edges: Rounded pencil edge thermo-molded frame.
  5. Finish: Fabric facing.
  6. Fabric: As indicated on drawings.
  7. Sound Deadener: Bitument base sheet material, coated with a pressure-sensitive adhesive on one side, bonded to inside face of geometric diffuser sound-diffusing panel with one hundred percent coverage.
    - a. Product: Kinetics Sound Deadener KDD-3642: [www.kineticsnoise.com/#sle](http://www.kineticsnoise.com/#sle).
    - b. Substitutions: See Section 01 6000 - Product Requirements.
  8. Mounting Method: Wall mount with top of panel angle and Z-clip and bottom angle to secure panel.
  9. Products:
    - a. Kinetics Noise Control, Inc; Geometric Diffusers: [www.kineticsnoise.com/#sle](http://www.kineticsnoise.com/#sle).
    - b. Conwed Designscape/Wall Technology; Diffusers: [www.conweddesignscape.com/#sle](http://www.conweddesignscape.com/#sle).
    - c. Sound Seal; Sound Diffusers: [www.soundseal.com/#sle](http://www.soundseal.com/#sle).
    - d. Substitutions: See Section 01 6000 - Product Requirements.

### **2.02 SOUND-DIFFUSING WOOD PLANKS**

- A. Manufacturers:
1. RPG Acoustical Systems: [www.rpgacoustic.com/#sle](http://www.rpgacoustic.com/#sle).
  2. Substitutions: See Section 01 6000 - Product Requirements.
- B. Wood Sound Diffuser Planks - Type AWD-1:
1. Construction: 3/8 inch (9.5 mm) thick solid, paint-grade maple, constructed to produce equal width wells of varying depths. The well depths shall be determined by a quadratic residue theory sequence to optimize sound diffusion. There shall be a sequence of 7 elevations across the face.
  2. Sound Diffusion: Diffusion Coefficients shall be no less than the following:
    - 500 Hz = 0.54
    - 630 Hz = 0.57
    - 800 Hz = 0.57
    - 1000 Hz = 0.54
    - 1250 Hz = 0.47

1600 Hz = 0.53

2000 Hz = 0.46

3. Panel Width: 24 inches nominal.
4. Panel Length: Custom, As indicated on drawings.
5. Panel Orientation: As indicated on drawings.
6. Finish: Field painted as indicated on the drawings and in section 09 9123 - Interior Painting.
7. Paint Color: As indicated on drawings.
8. Trim: Bottom end cap trim to match the wood type and finish.
9. Mounting Method: Planks installed flush to the wall per manufacturer's guidelines.
10. Core Fire Rating: Class A; per ASTM E-84.
11. Products:
  - a. RPG Acoustical Systems; Modffusor: [www.rpgacoustic.com/#sle](http://www.rpgacoustic.com/#sle).
  - b. Substitutions: See Section 01 6000 - Product Requirements.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Examine substrates for conditions detrimental to installation of acoustical units. Proceed with installation only after unsatisfactory conditions have been corrected.

#### **3.02 INSTALLATION**

- A. Install diffusing units in locations as indicated, following manufacturer's installation instructions.
- B. Install mounting accessories and supports in accordance with manufacturer's instructions and shop drawings.
- C. Align panels accurately, with edges plumb and top edges level. Scribe to fit accurately at adjoining work and penetrations.
- D. Install diffusing units to construction tolerances of plus or minus 1/16 inch for the following:
  1. Plumb and level.

#### **3.03 CLEANING**

- A. Clean diffusing panels upon completion of installation from dust and other foreign materials, following manufacturer's instructions.

#### **3.04 PROTECTION**

- A. Provide protection of installed acoustical panels until Date of Substantial Completion.
- B. Replace panels that cannot be cleaned and repaired to satisfaction of the Architect.

### **END OF SECTION**

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**SECTION 09 9123  
INTERIOR PAINTING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Surface preparation.
- B. Field application of paints.
- C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
  - 1. Mechanical and Electrical:
    - a. In all areas, paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.
- D. Do Not Paint or Finish the Following Items:
  - 1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
  - 2. Items indicated to receive other finishes.
  - 3. Items indicated to remain unfinished.
  - 4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
  - 5. Stainless steel, anodized aluminum, and bronze items.
  - 6. Granite, slate, and other natural stones.
  - 7. Floors, unless specifically indicated.
  - 8. Glass.
  - 9. Acoustical materials, unless specifically indicated.
  - 10. Concealed pipes, ducts, and conduits.

**1.02 RELATED REQUIREMENTS**

- A. Section 05 5000 - Metal Fabrications: Shop-primed items.
- B. Section 06 2000 - Finish Carpentry.
- C. Section 09 9600 - High-Performance Coatings.
- D. Section 09 8439 - Sound-Diffusing Wall and Ceiling Units.
- E. Division 21: Painted identification.
- F. Division 22: Painted identification.
- G. Division 23: Painted identification.
- H. Division 26: Painted identification.

**1.03 REFERENCE STANDARDS**

- A. ASTM D4258 - Standard Practice for Surface Cleaning Concrete for Coating; 2023.
- B. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2020 (Reapproved 2025).
- C. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; Current Edition.
- D. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.
- E. SSPC-SP 13/NACE No.6 - Surface Preparation of Concrete; 2018.

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.



- B. Product Data: Provide complete list of products to be used, with the following information for each:
  - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g., "alkyd enamel").
  - 2. MPI product number (e.g., MPI #47).
  - 3. Cross-reference to specified paint system products to be used in project; include description of each system.
- C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
  - 1. Where sheen is specified, submit samples in only that sheen.
- D. Certification: By manufacturer that paints and finishes comply with VOC limits specified.
- E. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01 6000 - Product Requirements, for additional provisions.
  - 2. Extra Paint and Finish Materials: 1 gal of each color; from the same product run, store where directed.
  - 3. Label each container with color in addition to the manufacturer's label.

#### **1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum five years documented experience.

#### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

#### **1.07 FIELD CONDITIONS**

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Provide lighting level of 80 fc measured mid-height at substrate surface.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.
- B. Paints:
  - 1. Benjamin Moore: [www.benjaminmoore.com/#sle](http://www.benjaminmoore.com/#sle).
  - 2. Pittsburgh Paints: [www.pittsburghpaintsco.com/#sle](http://www.pittsburghpaintsco.com/#sle).
  - 3. Basis of Design: Sherwin-Williams Company: [www.sherwin-williams.com/#sle](http://www.sherwin-williams.com/#sle).
- C. Primer Sealers: Same manufacturer as top coats.
- D. Substitutions: See Section 01 6000 - Product Requirements.

## **2.02 PAINTS AND FINISHES - GENERAL**

- A. Paints and Finishes: Ready-mixed, unless intended to be a field-catalyzed paint.
  - 1. Where MPI paint numbers are specified, provide products listed in Master Painters Institute Approved Product List, current edition available at [www.paintinfo.com](http://www.paintinfo.com), for specified MPI categories, except as otherwise indicated.
  - 2. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
  - 3. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
  - 4. Supply each paint material in quantity required to complete entire project's work from a single production run.
  - 5. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.
- B. Flammability: Comply with applicable code for surface burning characteristics.
- C. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

## **2.03 PAINT SYSTEMS - INTERIOR**

- A. Paint I-OP - Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsum board, concrete, and concrete masonry units.
  - 1. Two top coats and one coat primer.
  - 2. Top Coat(s), typical unless noted otherwise: Institutional Low Odor/VOC Interior Latex.
    - a. Products:
      - 1) Benjamin Moore Ultra Spec 500 Interior Latex Eggshell T538. (MPI #145)
      - 2) Pittsburgh Paints Speedhide Max Interior Latex, 6-9410 Series, Satin. (MPI #145)
      - 3) Sherwin-Williams ProMar 200 Zero VOC Interior Latex, Eg-Shel. (MPI #145)
      - 4) Substitutions: See Section 01 6000 - Product Requirements
  - 3. Top Coat Sheen:
    - a. Eggshell: MPI gloss level 3; use this sheen unless noted otherwise.
    - b. In rooms where only partial or some walls are scheduled to be painted, provide sheen to match the existing adjacent sheen in the room.
  - 4. Primer: As specified under "PRIMERS" below.
- B. Paint I-OP-MD-DT - Medium Duty Door/Trim: For surfaces subject to frequent contact by occupants, including metals and wood:
  - 1. Medium duty applications include doors, door frames, railings, handrails, guardrails, and balustrades.
  - 2. Two top coats and one coat primer.
  - 3. Top Coat(s): Interior Light Industrial Coating, Water Based.
    - a. Products:
      - 1) Benjamin Moore HP DTM Semi-Gloss HP3310. (MPI #153)
      - 2) Pittsburgh Paints Pitt-Tech Plus EP WB DTM Industrial Enamel. 90-1610 Series, Semi-Gloss. (MPI #153)
      - 3) Sherwin-Williams Pro Industrial Acrylic Coating, Semi-Gloss. (MPI #153)
      - 4) Substitutions: See Section 01 6000 - Product Requirements
  - 4. Top Coat Sheen:
    - a. Semi-Gloss: MPI gloss level 5; use this sheen at all locations.
  - 5. Primer: As specified under "PRIMERS" below.
- C. Paint I-OP-MD-WC - Medium Duty Overhead: Including gypsum board.

1. Two top coats and one coat primer.
  2. Top Coat(s): Institutional Low Odor/VOC Interior Latex.
    - a. Products:
      - 1) Benjamin Moore Ultra Spec 500 Interior Latex Flat T525. (MPI #143)
      - 2) Pittsburgh Paints Speedhide Interior Zero VOC Latex, 6-70ZV Series, Flat. (MPI #143)
      - 3) Sherwin-Williams ProMar 200 Zero VOC Interior Latex, Flat. (MPI #143)
      - 4) Substitutions: See Section 01 6000 - Product Requirements
  3. Top Coat Sheen:
    - a. Flat: MPI gloss level 1; use this sheen for ceilings and other overhead surfaces.
  4. Primer: As specified under "PRIMERS" below.
- D. Paint WI-OP-3L - Wood, Opaque:
1. Primer: As specified under "PRIMERS" below.
  2. Top Coat(s): Two coats
  3. Products:
    - a. Benjamin Moore HP DTM Semi-Gloss HP3310. (MPI #153)
    - b. Pittsburgh Paints Pitt-Tech Plus EP WB DTM Industrial Enamel. 90-1610 Series, Semi-Gloss. (MPI #153)
    - c. Sherwin-Williams Pro Industrial Acrylic Coating, Semi-Gloss. (MPI #153)
  4. Top Coat Sheen:
    - a. Satin: MPI gloss level 4; use this sheen on wood base and quarter round trim on the stage.
    - b. Semi-Gloss: MPI gloss level 5; use this sheen as typical unless noted otherwise.

## 2.04 PRIMERS

- A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.
1. Concrete Primer.
    - a. Products:
      - 1) Benjamin Moore Ultra Spec Masonry Interior/Exterior 100% Acrylic Sealer 608. (MPI #3)
      - 2) Pittsburgh Paints Perma-Crete Interior/Exterior Alkali Resistant Primer, 4-603XI. (MPI #3)
      - 3) Sherwin-Williams Loxon Concrete and Masonry Primer Sealer, LX02W50. (MPI #3)
      - 4) Substitutions: See Section 01 6000 - Product Requirements
  2. Concrete Masonry Unit Primer.
    - a. Products:
      - 1) Benjamin Moore Ultra Spec Masonry Interior/Exterior Hi-Build Block Filler 571. (MPI #4)
      - 2) Pittsburgh Paints Speedhide Masonry Hi Fill Latex Block Filler, 6-15XI. (MPI #4)
      - 3) Sherwin-Williams PrepRite Block Filler. (MPI #4)
      - 4) Substitutions: See Section 01 6000 - Product Requirements
  3. Gypsum Board Primer.
    - a. Products:
      - 1) Benjamin Moore Ultra Spec 500 Interior Latex Primer N534. (MPI #50)
      - 2) Pittsburgh Paints Speedhide zero VOC Interior Latex Sealer, 6-4900XI. (MPI #50)
      - 3) Sherwin-Williams ProMar 200 Zero VOC Interior Latex Primer. (MPI #50)
      - 4) Substitutions: See Section 01 6000 - Product Requirements
  4. Interior Rust-Inhibitive Water Based Primer for Metals and Wood.
    - a. Products:

- 1) Benjamin Moore Acrylic Metal Primer HP1100. (MPI #107)
- 2) Pittsburgh Paints Pitt-Tech Plus Interior/Exterior EP DTM Waterborne Acrylic Primer/Finish, 90-1908. (MPI #107)
- 3) Sherwin-Williams Pro-Cryl Universal Primer. (MPI #107)
- 4) Substitutions: See Section 01 6000 - Product Requirements

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- C. Test shop-applied primer for compatibility with subsequent cover materials.
- D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:
  1. Gypsum Wallboard: 12 percent.
  2. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
  3. Interior Wood: 15 percent, measured in accordance with ASTM D4442.
  4. Concrete Floors and Traffic Surfaces: 8 percent.

#### **3.02 PREPARATION**

- A. Clean surfaces thoroughly and correct defects prior to application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
- D. Seal surfaces that might cause bleed through or staining of topcoat.
- E. Concrete:
  1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
  2. Clean concrete according to ASTM D4258. Allow to dry.
  3. Prepare surface as recommended by top coat manufacturer and in accordance with SSPC-SP 13/NACE No.6.
- F. Masonry:
  1. Remove efflorescence and chalk. Do not coat surfaces if moisture content, alkalinity of surfaces, or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions. Allow to dry.
  2. Prepare surface as recommended by top coat manufacturer.
- G. Concrete Floors and Traffic Surfaces: Remove contamination, acid etch and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.
- H. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.
- I. Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.
- J. Wood Doors to be Field-Finished: Seal wood door top and bottom edge surfaces with clear sealer.
- K. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

#### **3.03 APPLICATION**

- A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
- C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- D. Apply each coat to uniform appearance in thicknesses specified by manufacturer.
- E. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.
- F. Sand wood and metal surfaces lightly between coats to achieve required finish.
- G. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- H. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

#### **3.04 CLEANING**

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

#### **3.05 PROTECTION**

- A. Protect finishes until completion of project.

#### **3.06 COLOR SCHEDULE**

- A. See the color schedule on the drawings.

**END OF SECTION**

**SECTION 09 9600  
HIGH-PERFORMANCE COATINGS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Water-based epoxy floor coating system.
- B. Surface preparation.

**1.02 RELATED REQUIREMENTS**

- A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 03 3000 - Cast-in-Place Concrete.
- C. Section 09 6419 - Wood Composition Flooring: Hardboard overlay stage flooring.

**1.03 REFERENCE STANDARDS**

- A. ASTM D523 - Standard Test Method for Specular Gloss; 2014 (Reapproved 2018).
- B. ASTM D2794 - Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact); 1993 (Reapproved 2024).
- C. ASTM D3359 - Standard Test Methods for Rating Adhesion by Tape Test; 2023.
- D. ASTM D4060 - Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser; 2025.
- E. ASTM D4541 - Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers; 2022.
- F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- G. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide complete list of all products to be used, with the following information for each:
  - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
- C. Samples: Submit two cured samples of coating system, 6 by 6 inch in size, illustrating color and sheen selected.
- D. Manufacturer's Certificate: Certify that high-performance coatings comply with VOC limits specified.
- E. Manufacturer's Installation Instructions: Indicate special procedures and preparation, mixing, and application instructions.
- F. Maintenance Data: Include cleaning procedures, repair and patching techniques, and compatible cleaning agents.

**1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum ten years documented experience.
- B. Applicator Qualifications: Company specializing in performing the work of this section with minimum five years documented experience.

**1.06 MOCK-UPS**

- A. See Section 01 4000 - Quality Requirements for general requirements for mock-ups.
- B. Provide mock-up of 100 square feet illustrating coating, color, and surface sheen for each substrate.
- C. Locate where directed by the Architect.
- D. Mock-up may remain as part of the work.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of coating, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Coating Materials: Store at minimum ambient temperature of 50 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions. Protect materials from freezing, moisture, and direct sunlight.

#### **1.08 FIELD CONDITIONS**

- A. Apply only when ambient and substrate temperatures are within manufacturer's recommended range and at least 5 °F above dew point.
- B. Maintain this temperature range, 24 hours before, during, and 72 hours after installation of coating.
- C. Restrict traffic from area where coating is being applied or is curing.

#### **1.09 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Provide manufacturer's standard one-year warranty against defects in materials and workmanship.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. High-Performance Coatings:
  - 1. Benjamin Moore: [www.benjaminmoore.com/#sle](http://www.benjaminmoore.com/#sle).
  - 2. PPG Paints: [www.ppgpaints.com/#sle](http://www.ppgpaints.com/#sle).
  - 3. Sherwin-Williams Company: [www.protective.sherwin-williams.com/industries/#sle](http://www.protective.sherwin-williams.com/industries/#sle).
  - 4. Substitutions: Section 01 6000 - Product Requirements.

#### **2.02 HIGH-PERFORMANCE COATINGS**

- A. Water Based Epoxy Floor Coating for Hardboard Panel Flooring, Type HPC-1 and HPC-2:
  - 1. Coating: Water based epoxy floor coating; two-component polyamine epoxy.
  - 2. Number of Coats: Two.
  - 3. Volatile Organic Compound (VOC) Content: See Section 01 6116.
  - 4. Finish: Satin.
  - 5. Product Characteristics:
    - a. Percentage of solids by volume, 40 percent,  $\pm 2$  percent.
    - b. Dry film thickness, per coat, 2.0 - 3.0 mils, DFT.
    - c. Performance Requirements (minimum):
      - 1) Adhesion, ASTM D4541: > 400 psi.
      - 2) Abrasion Resistance, ASTM D4060, CS-17/1000 cycles/1000 g: 150 mg loss.
      - 3) Gloss, ASTM D523: 15 - 25 units at 85 degrees.
      - 4) Impact Resistance, ASTM D2794: 100 in.lb. direct; 80 in.lb. indirect.
      - 5) Slip Resistance, Floors, 0.60 minimum static coefficient of friction: Passes wet and dry.

6. Products:
  - a. Benjamin Moore Corotech V440 Waterborne Epoxy: [www.benjaminmoore.com/#sle](http://www.benjaminmoore.com/#sle).
  - b. PPG Paints, Aquapon WB Epoxy Coating: [www.ppgpaints.com/#sle](http://www.ppgpaints.com/#sle).
  - c. Sherwin-Williams Company, ArmorSeal 8100: [www.protective.sherwin-williams.com/industries/#sle](http://www.protective.sherwin-williams.com/industries/#sle).
7. Top Coat/Sealer:
  - a. Coating: Two-component waterborne hardwood floor finish; water, polymeric resins, and amorphous silica.
  - b. Number of Coats: One.
  - c. Volatile Organic Compound (VOC) Content: less than 150 g/L (with hardner).
  - d. Clarity: Clear and colorless when dry.
  - e. pH: 7.9.
  - f. Solids: 34 percent (with hardner).
  - g. Finish: Extra Matte.
  - h. Products:
    - 1) Bona Traffic HD.
    - 2) Substitutions: Section 01 6000 - Product Requirements

### **2.03 ACCESSORY MATERIALS**

- A. Accessory Materials: Provide primers, patch and crack filler, sealers, and cleaning agents compatible with coating and as recommended by the coating manufacturer.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Do not begin application of coatings until substrates have been properly prepared.
- C. Verify that substrate surfaces are clean, dry, sound, free of contaminants, and ready to receive work as instructed by the coating manufacturer. Obtain and follow manufacturer's instructions for examination and testing of substrates.
- D. Verify moisture content and alkalinity of concrete per manufacturer's limitations.
- E. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- F. Proceed with coating application only after unacceptable conditions have been corrected.
  1. Commencing coating application constitutes Architects's acceptance of substrates and conditions.

### **3.02 PREPARATION**

- A. Protect adjacent surfaces and materials not receiving coating from spatter and overspray; mask if necessary to provide adequate protection. Repair damage.
- B. Clean surfaces of loose foreign matter.
- C. Remove grease, oil, curing compounds, and loose material by shot-blasting or mechanical means.
- D. Remove finish hardware, fixture covers, and accessories and store.
- E. Fill cracks, voids, spalls and joints with approved patching compound and allow to cure.

### **3.03 COATING APPLICATION**

- A. Mix and apply coatings in strict accordance with manufacturer's written instructions, to thicknesses specified and recommendations in MPI - Architectural Painting and Specification Manual.



- B. Apply in uniform thickness coats, without runs, drips, pinholes, brush marks, or variations in color, texture, or sheen. Finish edges, crevices, corners, and other changes in dimension with full coating thickness in coverage rates required to achieve specified film thickness.
- C. Provide proper ventilation and protection from dust and traffic until fully cured.

**3.04 FIELD QUALITY CONTROL**

- A. See Section 01 4000 - Quality Requirements for general requirements for field inspection.
- B. Repair or recoat deficient areas to obtain continuous film of uniform thickness.

**3.05 CLEANING**

- A. After coating has cured, clean surfaces per manufacturer's recommendations before turnover.

**3.06 PROTECTION**

- A. Protect finished work from damage.

**END OF SECTION**

**SECTION 10 1100  
VISUAL DISPLAY UNITS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Porcelain enamel steel markerboards.

**1.02 REFERENCE STANDARDS**

- A. ASTM A424/A424M - Standard Specification for Steel, Sheet, for Porcelain Enameling; 2018.
- B. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.
- C. ASTM C208 - Standard Specification for Cellulosic Fiber Insulating Board; 2022.
- D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.

**1.03 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's data on porcelain enamel steel markerboard, tackboard, tackboard surface covering, trim, and accessories.
- C. Shop Drawings: Indicate wall elevations, dimensions, joint locations, attachment methods, special anchor details.
- D. Samples: Color charts for selection of color and texture of porcelain enamel steel markerboard and tackboard surface covering.
- E. Test Reports: Show compliance to specified surface burning characteristics requirements.
- F. Manufacturer's printed installation instructions.
- G. Maintenance Data: Include data on regular cleaning, stain removal .

**1.04 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.

**1.05 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year warranty for markerboard to include warranty against discoloration due to cleaning, crazing or cracking, and staining.

**PART 2 PRODUCTS**

**2.01 VISUAL DISPLAY UNITS**

- A. Magnetic Porcelain Enamel Steel Markerboards:
  - 1. Manufacturers:
    - a. Basis-of-design: Claridge Products and Equipment, Inc; Series 4: [www.claridgeproducts.com/#sle](http://www.claridgeproducts.com/#sle).
    - b. Substitutions: See Section 01 6000 - Product Requirements.
  - 2. Color: White.
  - 3. Steel Face Sheet: Enameling grade cold rolled steel.
  - 4. Core: Fiberboard, 7/16 inch thick, laminated to face sheet.
  - 5. Backing: Aluminum sheet, laminated to core.
  - 6. Size: As indicated on drawings.
  - 7. Frame: Extruded aluminum.
  - 8. Frame Size: 5/8 inch wide.

- 9. Frame Finish: Anodized, clear.
- 10. Accessories: Provide marker tray, map rail, and flag holder.

## **2.02 MATERIALS**

- A. Porcelain Enameled Steel Sheet: ASTM A424/A424M, Type I, Commercial Steel, with fired-on vitreous finish.
- B. Fiber Board: ASTM C208, cellulosic fiber board.
- C. Aluminum Sheet Backing: 27 gauge, 0.014 inch thick.
- D. Adhesives: Type used by manufacturer.

## **2.03 ACCESSORIES**

- A. Map Rail: Extruded aluminum, manufacturer's standard profile, with cork insert and runners for accessories; 1 inch wide overall , full width of frame.
- B. Flag Holders: Cast aluminum bored to receive 1 inch diameter flag staff, bracketed to fit top rail of board.
- C. Marker Tray: Aluminum, manufacturer's standard profile, one piece full length of markerboard, molded ends, concealed fasteners, same finish as frame.
- D. Mounting Brackets: Concealed.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that field measurements are as indicated.

### **3.02 PREPARATION**

- A. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

### **3.03 INSTALLATION**

- A. Install boards in accordance with manufacturer's instructions.
- B. Install with top of marker tray at height indicated on the drawing and reviewed with the Owner.
- C. Secure units level and plumb.
- D. Butt Joints: Install with tight hairline joints.

### **3.04 CLEANING**

- A. Clean board surfaces in accordance with manufacturer's instructions.
- B. Remove temporary protective cover at Date of Substantial Completion.

## **END OF SECTION**

## **SECTION 10 1423 PANEL SIGNAGE**

### **PART 1 GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Panel signage.

#### **1.02 REFERENCE STANDARDS**

- A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- B. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

#### **1.03 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's product literature for each type of panel sign, indicating styles, font, colors, locations, and overall dimensions of each sign.
- C. Shop Drawings:
  - 1. Include dimensions, locations, elevations, materials, text and graphic layout, attachment details, and schedules.
  - 2. Schedule: Provide information sufficient to completely define each panel sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.
    - a. Submit for approval by Owner through Architect prior to fabrication.
- D. Samples: Submit two samples each of a solid panel type, of size similar to that required for project, indicating sign style, font, and method of attachment.
- E. Manufacturer's Installation Instructions: Include installation templates and attachment devices.
- F. Manufacturer's qualification statement.

#### **1.04 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years of documented experience.

#### **1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Package signs as required to prevent damage before installation.
- B. Store tape adhesive at normal room temperature.

#### **1.06 FIELD CONDITIONS**

- A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.
- B. Maintain minimum ambient temperature during and after installation.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Panel Signage:
  - 1. ASI Sign Systems, Inc: [www.asisignage.com/#](http://www.asisignage.com/#).
  - 2. Best Sign Systems, Inc: [www.bestsigns.com/#sle](http://www.bestsigns.com/#sle).
  - 3. OSS/Kroy Product Center: [www.osskroy.com/#sle](http://www.osskroy.com/#sle).
  - 4. Takeform: [www.takeform.net/#sle](http://www.takeform.net/#sle).
  - 5. Substitutions: See Section 01 6000 - Product Requirements.

#### **2.02 REGULATORY REQUIREMENTS**

- A. Accessibility Requirements: Comply with ADA Standards and ICC A117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most restrictive requirements.

## **2.03 PANEL SIGNAGE**

- A. Panel Signage:
  - 1. Application: Sign types as indicated on drawings.
  - 2. Description: Flat panel acrylic sign system with tactile characters integral to sign material. Applied characters and graphics will not be accepted. 3D printed signs will not be accepted.
  - 3. Sign Sizes: As indicated on drawings.
  - 4. Total Thickness: 1/4 inch.
  - 5. Sign Edges: Squared, free from chips, burrs, sharp edges or marks.
  - 6. Corners: Squared.
  - 7. Color and Font, unless otherwise indicated:
    - a. Character Font: To match font on existing panel signs in the building and as approved by Architect.
    - b. Character Case: As indicated on drawings.
    - c. Background Color: As indicated on drawings and as selected by Architect including custom colors to match existing panel signs in the building.
    - d. Character Color: As indicated on drawings and as selected by Architect including custom colors to match existing panel signs in the building.
  - 8. Material: Fabricated of two layers of acrylic, sign color shall be applied to sub-surface to protect from scratches or other damage. Acrylic shall be non-glare optically clear with no loss of clarity or composition.
  - 9. Tactile Letters: Raised 1/32 inch minimum, integral to sign material.
  - 10. Braille: Grade II, ADA-compliant.
  - 11. Pictograms: As indicated on drawings.
  - 12. Mounting: Tape adhesive.
    - a. Blank backer of same sign material, size, and shape mounted on opposite side of signs installed on glass.

## **2.04 ACCESSORIES**

- A. Tape Adhesive: Double-sided, pressure sensitive acrylic foam tape, permanent adhesive.
  - 1. Products:
    - a. VHB™ by 3M™: [www.3m.com/#](http://www.3m.com/#).
    - b. Substitutions: See Section 01 6000 - Product Requirements.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that substrate surfaces are ready to receive work.
- B. Notify Architect if conditions are not suitable for installation of signs; do not proceed until conditions are satisfactory.

### **3.02 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install with horizontal edges level.
- C. Locate panel signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.
- D. Protect from damage until Substantial Completion; repair or replace damaged items.

### **3.03 SIGNAGE TYPE SCHEDULE**

- A. Refer to signage schedule, types, and locations on drawings.

**END OF SECTION**

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**SECTION 10 2113.19  
PLASTIC TOILET COMPARTMENTS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Solid plastic toilet compartments: floor mounted, head rail braced.
- B. Urinal screens: floor mounted.

**1.02 RELATED REQUIREMENTS**

- A. Section 05 5000 - Metal Fabrications: Concealed steel support members.
- B. Section 06 1000 - Rough Carpentry: Blocking and supports.
- C. Section 10 2800 - Toilet, Bath, and Laundry Accessories.
- D. Section 09 2216 - Non-Structural Metal Framing.
- E. Division 22 - Plumbing Fixtures.

**1.03 REFERENCE STANDARDS**

- A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- B. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2024.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- D. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth; 2024.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination: Coordinate the work with placement of support framing and anchors in walls and ceilings.

**1.05 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on panel construction, hardware, accessories, and finishes.
- C. Shop Drawings:
  - 1. Indicate plans, elevations, and dimensions. Include door swings, toilet fixture centerlines, and floor drains on plans.
  - 2. Indicate details of wall, floor, and ceiling supports and attachments.
- D. Samples: Submit two samples of partition panels, 3" by 3" inch in size illustrating panel finish, color, and sheen.
- E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

**1.06 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing of products specified in this section with minimum five years documented experience.
- B. Installer Qualifications: Company specializing in installing products specified in this section with a minimum five years documented experience and approved by manufacturer.
- C. Materials: Doors, panels and pilasters, constructed from high density polyethylene (HDPE) resins. Partitions to be fabricated from polymer resins compounded under high pressure, forming a single component which is waterproof, nonabsorbent and has a self-lubricating surface that resists marks from pens, pencils, markers and other writing instruments. Cover all plastic components with a protective plastic masking.



### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. See 01 7419 - Construction Waste Management and Disposal for packaging waste requirements.
- B. Deliver, store, and handle materials and products in accordance with manufacturer's instructions and recommendations and industry standards.
- C. Do not deliver materials or begin installation until building temperature is maintained at minimum of 60 degrees F.
- D. Store products indoors in manufacturer's or fabricator's original containers and packaging, with labels clearly identifying product name and manufacturer. Protect from damage.
- E. Lay cartons flat, with adequate support to ensure flatness and prevent damage to prefinished surfaces.
- F. Do not store where ambient temperature exceeds 120 degrees F.

### **1.08 PROJECT CONDITIONS**

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
- B. Ambient Conditions: Maintain building temperature at minimum of 60 degrees F for 24 hours before, during, and after installation of toilet partitions.
- C. Existing Conditions: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

### **1.09 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Manufacturer Warranty: Provide 25-year manufacturer warranty for HDPE material against breakage, corrosion, and delamination from Date of Substantial Completion.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Source Limitations: Furnish products produced by single manufacturer and obtained from single supplier.
- B. Solid Plastic Toilet Compartments and Urinal Screens:
  - 1. ASI Global Partitions; Accurate Partitions: [www.asi-globalpartitions.com/#sle](http://www.asi-globalpartitions.com/#sle).
  - 2. Scranton Products; Hiny Hiders Partitions: [www.scrantonproducts.com/#sle](http://www.scrantonproducts.com/#sle).
  - 3. Substitutions: Section 01 6000 - Product Requirements.

### **2.02 PLASTIC TOILET COMPARTMENTS**

- A. Solid Plastic Toilet Compartments: Factory fabricated doors, pilasters, and divider panels made of solid molded high density polyethylene (HDPE), tested in accordance with NFPA 286; floor-mounted headrail-braced.
  - 1. Colors: As indicated on the drawings.
  - 2. Finish: Pebble-textured; homogenous color throughout material.
- B. Design Criteria:
  - 1. Accessibility: Design compartments indicated on drawings to comply with applicable codes for the project and ADA Standards.
  - 2. Fire Performance: Provide assemblies that pass when tested in accordance with NFPA 286.
  - 3. Surface Burning Characteristics: Provide assemblies with flame spread index of 75 or less and smoke developed index of 450 or less (Class B), when tested in accordance with ASTM E84.

- C. Fabrication:
  - 1. Fabricate toilet compartment components to sizes indicated, in single component sections.
  - 2. Provide shoes and caps at pilasters and posts to conceal anchorage, supports, and leveling mechanisms.
- D. Components: Single sheets of solid molded homogenous high-density polyethylene (HDPE).
  - 1. Doors:
    - a. Thickness: 1 inch.
    - b. Width: As indicated on the drawings.
    - c. Width for Handicapped Use: As indicated on the drawings.
    - d. Height: 55 inch.
    - e. Panel Height Above Floor: 14 inches.
  - 2. Panels:
    - a. Thickness: 1 inch.
    - b. Height: 55 inch.
    - c. Depth: As indicated on drawings.
  - 3. Pilasters:
    - a. Thickness: 1 inch.
    - b. Width: As required to fit space; minimum 3 inch.
  - 4. Screens: Without doors; to match compartments; with pilasters; and mounted to wall with continuous panel brackets.
    - a. Thickness: 1 inch.
    - b. Height: 55 inch.
    - c. Panel Height Above Floor: 12 inches.
    - d. Depth: As indicated on drawings.

### 2.03 ACCESSORIES

- A. Pilaster Shoes: Stainless steel, satin finish, 3 inches high; concealing floor fastenings and leveling bolts; secured to pilaster with stainless steel tamper-resistant screws; secured to floor with concrete anchors.
  - 1. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster.
- B. Head Rails: Extruded aluminum, anti-grip profile.
  - 1. Size: 1 inch by 1-1/2 inch.
  - 2. Fasteners: Head rails shall be fastened to top of pilasters and headrail brackets by thru-bolting with one-way stainless steel sex bolts.
- C. Wall, Pilaster, and Head Rail Brackets: Stainless steel; continuous type.
- D. Attachments, Screws, and Bolts: Stainless steel, tamper proof type.
  - 1. For attaching panels and pilasters to brackets: Sex-type through-bolts and nuts; tamper proof.
- E. Hinges: Stainless steel; satin finish.
  - 1. Continuous-type hinge, self closing. Provide one per door.
  - 2. Height: 54 inch minimum.
- F. Door Hardware: Stainless steel; satin finish.
  - 1. Door Latch: Slide type with exterior emergency access feature. Provide one per door.
  - 2. Door Strike and Keeper with Rubber Bumper: Mount on pilaster in alignment with door latch. Provide one per door.
  - 3. Provide door pull for outswinging doors. Provide two per door, one each side.
- G. Coat Hook: One per compartment, mounted on door.

### PART 3 EXECUTION

### **3.01 EXAMINATION**

- A. Verify that field measurements are as indicated on shop drawings.
- B. Verify correct spacing of and between plumbing fixtures.
- C. Verify correct location of built-in framing, anchorage, and bracing.

### **3.02 INSTALLATION**

- A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions and shop drawings.
- B. Maintain 3/8 inch to 1/2 inch space between wall and panels and between wall and end pilasters.
- C. Attach panel brackets securely to walls using anchor devices.
- D. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.
- E. Field touch-up of scratches or damaged finish will not be permitted. Replace damaged or scratched materials with new materials. No evidence of cutting, drilling, and/or patching shall be visible on the finished work.

### **3.03 TOLERANCES**

- A. Maximum Variation From True Position: 1/4 inch.
- B. Maximum Variation From Plumb: 1/8 inch.

### **3.04 ADJUSTING**

- A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch.
- B. Adjust hinges to position doors in partial opening position when unlatched. Return out-swinging doors to closed position.
- C. Adjust adjacent components for consistency of line or plane.

**END OF SECTION**

**SECTION 10 2600**  
**WALL AND DOOR PROTECTION**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Protective wall covering.

**1.02 REFERENCE STANDARDS**

- A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- B. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics; 2024.
- C. ASTM D543 - Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents; 2021.
- D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- E. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2024.
- F. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

**1.03 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Indicate material properties, dimensions, adhesives, and accessories.
- C. Shop Drawings: Include plans, elevations, sections, seaming details, and attachment details.
- D. Samples: Submit samples illustrating component design, configurations, joinery, color and finish for each type as indicated on drawings.
  - 1. Submit two samples of protective wall covering, 6 by 6 inches square. Include examples of joinery, corners, and field splices.
- E. Manufacturer's Instructions: Indicate special procedures, perimeter conditions requiring special attention.
- F. Warranty Documentation: Submit manufacturer warranty.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project:
  - 1. See Section 01 6000 - Product Requirements, for additional provisions.
  - 2. Extra Stock Materials: Minimum 120 square feet of each kind of protective wall covering.
  - 3. Mounting and Accessory Components: Amounts proportional to the quantities of extra materials. Package mounting and accessory components with each extra material.
- H. Maintenance Data: Manufacturer's instructions for care and cleaning of each type of product. Include information about both recommended and potentially detrimental cleaning materials and methods.

**1.04 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver items in original, undamaged protective packaging. Label items to designate installation locations.
- B. Protect work from moisture damage.
- C. Protect work from UV light damage.
- D. Do not deliver products to project site until areas for storage and installation are fully enclosed, and interior temperature and humidity are in compliance with manufacturer's recommendations for each type of item.

- E. Store products in either horizontal or vertical position, in compliance with manufacturer's instructions.

#### **1.05 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide limited lifetime manufacturer warranty for wall protection products.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures or internal connection failures.
    - b. Detachment of components from each other or substrates, delamination and permanent deformation.
    - c. Deterioration of materials beyond that expected of normal use, as intended by manufacturer.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Protective Wall Covering:
  - 1. Construction Specialties, Inc; Acrovyn High-Impact Wall Covering: [www.c-sgroup.com/#sle](http://www.c-sgroup.com/#sle).
  - 2. Inpro; Palladium Rigid Sheet: [www.inprocorp.com/#sle](http://www.inprocorp.com/#sle).
  - 3. Koroseal Interior Products; Korogard Sheets: [www.koroseal.com/#sle](http://www.koroseal.com/#sle).
  - 4. Substitutions: See Section 01 6000 - Product Requirements.

#### **2.02 PERFORMANCE CRITERIA**

- A. Impact Strength: Unless otherwise noted, provide protection products and assemblies that have been successfully tested for compliance with applicable provisions of ASTM D256 and/or ASTM F476.
- B. Chemical and Stain Resistance: Unless otherwise noted, provide protection products and assemblies with chemical and stain resistance complying with applicable provisions of ASTM D543.

#### **2.03 PRODUCT TYPES**

- A. Protective Wall Covering:
  - 1. Material: High-impact acrylic-modified vinyl.
  - 2. Thickness: 0.040 inch.
  - 3. Surface Burning Characteristics: Provide assemblies with flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
  - 4. Color: As indicated on drawings.
  - 5. Texture: Suede.
  - 6. Accessories: Provide manufacturer's standard color-matched trim and moldings.
    - a. Inside Corner Trim: Standard angle
    - b. Outside Corner Trim: Standard angle.
  - 7. Mounting: Adhesives as approved by manufacturer.
  - 8. Caulk: Furnish color matched caulk by protective wallcovering manufacturer to ensure accurate match of colors at vertical joints not at corners.
- B. Adhesives and Primers: As recommended by manufacturer.

#### **2.04 FABRICATION**

- A. Fabricate components with tight joints, corners and seams.
- B. Fabricate components in single largest piece possible without seams.
- C. Form end trim closure by capping and finishing smooth.

## **2.05 SOURCE QUALITY CONTROL**

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Provide wall and door protection systems of each type from a single source and manufacturer.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that field measurements are as indicated on drawings.
- B. Verify that substrate surfaces for adhered items are clean and smooth.
  - 1. Test painted or wall covering surfaces for adhesion in inconspicuous area, as recommended by manufacturer. Follow adhesive manufacturer's recommendations for remedial measures at locations and/or application conditions where adhesion test's results are unsatisfactory.
- C. Start of installation constitutes acceptance of project conditions.

### **3.02 INSTALLATION**

- A. Install components in accordance with manufacturer's instructions, level and plumb, secured rigidly in position to supporting construction.
- B. Position protective wall covering at heights indicated on drawings.
  - 1. Wainscot Installation: Establish a level line at the specified height for entire length of run. Install by aligning top of edge of covering with this line.
  - 2. Apply adhesive with manufacturer recommended trowel to an area of wall surface that can be completed within cure time of the adhesive.
  - 3. Install trim pieces as required for a complete installation. Allow tolerance for thermal movement.
  - 4. At joints indicated to be caulked, allow for a minimum 1/16 inch wide gap between edges of sheets. Gaps are required to be of consistent width throughout the project.
  - 5. Use a roller to ensure maximum contact with adhesive.
  - 6. At inside and outside corners cut covering sheets to facilitate installation of trim pieces.

### **3.03 TOLERANCES**

- A. Maximum Variation From Required Height: 1/4 inch.
- B. Maximum Variation From Level or Plane For Visible Length: 1/4 inch.

### **3.04 CLEANING**

- A. Clean wall and door protection items of excess adhesive, dust, dirt, and other contaminants.

**END OF SECTION**

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**SECTION 10 2800  
TOILET, BATH, AND LAUNDRY ACCESSORIES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Commercial toilet accessories.
- B. Electric hand/hair dryers (ALTERNATE NO. A-01).

**1.02 RELATED REQUIREMENTS**

- A. Section 06 1000 - Rough Carpentry: Concealed supports for accessories, including in wall framing and plates.
- B. Section 10 2113.19 - Plastic Toilet Compartments.
- C. Division 22: Under-lavatory pipe and supply covers.
- D. Division 26: Power for electric hand/hair dryers.

**1.03 REFERENCE STANDARDS**

- A. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2024.
- B. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2024.
- C. ASTM B456 - Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium; 2017 (Reapproved 2022).
- D. ASTM C1036 - Standard Specification for Flat Glass; 2025.
- E. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror; 2024.
- F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- G. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordinate the work with the placement of internal wall reinforcement and reinforcement of toilet partitions to receive anchor attachments.

**1.05 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.
- C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Store products in manufacturer's unopened packaging until ready for installation.

**1.07 PROJECT CONDITIONS**

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits as recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's limit.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Commercial Toilet, Shower, and Bath Accessories:
  - 1. Basis-of-design: Bobrick Washroom Equipment, Inc: [www.bobrick.com/#sle](http://www.bobrick.com/#sle).



2. American Specialties, Inc: [www.americanspecialties.com/#sle](http://www.americanspecialties.com/#sle).
  3. Bradley Corporation: [www.bradleycorp.com/#sle](http://www.bradleycorp.com/#sle).
  4. Substitutions: Section 01 6000 - Product Requirements.
- B. Electric Hand/Hair Dryers (ALTERNATE NO. A-01):
1. Excel Dryer: [www.exceldryer.com/#sle](http://www.exceldryer.com/#sle).
  2. Substitutions: Not permitted.
- C. Provide products of each category type by single manufacturer.

## **2.02 MATERIALS**

- A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
- B. Keys: Provide keys for each accessory to Owner; master key lockable accessories.
- C. Stainless Steel Sheet: ASTM A666/A666M, Type 304.
- D. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.
- E. Mirror Glass: Annealed float glass, ASTM C1036 Type I, Class 1, Quality Q2, with silvering, protective and physical characteristics complying with ASTM C1503.
- F. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.

## **2.03 FINISHES**

- A. Stainless Steel: Satin finish, unless otherwise noted.
- B. Chrome/Nickel Plating: ASTM B456, SC 2, polished finish, unless otherwise noted.

## **2.04 COMMERCIAL TOILET ACCESSORIES**

- A. Toilet Paper Dispenser (T6):
1. Furnished by owner; installed by contractor.
- B. Paper Towel Dispenser (T11):
1. Furnished by owner; installed by contractor.
- C. Soap Dispenser (T9):
1. Furnished by owner; installed by contractor.
- D. Mirrors (T8):
1. Type: One-piece, stainless steel framed.
    - a. Glass: No. 1 quality, 1/4 inch (6mm) select float glass, electrolytically copper-plated by the galvanic process, guaranteed for 15 years against silver spoilage. Edges shall be protected by plastic filler strips; back is protected by full-size, shock-absorbing, water-resistant, nonabrasive, 3/16 inch thick polyethylene padding.
    - b. Frame: One-piece, 18-8 stainless steel angle frame, 3/4 inch by 3/4 inch with continuous integral stiffener on all sides and beveled front to hold frame tightly against mirror. Corners shall be heliarc welded, ground, and polished smooth.
    - c. Frame Finish: Satin.
    - d. Wall Hanger: Integral, heavy-gauge steel horizontal hanging brackets located at the top and bottom for concealed mounting on concealed wall hanger to prevent the mirror from pulling away from the wall.
    - e. Size: As indicated on drawings.
  2. Products:
    - a. Bobrick; Model B-2888: [www.bobrick.com/#sle](http://www.bobrick.com/#sle).
    - b. Substitutions: Section 01 6000 - Product Requirements.
- E. Grab Bars (T1, T2, T3, T4, and T5):
1. Type: Stainless steel, smooth surface.

- a. Construction: 1-1/2 inch outside diameter, minimum 18-gauge (1.2mm) type 304 stainless steel tubing, concealed flange mounting, 1-1/2 inch clearance between wall and inside of grab bar.
- b. Finish: Satin.
- c. Length and Configuration: As indicated on drawings and as required by code.
- d. Mounting: Concealed mounting flanges shall be 11-gauge (3.2mm) stainless steel plate, 2 inches by 3-1/8 inches, equipped with at least two screw holes for attachment to wall.
- e. Flange covers: Shall be 22-gauge (0.8mm), 3-1/4 inch diameter by 1/2 inch deep and shall snap over mounting flange to conceal mounting screws. Ends of grab bar shall pass through concealed mounting flanges and be heliarc welded to form one structural unit.
- f. Strength: Shall comply with accessibility guidelines for structural strength.
2. Products:
  - a. Bobrick; Series B-6806 for straight grab bars and series B-6861 for two-wall grab bars: [www.bobrick.com/#sle](http://www.bobrick.com/#sle).
  - b. Substitutions: Section 01 6000 - Product Requirements.
- F. Sanitary Napkin/Tampon Dispenser (T19):
  1. Furnished by owner; installed by contractor.

## **2.05 ELECTRIC HAND/HAIR DRYERS (ALTERNATE NO. A-01)**

- A. Electric Hand Dryers: Traditional fan-in-case type, with downward fixed nozzle.
  1. Operation: Automatic, sensor-operated on and off.
  2. Mounting: Wall-mounted - surface.
  3. Cover: Stainless steel with brushed finish.
    - a. Tamper-resistant screw attachment of cover to mounting plate.
  4. Electric Hand Dryer Products:
    - a. Excel Dryer Inc; XLERATOR: [www.exceldryer.com/#sle](http://www.exceldryer.com/#sle).
    - b. Substitutions: Not permitted.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify conditions before starting work.
- B. Verify exact location of accessories for installation.
- C. For electrically-operated accessories, verify that electrical power connections are ready and in the correct locations.
- D. Verify that field measurements are as indicated on drawings.

### **3.02 PREPARATION**

- A. Deliver inserts and rough-in frames to site for timely installation.
- B. Provide templates and rough-in measurements as required.

### **3.03 INSTALLATION**

- A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.
- B. Install plumb and level, securely and rigidly anchored to substrate.
- C. Mounting Heights: As indicated on the drawings and as required by accessibility regulations.

### **3.04 PROTECTION**

- A. Protect installed accessories from damage due to subsequent construction operations.

## **END OF SECTION**

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**SECTION 12 6100  
FIXED AUDIENCE SEATING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Fixed, upholstered audience seating.
- B. Seating accessories.

**1.02 REFERENCE STANDARDS**

- A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- B. ASTM B26/B26M - Standard Specification for Aluminum-Alloy Sand Castings; 2018, with Editorial Revision.
- C. ASTM B108/B108M - Standard Specification for Aluminum-Alloy Permanent Mold Castings; 2019.
- D. ASTM B179 - Standard Specification for Aluminum Alloys in Ingot and Molten Forms for Castings from All Casting Processes; 2018.
- E. ASTM D3574 - Standard Test Methods for Flexible Cellular Materials—Slab, Bonded, and Molded Urethane Foams; 2017.
- F. ASTM D3597 - Standard Performance Specification for Woven Upholstery Fabrics—Plain, Tufted, or Flocked; 2002 (Reapproved 2024).
- G. ASTM D4157 - Standard Test Method for Abrasion Resistance of Textile Fabrics (Oscillatory Cylinder Method); 13.

**1.03 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's printed data sheets for products specified.
- C. Shop Drawings: Fabrication and installation details, chair layouts and dimensions and seat numbering scheme.
  - 1. Field Measurements: Verify seating layout by field measurements and record field dimensions on shop drawings.
- D. Selection Samples: Manufacturer's color charts and swatches for fabric upholstery, baked enamel finish, and molded plastic, indicating full range of materials, colors, and patterns available.
- E. Verification Samples: Full-size one-seat fabricated sample of each type of chair specified, including all accessories, illustrating all finishes and workmanship to be expected in the finished Work; approved sample may be incorporated into the Work.
- F. Installer's qualification statement.
- G. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

**1.04 QUALITY ASSURANCE**

- A. Installer Qualifications: An experienced installer certified in writing by the seating manufacturer to be qualified for installation of specified seating.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver seats to project site in unopened containers clearly labeled with manufacturer's name and identification of contents.
- B. Store seating units in dry and clean location until needed for installation. During installation, handle in a manner that will prevent marring and soiling of finished surfaces.

## **1.06 FIELD CONDITIONS**

- A. Ambient Conditions: Continuously maintain ambient temperature and humidity conditions at values near those indicated for final occupancy for minimum of one week before, during, and after installation of seating.

## **1.07 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide manufacturer warranty for interior fixed audience seating. Complete forms in Owner's name and register with manufacturer.
  - 1. Limited Lifetime for Structural Standards, Cast Seat Supports and Brackets and Dual Action Seat Return Springs. Five years on remaining components.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Fixed Audience Seating:
  - 1. Hussey Seating Company; Quattro Modern Chair System, Classic Series: [www.husseyseating.com/#sle](http://www.husseyseating.com/#sle).
- B. Substitutions: See Section 01 6000 - Product Requirements.
- C. Provide all fixed audience seating by one manufacturer.

### **2.02 UPHOLSTERED SEATING**

- A. Description: Fixed seating system with self-rising mechanisms designed to permit radial installation using common intermediate support standards in each row and aisle standards aligned as indicated on drawings. Width of seats as indicated on drawings.
- B. Support Standards: One-piece die cast aluminum, A380 grade, with integral mounting points for backs, seats, and arm rests, and integral floor anchoring points as required to meet the intent of the layout as indicated on drawings.
  - 1. Standards shall be attached to floor so that a constant seat height is maintained.
  - 2. Standards shall be an integral aesthetic part of the chair's appearance and do not require the use of end panels.
- C. Backs: Fixed type; fabric covering over foam padding and protective back panel, with installed height not less than 32 inches above finished floor.
  - 1. Structural Support: Molded hardwood plywood, not less than 11-ply, 5/8 inch thick, with an ergonomically engineered contour.
  - 2. Attachment: Wings for attachment of chair back to standard shall be not less than 14 gauge and attached with concealed fasteners. Exposed fasteners above the seat shall not be permitted.
    - a. Position: Wings shall position the chair back at one of three positions: 15, 18, or 21 degrees.
  - 3. Padding: Foam, 2 inches thick bonded to structural support.
  - 4. Covering: Upholstery fabric bonded to padding and fastened by upholstery technique that facilitates replacement.
    - a. Back Tailoring: Waterfall.
  - 5. Outer Back: One-piece injection molded high-impact polypropylene plastic, with scuff-resistant textured surface.
    - a. Height: No less than 27 inches in length and conceal the rear and sides of the upholstered inner panel and shall extend below the rear of the seat to protect the chair occupant's back.
  - 6. Back Style: Soft square.
  - 7. Back Height: Low; 33 inches above the floor.

- D. Seats: Hinged type, with dual sprung lifting mechanism able to achieve a full fold position when pressure is applied, constructed to permit reupholstering without removing seat from chair.
  - 1. Seat Construction: The upholstered seat topper shall consist of a 5/8" thick formed ply form base with 3.5" to 4" ultra plush contoured molded polyurethane foam padding and fabric upholstered cover. Seat padding shall be properly contoured to support the body without causing discomfort. The upholstered seat cover shall exhibit a high degree of tailoring and will be affixed to the base with upholstery staples.
    - a. Seat Cover Tailoring: Waterfall.
  - 2. Seat Mechanism: Seat lifting mechanism shall use lubricated lifting springs to provide whisper quiet fail-safe operation. The seat structure shall rotate on a 3/4" spanner bar to assure shaft alignment and eliminate binding due to irregular floor conditions. Seats shall be certified to withstand 350,000 lifting cycles and a 600lb static load without failure.
  - 3. Seat Shell: Constructed of polypropylene plastic and shall protect the mechanical parts of the lifting hinge and upholstered seat topper.
- E. Hinges: Fully contained, self-lubricating, noiseless steel hinges with a pair of independent nylon bushings, equipped with double acting, self-centering, pre-loaded coil spring mechanism that causes unoccupied seat to rise automatically to uniform 3/4 fold, with 100 percent fold when additional pressure is applied. Seat hinge and spring installation shall be designed not to require periodic adjustment or lubrication.
- F. Arm Rests: Locate at aisles and between chairs; mount to support standard with concealed fasteners; exposed surfaces of molded high-impact plastic.
- G. Chair Assembly:
  - 1. All welds shall be made at the factory by welders that are certified on the equipment and process used.
  - 2. All structural connections shall be made with S.A.E. stress rated zinc plated or, black oxide steel bolts, washers and nuts.

## **2.03 MATERIALS**

- A. Cast Aluminum: A380; ASTM B26/B26M, ASTM B108/B108M, or ASTM B179.
- B. Mechanical Concrete Anchors: SAE grade 2.
- C. Exposed Hardwood: Solid lumber selected for absence of visible defects; northern hard maple.
- D. Concealed Plywood: Engineered Wood Association PS 1-95 2000; poplar.
- E. Molded Plastic: Injection molded copolymer polypropylene.
- F. Polyurethane Foam: ASTM D3574 density not less than 1.8 lb/cu ft, fire retardant, non-hardening and non-oxidizing, with high resistance to alkalis, oils, moisture, and mildew.
- G. Upholstery Fabric: Fabric as indicated.

## **2.04 FINISHES**

- A. Hardwood: Manufacturer's standard clear low-gloss finish.
- B. Hardwood Plywood: Manufacturer's standard clear low-gloss finish.
- C. Steel/Aluminum Components: Material shall be pre-treated in an iron phosphate wash system prior to finish application. Finish shall be a specially blended polyester T.G.I.C./Epoxy powder coating with a minimum dry film thickness of 1.5 mils.
- D. Injection Molded Polypropylene: Shall be pigmented, in one of manufacturers standard colors and have a textured surface.
- E. Fabric: Maharam, #466553 Metaphor.
  - 1. Content: 100% Polyester.
  - 2. Backing: Acrylic.
  - 3. Width: 54 inches.

4. Abrasion: ASTM D4157; 100,000 double rubs Wyzenbeek.
- F. Colors:
  1. Powder Coating: Hussey; Titanium.
  2. Polypropylene: Hussey; Titanium #7540C.
  3. Fabric: Maharam; Metaphor, Electricity #008.

## **2.05 FASTENINGS**

- A. Chair Assembly:
  1. All welds shall be made at the factory by welders that are certified on the equipment and process used.
  2. All structural connections shall be made with S.A.E. stress rated zinc plated or, black oxide steel bolts, washers and nuts.
- B. Concrete Floor Attachment:
  1. Chair stanchions shall each be attached by means of two 1/4" mechanical wedge anchors set in holes drilled to a minimum depth of 2" in the concrete.
  2. Wedge anchors shall be tested to ASTM E488 criteria and listed by ICBO and SBCCI. Wedge anchors feature a type 18-8 stainless steel split expansion ring and a threaded stud bolt body and integral cone expander, and a nut and washers. Stanchion shall be placed on the bolts, stanchions to be permanently secured with a flat washer, lock washer and nut.

## **2.06 ACCESSORIES**

- A. Armrest, Easy Access: Swing-up end arms shall be provided for one percent of fixed seating capacity to meet the Americans with Disabilities Act (ADA).
  1. Armrest shall hinge on end standards to allow easy access for disabled patrons.
  2. Each accessible chair shall include the universal handicap symbol on the end aisle standard for clear identification.
- B. Chair Numbers: Black text on brushed aluminum background, 23/32" x 2 7/32" elliptical plate. Plate fitted in a vandal resistant recess located in front edge of plastic seat cover and secured with two aluminum pop rivets.
- C. Row Letters: Black text on brushed aluminum, 23/32" x 2 7/32" elliptical aluminum plate. Plate fitted in a vandal resistant recess located in rear of armrest and secured by means of two mechanical fasteners.
- D. Portable Stacking Quattro Chairs (three chairs per pair ADA spaces shown on drawings, 18 total chairs): Provide portable chairs with common styling of specified chairs for integrated use into seating layouts. The seat and back assemblies of these chairs shall be identical in design with the exception of 2" seat foam for the portable chairs. Provide a total of 24 removable armrests with polypropylene caps similar to the fixed seating, this will allow for 6 rows of 3 chairs ganged together. These are to be used at the ADA seating locations when wheelchairs are not present. Seats can be easily stacked and removed by one person via a portable dolly into storage when not required. Provide adequate storage carts for storage of chairs (6 chairs stored per cart, 3 carts total).

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Examine substrates for conditions detrimental to installation of fixed audience seating in accordance with seating manufacturer's recommendations. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.02 INSTALLATION**

- A. Comply with manufacturer's installation instructions and approved shop drawings.

- B. Anchor support standards securely to substrate with anchoring devices recommended by manufacturer.
  - 1. Vary width of seats and backs as required to optimize sightlines, and comply with the ADA Standards for row and aisle widths.

### **3.03 ADJUSTING**

- A. Adjust seat mechanisms to ensure that seats in each row are aligned when unoccupied.
- B. Replace upholstery fabric damaged or soiled during installation.

### **3.04 CLEANING**

- A. Clean work area and remove debris from site.

### **3.05 PROTECTION**

- A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer to ensure audience seats are without damage or deterioration at time of substantial completion.

**END OF SECTION**



**SECTION 21 0170**  
**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)
  - 7. State, Township, and/or Local Fire Codes.

**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. 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.
  - 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.
  2. Fire extinguishers and cabinets.
- E. Related Sections include the following:
  1. Division 26 Section "Fire Alarm Systems" for alarm devices not in this Section.
  2. Division 22 Section "General Provisions – Plumbing/Fire Protection"
- F. The indicated sprinkler system components including zone valves, alarm and monitoring switches are the minimum requirement based on design and project requirements. If the bidding fire protection contractor elects to furnish and install a different arrangement to achieve the same end result and fire marshal approved system, this contractor shall be responsible for any and all added costs. This shall include but not be limited to the previous items mentioned as well as the additional support and monitoring requirements of the project fire alarm system. There shall be no additional cost to the owner or project.

### **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"
  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 Red Clay 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.
  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.

#### **1.4 BASE BID**

- A. The base bid shall be in accordance with the Design Drawings and Specifications.
  1. The contractor shall identify in his bid proposal the number of sprinklers, and fire hose cabinets to be provided under the base bid.
- B. The fire protection contractor shall state separately in his bid, any value engineering suggested changes to the Specifications or Design Drawing arrangements of systems, which shall be proposed as add or deduct alternates to the work shown. Bid proposals that are not qualified to the contrary, shall assume the intention to install the required work as shown on the design drawings.
- C. The bid proposal shall include a statement of unit prices for adding or deducting each type of sprinkler and each type of pipe proposed for the project.
  1. The costs for each type of sprinkler shall include one sprinkler, one fitting, one hanger and 14' of pipe.
  2. The costs for each type of pipe shall be included for one foot of each nominal pipe diameter, 1" through 8".
  3. The costs for each type of fitting shall be included for each nominal pipe diameter, 1" through 8".

#### **1.5 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.
  - 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 area 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.

#### **1.6 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. 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.

- D. 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 "Contractor's Material and Test Certificate for Aboveground Piping" for each system.
- E. Maintenance Data: shall be submitted for each type of sprinkler component and specialty, and included in the maintenance manuals, specified in Division 1.
- F. 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.
- G. 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".
- H. 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.
- I. The indicated sprinkler system components including zone valves, alarm and monitoring switches, are the minimum requirement based on design and project requirements. If the bidding fire protection contractor elects to furnish and install a different arrangement to achieve the same end result and fire marshal approved system, this contractor shall be responsible for any and all added costs. This shall include but not be limited to the previous items mentioned as well as the additional support and monitoring requirements of the project fire alarm system. There shall be no additional cost to the Owner or project.

## **1.7 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 1/4" 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.
    - c. All pipe lengths, diameters, fittings, hangers 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, 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, 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.

## **1.8 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.

## **1.9 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 or approved equal (unless noted otherwise):
  - 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
    - Tyco Fire Suppression & Building Products
    - Potter Electric Signal Co.
    - Reliable Automatic Sprinkler Co., Inc.
    - Viking Corp.
  - 3. Sprinkler, System Sensor, 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:
    - 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.
  - Glaconni
  - 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
10. Keyed Couplings for Steel Piping: (Grooved Fittings)
  - Tyco Fire Suppression & Building Products
  - Victaulic Company
  - Viking Corp.
  - Anvil International Grulok
  - Gemlock
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.

### 2.4 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.
- 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.

### 2.5 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.

### 2.6 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-V ac, 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.

### 2.7 SPRINKLERS

- A. Utilize quick-response sprinklers throughout Light and Ordinary Hazard occupancies

- 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 pendants 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).

## **2.8 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.
- 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.

### **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, 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 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. The indicated sprinkler system components including zone valves, alarm and monitoring switches, are the minimum requirement based on design and project requirements. If the bidding fire protection contractor elects to furnish and install a different arrangement to achieve the same end result and fire marshal approved system, this contractor shall be responsible for any and all added costs. This shall include but not be limited to the previous items mentioned as well as the additional support and monitoring requirements of the project fire alarm system. There shall be no additional cost to the Owner or project.

### **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.

### **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.
- B. Steel-Piping, Grooved Joints: Use Schedule 40 steel pipe with cut or roll-grooved ends and Schedule 30 with only 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.
- 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. All new piping shall be supported in accordance with the recognized and adopted fire and building codes, and their amendments for the township and/or authority having jurisdiction. All new piping hangers and supports furnished and installed shall meet the seismic requirements of the recognized and adopted fire and building codes for the township and/or authority having jurisdiction.
- L. Where earthquake loads are applicable in accordance with the locally adopted building code, pipe hangers and supports shall be designed and installed for the seismic forces in accordance with the locally adopted building code and NFPA 13.
- K. All hangers, anchors, support and guides for piping and equipment shall be securely fastened to the building structure and/or floors with concrete decking with the following exception: Hangers, anchors, support and guides shall not be fastened to or through metal roof decking (i.e. bare metal decking or metal deck supporting a roofing system).
- L. Install piping with grooved joints according to manufacturer's written instructions. Construct rigid piping joints, unless otherwise indicated.
- M. 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.
- N. Horizontal runs of fire sprinkler pipe shall be run as high as possible, unless noted otherwise.

### **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.

### **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.

### **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. Adjust operating controls and pressure settings.
- H. Coordinate with fire alarm tests. Operate alarm devices with water, as required to demonstrate proper function.
- I. Provide a flow test for record on the site fire hydrants nearest the building regardless of the previous date. Data to be included below.
- J. 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.
- 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.
- 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 & straps have been removed or put in place, 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**



## **SECTION 22 0000**

### **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. The contractor shall inform themselves of the specifications and drawings constituting the entirety of the project and shall adhere to all requirements affecting its work. In the event of a conflict between these conditions and other contract documents, the more restrictive standards shall govern.
- C. All fire protection suppression systems shall be part of and included in all of the following 220000 thru 220191 Sections.
- D. Refer to Section 07841 for Through-Penetration Firestop Systems.
- E. Refer to Section 08311 for Access Doors and Frames

##### **1.2 WORK INCLUDED**

- A. Provide labor, materials, equipment and supervision necessary to install complete operating Plumbing and Fire Protection Systems as indicated the drawings and specified herein, including all work at the site and within the proposed construction areas to accomplish the required work.

##### **1.3 REGULATIONS, CODES AND STANDARDS**

- A. Work shall be performed in accordance with latest adopted codes, regulations and ordinances by authorities having jurisdiction. Observe all safety regulations.
- B. Latest editions of any referenced standards shall govern.
- C. Obtain all municipal and/or the Authorities Having Jurisdiction permits and inspection certificates and pay all charges.
- D. Make or arrange for any/or all inspection agency reviews or visits and pay all charges. This includes communication with each respective agency and/or utility to verify the project system work, coordination responsibilities, fees, back charges, etc., required.
- E. All fees and back charges shall be verified during the bidding phase of the work. Any discrepancy of this item between any utility, inspection agency and the Contractor shall be brought to the attention of the A/E prior to bid opening.
- F. Submission of a bid will be deemed evidence of having complied with these requirements.

##### **1.4 RELATED WORK**

- A. Refer to equipment shown or specified in all other applicable Divisions that require Plumbing and Fire Protection services.

- B. Refer to work related to Plumbing and Fire Protection as shown on the following contract drawings:

Architectural & Structural

Mechanical

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.
- E. Obtain written confirmation from all related trade Contractors and the Owner or his representative that requirements, conflicts and coordination issues have been discussed and resolved.

## 1.6 SUBMITTALS

- A. Shop Drawings & Product Data:
1. Shop drawings and product data shall be submitted in accordance with Division 1 specifications except where herein modified.

**NOTE: Submittals will only be reviewed once and resubmittals will be reviewed once. Any other submittals will be billed to the Contractor at the Engineer's standard rates.**

2. Listed are the required shop drawings and reports required for this project. The Engineer/Owner shall reserve the right to require additional submissions not listed below:
  - All fixtures, equipment and associated devices so listed on the Fixture Schedule on the Drawings.
  - Sewage Pumps.
  - Insulation
  - All specified piping systems.
  - All specified valves.

- Medical Gas Systems, certifier and report.
  - Gauges and thermometers
  - Recirculating pump.
  - Hanger and supports including Sumner system.
  - Piping labels and identification.
  - Sprinkler System and all related data, devices, switches and trimmings.
  - Sump pumps.
  - Testing reports.
  - Sterilization report.
  - Operating/Maintenance manuals.
  - As-Built Drawings.
3. Submittals comprising complete catalog cuts, shop drawings and performance test data for Plumbing and Fire Protection materials and equipment as required by other sections of Divisions 21 and 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.
- a. The Contractor an equipment manufacturer shall clearly identify in all submittals and shop drawings any and all applications standards which require additional work to accommodate this equipment and provide a complete and operational system as described in the contract documents.
  - b. The Contractor shall be completely responsible for any and all additional costs associated with the changes required by this and all other trades.
  - c. The indicated sprinkler system components including zone valves, alarm and monitoring switches are the minimum requirement based on design and project requirements. If the bidding fire protection contractor elects to furnish and install a different arrangement to achieve the same end result and fire marshal approved system, this contractor shall be responsible for any and all added costs. This shall include but not be limited to the previous items mentioned as well as the additional support and monitoring requirements of the project fire alarm system. There shall be no additional cost to the owner or project.
4. All submittals shall have the following identification data, as applicable, contained therein or permanently adhered thereto.
- a. Project name.
  - b. Project number.

- c. Sub-contractor's, vendor's and/or manufacturer's name and address.
  - d. Product identification.
  - e. Identification of deviation from contract documents.
  - f. Applicable contract drawings and specification section number.
  - g. Shop drawing title, drawing number, revision number, and date of drawing and revision.
  - h. Resubmit revised or additional submittals as requested.
  - i. Wherever shop drawings or vendor's standard data sheets indicate work to be done "by others", it shall be the responsibility of the contractor making the submission to identify by name, the contractor who is to do this work. If the contractor named is other than the contractor making the submission, the shop drawing submission must be reviewed by the named contractor and bear his mark of approval, prior to submission to the Architect/Engineer.
  - j. Where equipment proposed differs from that shown on the drawings or specified, he shall submit for approval drawings showing the manner in which the layout is affected by the substitution.
  - k. The Contractor shall keep a copy of approved shop drawings at the job site.
  - 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, include Division 1 General Requirements. 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.

#### **1.8 SITE INSPECTION**

- A. The Contractor shall visit the site, inspect, and become aware of all conditions which may affect the work during the estimation phase of his work and prior to bid openings. Investigate utilities, protection requirements for adjacent facilities, storage locations, and access to the construction area.
- B. Submission of a bid will be deemed evidence of having complied with this requirement.

#### **1.9 SUBSTITUTIONS**

- A. Whenever a material, article, piece of equipment or system is identified in the following specification or indicated on the drawings by reference to manufacturers' or vendors' names, trade names, catalog numbers or the like, it is so identified for the purpose of establishing the basis of the Bid.

- B. Substitution approval must be obtained and included as an addendum item prior to the submission of the bid. An approved substitution shall not be considered as an approval for the Contractor or an equipment vender to deviate from the written portion of the specifications unless so stated in the addendum.
- C. The drawings illustrate the space allocated for equipment and the Contractor shall install the equipment accordingly. If changes are required in the building or arrangement due to substitution of equipment, the Contractor making the substitution must pay for the necessary modifications.
- D. The listed equivalent or substituted manufacturers along with the bidding related contractor shall be completely responsible to comply with all requirements as indicated on all contract documents and as described within the specifications. This shall include, but shall not be limited to space requirements, code clearances, the type, horsepower, capacities, number and size of services required from other trades, including all required ancillary items furnished and installed by other trades. If the manufacturer or related bidding contractor does not comply with these requirements, then they shall be responsible for any and all additional costs associated with the changes required by other trades.

#### **1.10 LUBRICATION**

- A. Furnish, install and maintain all required lubrication of any equipment operated prior to acceptance by the Owner. Lubrication shall be as recommended by the equipment manufacturer.
- B. Provide one year's supply of lubricants to Owner at date of acceptance.
- C. Verify that required lubrication has taken place prior to any equipment start-up.

#### **1.11 EQUIPMENT START-UP**

- A. Verify proper installation by manufacturer or his representative.
- B. Advise General Contractor 2 days prior to actual start-up.
- C. Verify proper operation. Obtain signed statement by manufacturer or his representative that equipment is operating within warranty requirements. Submit statement to General Contractor.

#### **1.12 OPERATION & MAINTENANCE INSTRUCTIONS**

- A. Properly and fully instruct Owner's personnel in the operation and maintenance of all systems and equipment.
- B. Ensure 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. Two manuals shall be provided, one hard bound copy and one electronic copy.

- F. Submit manuals for review prior to operating instruction period. Hard copy shall be 8-1/2 x 11" with hard cover, suitably bound. Electronic shall be pdf for mat with drawings, also as autocad format.
- G. Provide to the Owner any special tools necessary for operation and routine maintenance of any of the equipment.

### **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.
- 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.
- D. Horizontal runs of plumbing and fire sprinkler/standpipe pipe shall be run as high as possible, unless noted otherwise.
- E. Trenching, excavation, and backfill for installation of underground plumbing piping shall be in accordance with the current plumbing code, and all local codes and ordinances. Trenching, excavation, and backfill for the installation of underground fire protection piping shall be in accordance with the current plumbing code, all local codes, and ordinances, and the NFPA 24 Standards "Standard for the Installation of Private Fire Service Mains and Their Appurtenances."

### **3.3 EXCAVATION**

- A. The excavation shall be of the open-trench method and to the depths and widths as may be necessary. The Contractor shall do all excavation required in connection with his work. Bottoms of trenches shall be excavated to a uniform grade. All materials excavated shall be deposited on the side of the trenches and beyond the reach of the slides. Excavated material shall not be piled where it will interfere with traffic. If rock is encountered, it shall be removed by the General Contractor. See provisions in Division 2.
- B. No piping shall be bedded directly on rock. They shall be cushioned by a 6-inch layer of crushed stone or gravel of selected grade, of size to pass through 3/4" mesh sieve. Not less than 30% shall be fine which will pass through a 3/8" mesh sieve.

### **3.4 SHORING AND PUMPING**

- A. The Contractor shall provide all shoring, bracing or sheet piling necessary to maintain the banks of his excavation and shall take out same as the work progresses and filling in has been accomplished. Shoring shall be in accordance with OSHA Standards.
- B. The arrangement of shoring must be such as to prevent any movement of the trench banks and consequent strains on the conduits. Shoring shall be provided to prevent damage to work installed by other trades.
- C. The Contractor shall do all pumping required to keep his excavations free of water. The water shall be conveyed in piping or watertight troughs a sufficient distance that it will flow from the site and not affect other work being performed.

### **3.5 BACKFILLING**

- A. After work in trenches has been completed, they shall be filled with select fill in 8" layers and shall be pneumatically tamped before the next layer of material has been filled in. The backfill shall be free of excavated rock, cinders, stones, brickbats or other debris.
- B. Wherever rock is removed, the Contractor shall secure and fill select clean earth to a minimum depth of 3'-0" above the top of the pipe. Unless otherwise indicated, no rock shall be deposited in the trench fill. This clean earth fill shall be procured other than from the site unless permission for earth borrow from the site is granted by the Architect. If site borrow is permitted, the topsoil removal, relocation and finished grading will be accomplished as directed by the Architect.
- C. Under no circumstances shall excavated material be left where it will interfere with the Owner's or other Contractor's operations.
- D. All earth and other materials taken from the trenches and not required for backfilling shall be deposited where directed, or removed from the premises as directed by the Architect.
- E. Any rock removed from the excavation shall be removed from the project site by the Contractor.
- F. Trenches which pass under wall footings or within 18" of column footings shall be backfilled with lean concrete. To secure adequate foundation support, the method and depositing of the concrete fill shall be as directed by the Architect. To prevent the concrete from adhering to the pipes, necessary pipe protection shall be applied.

### 3.6 EQUIPMENT SETTING

- A. Furnish and install as a minimum, a 4-inch concrete pad beneath all floor-mounted equipment. Install anchor bolts in pour.
- B. Furnish and install as a minimum, spring vibration isolation under any equipment 10 HP and over and rubber in shear vibration isolation on any equipment up to 10 HP.
- C. Concrete shall be 3,000 psi, 28-day compressive strength in accordance with ACI-613. Reinforce with No. 4 rod 12" on centers both ways or as otherwise detailed.

### 3.7 FASTENERS, HANGERS AND SUPPORTS

- A. Furnish and install all hangers and supports required to suspend, mount, or hang the work.
- B. Furnish and install all miscellaneous steel angles, channels, beams, clips, brackets and anchors necessary to hang or support the work. Provide submissions for review.
- C. Install concrete inserts before concrete is poured.
- D. Drilled inserts shall not be loaded more than 1/4 rated capacity or 200 pounds.
- E. Power-driven fasteners shall not be allowed for piping larger than 2 inch, or equipment. When used they shall not be loaded more than 1/8 rated capacity or 200 pounds.
- F. All hangers, miscellaneous steel, braces and supports shall be galvanized, cadmium plated, or primed steel. Copper tubing shall be supported with copper hangers. No direct contact of dissimilar metals between the piping system and its hanger support shall be permitted.
- G. Piping shall be supported from adjustable clevis type hangers with insulation pipe saddles. Where hangers are 18" or longer, provide lateral bracing at every fourth hanger. See IPC Pipe Support Table below:

PIPE SUPPORT SPACING

| Material                | Horizontal<br>Max. Feet | Vertical<br>Max. Feet |
|-------------------------|-------------------------|-----------------------|
| ABS Pipe                | 4                       | 10                    |
| Aluminum                | 10                      | 15                    |
| Brass                   | 10                      | 10                    |
| Brass Tube up to 1-1/4" | 6                       | 10                    |
| Brass Tube over 1-1/2"  | 10                      | 10                    |
| Cast Iron               | 5                       | 15                    |
| Copper up to 1-1/4"     | 6                       | 10                    |
| Copper over 1-1/4"      | 10                      | 10                    |
| CPVC Up to 1"           | 3                       | 10                    |
| CPVC Over 1"            | 4                       | 10                    |
| Lead Pipe               | Continuous              | 4                     |
| PB Pipe/Tubing          | 2.6 ft. (32")           | 10                    |
| PVC Pipe                | 4                       | 10                    |
| PEX                     | 2.6 ft. (32")           | 10                    |
| Steel Tubing            | 8                       | 10                    |
| Steel Pipe              | 12                      | 15                    |
|                         |                         |                       |

- H. Support vertical piping at floor levels using approved riser clamps. Clamp material shall be compatible with pipe material. Maximum vertical spacing shall be 10'-0".
- I. All new piping shall be supported in accordance with the recognized and adopted plumbing, fire and building codes, and their amendments for the township and/or authority having jurisdiction. All new piping hangers and supports furnished and installed shall meet the seismic requirements of the recognized and adopted plumbing, fire, and building codes for the township and/or authority having jurisdiction.
- J. Where earthquake loads are applicable in accordance with the locally adopted building code, plumbing, and sprinkler & standpipe hangers and supports shall be designed and installed for the seismic forces in accordance with the locally adopted building code and NFPA 13 for sprinkler and standpipe piping.

### **3.8 SLEEVES**

- A. Provide each pipe passing through a masonry or concrete wall, floor or partition with a sleeve made from standard weight steel pipe for pipe with smooth edges, securely and neatly cemented in place. Provide each pipe passing through a frame or metal partition with a sleeve made from No. 22 gauge galvanized sheet metal, securely fastened in place.
- B. Pipe passing through foundation wall or under foundation shall be provided with relieving arch or steel pipe per IPC Section 305.3.
- 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. Fire stopping of all thru-penetrations of fire and/or smoke rated assemblies (partitions, floors, ceilings, etc.) shall be the responsibility of each installer or building trade (Mechanical, Plumbing, Electrical, Communications, Data, etc.) making the thru-penetrations, unless otherwise indicated on the Architectural series drawings (A-series). It is the responsibility of the Contractor making the thru-penetrations to verify and coordinate fire stopping with fire rating, assembly type and field conditions.
  - 2. 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.
  - 3. Products: Refer to Division 7 of the specifications for Fire Stopping Requirements.

### **3.9 PLATES**

- A. Furnish and install chrome plated plates wherever piping passes into finished area.
- B. Plates shall be securely fastened to piping or building construction.
- C. Floor plates shall cover 1-inch sleeve extension.

### **3.10 OFFSETS, TRANSITIONS, MODIFICATIONS**

- A. Furnish and install all offsets necessary to install the work and to provide clearance for other trades.
- B. Maintain adequate headroom and clearance.
- C. Incidental modifications necessary to the installation of the systems shall be made as necessary and as approved by the Architect.

### **3.11 RECESSES**

- A. Furnish information to the General Contractor as to sizes and locations of recesses required to install panels, boxes, and other equipment or devices which are to be recessed in walls.
- B. Make offsets or modifications as required to suit final locations.

### **3.12 LABELING**

- A. All Plumbing equipment such as pumps, and devices requiring identification for operating procedures shall be provided with permanent black laminated micarta white core labels with 3/8 inch letters.
- B. This shall also apply to all controllers, remote start/stop pushbuttons and equipment cabinets.

### **3.13 FLASHING AND COUNTERFLASHING**

- A. Roof drains, vents, roof curbs, etc., shall have counterflashing fittings. General Contractor shall provide flashing.
- B. Piping and conduit thru the roof shall be flashed by the General Contractor. Furnish and install counterflashing.

### **3.14 ACCESS**

- A. Locate all equipment, valves, devices and controllers which may need service in accessible places.
- B. Where access is not available, access panels shall be provided. Furnish access doors to the General Contractor for installation.
- C. Access doors shall be Elmdor, Karp Co., MIFAB or Controlled Air Manufacturing Limited, with 16 gauge frames and 14 gauge steel door, prime painted.
- D. Maintain required access clearances.

### **3.15 WIRING**

- A. Packaged plumbing and fire protection system equipment shall be furnished with disconnect switches, and magnetic starters, factory furnished and wired by the unit manufacturer.
- B. All control wiring shall be furnished and installed under this Division of the work.
- C. All wiring shall be in accordance with the National Electrical Code and as recommended by the equipment manufacturer.

### **3.16 UTILITIES**

- A. Do not interrupt any utility or service to the Owner without adequate previous notice and schedule.
- B. Arrange and pay for the relocation, disconnection or removal of, or relocate, disconnect or remove existing utilities and services where such work is shown or where such utilities or services interfere with new construction, whether or not shown. Provide all excavation, backfilling and paving required by such work.
- C. Perform alteration of utilities and services in accordance with the rules, regulations and requirements of the involved utility companies, regulatory agencies having jurisdiction.

### **3.17 CUTTING AND PATCHING EXTERIOR SURFACES**

- A. This Contractor shall be responsible for returning disturbed paved and/or grass areas to original condition where excavation for utilities has been required.
- B. Cut and patch paved areas to match original surface.
- C. Properly tamp backfill before finishing or repairing disturbed area surfaces.

### **3.18 OPENINGS - CUTTING, REPAIRING**

- A. This contractor shall cooperate with the work to be done under other sections in providing information

as to openings required in walls, slabs and footings for all piping and equipment, including sleeves where required.

- B. Any drilling or cutting required for the performance of work under this Section, shall be the responsibility of this Contractor and the cost thereof shall be borne by him.
- C. Holes in Concrete: Sleeves shall be furnished, accurately located and installed in forms before pouring of concrete. This contractor shall pay all additional costs for cutting of holes as the result of the incorrect location of sleeves. All holes through existing concrete shall be either core drill or saw cut. All holes required shall have the approval of the Structural Engineer prior to cutting or drilling.
- D. It shall be the responsibility of this Contractor to ascertain that all chases and openings are properly located.

### **3.19 GUARANTEE**

- A. All materials and equipment provided and/or installed under this section of the specifications shall be guaranteed for a period of one year(s) 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.

### **3.20 DRAWINGS**

- A. The Plumbing and Fire Protection Systems are indicated on the Contract Drawings. Certain pertinent information and details required by the Plumbing and Fire Protection Work appear on the Architectural, Structural and Electrical Drawings; become familiar with all Drawings; and incorporate all pertinent requirements.
- B. Drawings are diagrammatic and indicate the general arrangement of systems and requirements of the Work. Do not scale Drawings. Exact locations of fixtures and equipment, not specifically shown shall be obtained before starting work.
- C. When indicated on the drawings, plumbing riser diagrams are completely diagrammatic and indicate the intent of the work for both the Contractor, L&I review agencies and/or Authorities Having Jurisdiction. Where valves, shock absorbers, incidental equipment, devices, etc., including execution notes are indicated on the riser diagrams, they shall be so required and installed as part of the system work.

### **3.21 RECORD DRAWINGS**

- A. As-Built record drawings, showing dimensions, locations and depth of all buried and concealed piping, plugged outlets and equipment shall be kept up to date. Master copy shall be kept on the job. No backfilling of trenches shall be permitted until as-built drawings are approved as up-to-date by the Owner/Representative. No plumbing or fire protection 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**





## **SECTION 22 0010**

### **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

Delaware State Plumbing Code

Delaware State Fire Marshal's Office

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 22 0000.
- B. Submit the following:

1. Manufacturer's Product Data on all pipe and fittings to be used in project.
2. Manufacturer's Product Data on all valves to be used in project.
- C. All products and equipment designed for the dispensing of potable water shall be ANSI/NSF 61 and ANSI/NSF 372 certified as "lead free." Lead free refers to the wetted surface of pipe, fittings and fixtures in potable water systems that have a weighted average lead content  $\leq 0.25\%$  per the federal law of the safe drinking water act (sec. 1417) amended 1-4-2011 and other equivalent state regulations. The federal law does not apply to pipes, pipe fittings, plumbing fittings or fixtures that are used exclusively for non-potable services such as manufacturing, industrial processing, irrigation, outdoor watering, or any other uses where water is not anticipated to be used for human consumption. The law specifically excludes toilets, bidets, urinals, fill valves, flushometer valves, tub fillers, shower valves, service saddles, or water distribution main gate valves that are 2 inches in diameter or larger.

## **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, 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 (epoxy-coated) 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 C-1277.
- B. Below grade and/or slab: (Contractor's Option)
  1. Bell and Spigot: Service weight bell and spigot pattern ASTM-74 with compression type neoprene gaskets ASTM C-564.

2. Hubless: Hubless cast iron pipe CISPI 301, with heavy duty 3.04.016 stainless steel bands for below-grade installation. Elastomeric seal component ASTM C-564 and CSA B-602.
  3. Hubless Joints: Cast iron CISPI 310 and as TM C-1277.
  4. PVC DWV pipe and fittings, Schedule 40, ASTM D-2665, D2949, F891 and CSA B181.2.
  5. Corrosion protection shall be in accordance with IPC 305.1. Provide appropriate wrapping or sheathing when pipe is exposed to lime and acid of concrete, cinder or other corrosive materials.
  6. Protection of all below-grade storm and sanitary shall be in accordance with IPC Section 305.
  7. All Kitchen and Boiler Room below slab piping shall be service weight 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.

## **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
- 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 VALVES (Copper Systems) – Solder ends of Threaded**

- A. Valves listed below shall be for domestic water systems and comply with the latest requirements of NSF 61-8. Refer to individual sections for gas valves.
- B. Ball Valves: NIBCO two-piece, full port, 600 psi WOG rated, cold non-shock valve with reinforced TFE seals, 316 stainless steel ball, Eco-brass body, ASTM 584, Alloy C87850, solder ends, or threaded non-blowout stem design. Acceptable NIBCO figure numbers: T/S 685-80-66-LF; T/S 595-Y-66-LF (3 piece).
- C. Check Valves: NIBCO Class 125, Eco-brass body, ASTM 584, Alloy C87850, swing type, Y Pattern, threaded cap access. Acceptable NIBCO figure number: T/S 413-LF.
- D. Gate Valves: NIBCO Class 125, Eco-Brass body, ASTM 584, Alloy C87850, Rising Stem. Acceptable NIBCO figure number: T/S 113-LF.
- E. Balance Valves: All balance valves shall be provided with a memory stop feature with calibrated name plate to assure specific valve setting. Bronze body/brass ball, carbon filled TFE seat rings. NIBCO, Bell & Gosset, Accu-Flow, Taco or Flow Design "Accusetter". Acceptable NIBCO figure numbers: T/S 1710, F/G 737.
- F. Strainers:
1. Class 125 Bronze Y-Strainer, body to be ASTM B584 or B62 bronze with threaded, solder or female press end connections and .033-inch perforated type 304 stainless steel screen or 20 mesh type 304 stainless steel screen accessible without removing the strainer from the line. Acceptable Figure numbers: NIBCO Fig. S/T-221, S/T-222, PF-221/222-A,B.
  2. Class 125 Flanged Cast Iron Y-Strainer, body to be ASTM A-126 Class B cast iron. End connections to be Class 125 flanged, tapped bolted bonnet with plug. Screen shall be .033-inch perforated type 304 stainless steel screen or 20 mesh type 304 stainless steel screen accessible without removing the strainer from the line. Acceptable Figure numbers: NIBCO Fig. F 721-A.
  3. Class 250 Threaded Cast Iron Y-Strainer: Strainer body to be ASTM A-126 Class B cast iron. End connections to be Class 250 threaded, tapped screw-in bonnet with plug. Screen shall be .033 inch perforated type 304 stainless steel screen or 20 mesh type 304 stainless steel screen accessible without removing the strainer from the line. Acceptable Figure numbers: NIBCO Fig. T-751-A

**G. VALVES (Copper Systems) – Press Fit**

1. Valves listed below shall be for domestic water systems and comply with the latest requirements of NSF-61-8.
  - a. 2 Inch and Smaller Ball Valves (On/Off):

Ball Valves with male or female press to connect shall be rated at 200 PSI CWP to +225°F maximum. Valves shall be manufactured in accordance with MSS SP-110 and constructed of dezincification resistant cast bronze bodies. Brass with more than 15% zinc shall not be approved. Valve shall have reinforced PTFE Seats, Blow-out Proof Stem, Full Port Ball, Chrome/Nickel Plated or Stainless-Steel Ball for aggressive water.
  - b. 2 Inch and Smaller Check Valves (Swing Type):

Check valves shall be swing type Y pattern with male or female press to connect ends and shall be rated 200 PSI CWP to + 250°F maximum. Valves shall be manufactured in

accordance with MSS SP-80. Body & cap shall be manufactured of dezincification resistant cast bronze ASTM B62 or ASTM B584 Alloy C8440. Valves shall have PTFE seat disc.

- c. 2 Inch and Smaller Check Valves (Lift or Spring Type):  
  
Incline resilient disc, spring actuated, 250psi rating, non-shock cold working pressure, 2500F maximum working temperature, bronze ASTM B584 alloy C84400. Stainless steel stem and disc holder and spring, EDPM O-ring.
- H. Insofar as possible, all valves of the same type shall be of the same manufacturer.
- I. Valve Manufacturers: Subject to compliance with requirements, provide valves of one of the following:  
  
Apollo/Conbraco  
  
Stockham  
  
Nibco  
  
Milwaukee  
  
Watts  
  
Hammond  
  
Webstone
- J. System Application:
  - 1. Domestic Water:
    - a. Check Valves - 2" & Smaller - threaded or soldered.
    - b. Ball Valves - 3" & Smaller - threaded or soldered.
    - c. Balance Valves - All sizes - threaded.
    - d. Butterfly Valves - 4" and larger - flanged.
    - e. Butterfly Valves – 3" and smaller – wafer type.

## **2.11 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.

## **2.12 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.

### **2.13 ISOLATING FITTINGS**

- A. Furnish isolating fittings between all sections of dissimilar piping materials or piping, general supports, equipment and supports, including piping hanger and rack supports where one material is ferrous and the other is non-ferrous.
- B. Install copper or brass piping or tubing in such a way as not to touch or come in contact with ferrous metals.
- C. Where ferrous piping or equipment is connected to copper or brass piping, make connection with insulating or dielectric unions to prevent electrolytic action between the ferrous and non-ferrous metals.
- D. Where copper or brass piping, tubing or fittings are anchored to, supported by or may come in contact with ferrous metal construction, provide an insulating nonconductor spacer of rubber, fiber or equivalent material to assure prevention of electrolysis.
- E. Manufacturer: Epco Sales, Inc., or insulated unions by Central Plastic Co.

### **2.14 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.

### **2.15 UNIONS**

- A. Up to and including 2 inch pipe size: Screwed pattern, bronze-to- bronze seat.
- B. Above 2 inch pipe size: 125 Class Flanged pattern, A.S.A. sweat copper fitting, with gaskets, bolts and nuts.
- C. Copper tubing unions shall have sweated type ends. Flanged unions on copper tubing may be soldered connections.
- D. Materials and pressure ratings shall be the same as specified for the respective pipe and fitting system unless otherwise specified.

## **PART 3 – EXECUTION**

### **3.1 PIPING SYSTEM INSTALLATION REQUIREMENTS**

- A. Drawings are generally diagrammatic and due to small scale, it is impossible to indicate all fittings, valves, gauges and specialties required. Provide complete operating systems and all necessary fittings, valves gauges and specialties whether or not indicated.
- B. Install all piping in accordance with the best practices of the trade and latest code requirements. Use uniform system materials throughout the building. All branch take-offs shall be off the top of the pipe.



- C. Pipe and fittings shall be clean from cutting burrs, foreign materials and defects in structure and threading. Make all cuts square. Ream after cutting. Clean off scale and dirt inside and outside, before assembly. Remove welding slag or other foreign material.
- D. **Keep all piping as high as possible**, consistent with proper pitch, to maintain maximum headroom. Cut piping accurately to measurements established at the building, work into place without springing, forcing or cutting of the building structure, and install as directly as possible between connecting points parallel with or at right angles to building construction, except as required to obtain pitch.
- E. Unless otherwise shown, run piping within the building, concealed in the walls, furred spaces, pipe spaces or above suspended ceilings. Unless otherwise noted, do not build in or bury horizontal piping in partitions. Install all exposed piping as closely as possible to walls, ceilings and columns, consistent with access and applicable insulation requirements.
- F. This project (may) includes a return air plenum ceiling. Regardless of materials specified, all system piping and/or materials within plenum spaces shall be non-combustible and shall be in full compliance with the requirements set forth in the IPC.
- G. All piping to drain to low points. Low points will be provided with drain valves with hose thread. All piping shall have high points vented with ball valve, nipple and threaded cap.
- H. Do not install trapped lines where water cannot be drained or air can accumulate without being vented.
- I. Piping shall run square with building lines.
- J. Piping shall not be insulated or covered until tested and until building is closed in.
- K. Necessary drains, off-sets, vents and drips shall be provided for coordination of the work as part of the contract.
- L. Piping shall not be installed over electrical transformers, panels, switchgear, substations, and control panels as per the National Electric Code. No piping shall be installed in elevator machine rooms unless it is directly related to the room's system equipment.
- M. Allow clearance for expansion and contraction.
- N. Install isolating fittings between sections of ferrous and non-ferrous pipe or connected equipment.
- O. Valves shall be installed with stems above horizontal.
- P. Valves shall be installed on all sides of equipment and control valves to allow isolation for repair.
- Q. Do not support piping from other piping, conduits, or equipment. Provide additional bracing to prevent movement of trapeze piping, or any singular run of pipe to fixtures. Provide additional bracing on all piping through walls to flush valves to prevent movement during normal operation or performing maintenance on valves.
- R. Thermometers and gauges shall be installed where indicated on the drawings, required by equipment specifications and where indicated elsewhere in the specifications. Gauges shall be located at an elevation that can be readable.
- S. Unions shall be provided adjacent to all valves, at equipment connections, and where necessary to facilitate dismantling of the piping system.
- T. Ball valves to be installed with the proper clearance for operating the valve handle. A minimum clearance of 10" from center of valve to wall must be maintained for ease of operation.

- U. Thermometers are to be located so they can easily be seen from the floor in front of unit. Make final adjustment by tilting thermometer. Locate bulb in waterway with an oversized tee or elbow fitting.
- V. Install pressure gauges on incoming services both domestic water and fire services. Locate pressure gauge after main shut-off valve and ahead of water meter if one is provided within building.
- W. All pipe unions installed shall be accessible. Unions shall not be concealed or located in places where they cannot be maintained.
- X. Support and bracing of 4" and above pipe shall be in accordance with the CISPI Standards and IPC Chapter 3.
- Y. All hangers, anchors, support and guides for piping and equipment shall be securely fastened to the building structure and/or floors with concrete decking with the following exception: Hangers, anchors, support and guides shall not be fastened to or through metal roof decking (i.e. bare metal decking or metal deck supporting a roofing system).
- Z. All new piping shall be supported in accordance with the recognized and adopted plumbing and building codes, and their amendments for the township and/or authority having jurisdiction. All new piping hangers and supports furnished and installed shall meet the seismic requirements of the recognized and adopted plumbing and building codes for the township and/or authority having jurisdiction. Where earthquake loads are applicable in accordance with the locally adopted building code, plumbing hangers and supports shall be designed and installed for the seismic forces in accordance with the locally adopted building code.
- AA. No piping shall be installed in exit stair towers unless directly related to stair tower system equipment.
- BB. Horizontal runs of plumbing piping shall be run as high as possible, unless noted otherwise.

### 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   |
| 10. Medical Gas                            | Conform to NFPA-99 Regulations |           |

|                          |          |         |
|--------------------------|----------|---------|
| 11. Plant Compressed Air | - Yellow | - Black |
|--------------------------|----------|---------|

- D. Provide 1/8" scale diagrams showing location, number and service or function of each tagged item.

1. Provide Owner with one (1) electronic copy of diagram.

a. Include one (1) additional copy in the Operation and Maintenance Manuals.

- E. 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.
- B. All black steel piping larger than 2 inch shall be fusion welded.
- C. All elevated pressure (above 14" WC) natural /propane gas piping within buildings shall be welded joints.
- D. All elbows, tees and branch connections shall be made with welding fittings ANSI B16.9.
- E. Welding shall be in accordance with the ASME Boiler and Pressure Vessel Code Section IX.
- F. 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
  - 3. All pressurized gas piping systems (min pressure compressed air, lab gases, etc) using copper 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.
- 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°F to 250°F 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 press-fit ½" to 4" dimensions, the Smart Connect Feature assures leakage of liquids and/or gases from inside the system past the sealing element of an unpressed connection. This feature shall provide the installer quick and easy identification of connections which have not been pressed prior to putting the system into operation.
- E. Press Connections: Copper press fitting joints shall be made in accordance with the manufacturer's installation instructions. The tubing shall be fully inserted into the fitting and the tubing marked at the shoulder of the fitting. The fitting alignment shall be checked against the mark on the tubing to assure the tubing is fully engaged (inserted) in the fitting. The joints shall be pressed using the tool approved by the manufacturer.
- F. Installer shall be a qualified installer, licensed within the jurisdiction, and familiar with the installation of press-fit copper press joint systems. Press-fit 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 "ProPress", Nibco "Press-fit", and Apollo "Xpress" 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 press-fit copper system in accordance with the IPC Chapter 6 Section 605.5.1, 605.5.1.2 and 605.14.1. Use caution around combustible material and follow all safety guidelines for open flame during silver brazing.

**END OF SECTION**



## **SECTION 22 0030**

### **INSULATION AND 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. Condensate waste piping from air conditioning units.
  - 4. Branch waste lines from all chilled water fountains.

##### **1.3 REFERENCE STANDARDS**

- A. Refer to Section 220000 for a general description of requirements applying to this section.
- B. Materials shall conform to the requirements of the NFPA Code.

##### **1.4 QUALITY ASSURANCE**

- A. Refer to Section 220010 for a general description of requirements applying to this section.

##### **1.5 SUBMITTALS**

- A. Submit shop drawings and product data in accordance with Section 220000.
- B. Submit the following:
  - 1. Product data on all insulation and covering.

##### **1.6 WARRANTY/GUARANTEE**

- A. All work and materials are subject to the general warranty as described in the General Conditions of the Contract and in Division 1, GENERAL REQUIREMENTS.

#### **PART 2 – PRODUCTS**

##### **2.1 PIPE INSULATION MATERIAL**

- A. 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

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 insulation in wet areas indoors:
1. PVC heavy duty fitting covers and jacketing for kitchen wet areas.
  2. Fitting covers shall be glossy white, high impact, UV resistant PVC.
  3. Operating Temperature Limit: Up to 150°F.
  4. Flame Spread: 25 or less.
  5. Smoke Developed: 50 or less.
  6. Grade: Weatherable.
  7. Color: White
  8. Finish: Gloss
  9. Fitting covers and jacketing shall be "Zeston" 300 Series PVC, heavy duty covers and "Zeston" PVC jacketing.

### **PART 3 – EXECUTION**

#### **3.1 INSTALLATION**

- A. Do not install until systems have been tested and meet requirements.
- B. Heavy work which may damage insulation shall have been completed in the vicinity of the insulation work.
- C. All installations shall be made by skilled craftsmen regularly engaged in this type of work.
- D. Insulation shall be continuous thru-wall, ceiling and floors.
- E. Pipe and equipment to be clean and dry prior to insulating.
- F. Install all insulation in strict conformance with manufacturer's instructions.
- G. Where "Barrier-free" lavatory supplies and waste are covered with a protective covering or insulation, the insulation must be installed back to wall, flush with wall escutcheon. Escutcheon to be finished flush with wall and wall opening to be smaller than escutcheon plate through entire building.
- H. Install pipe insulation by slitting tubular sections and applying onto piping or tubing. Alternately, whenever possible, slide unslit sections over the open ends of piping or tubing. All seams and butt joints shall be adhered and sealed using Armaflex 520 or 520 BLV Adhesive. If when using AP Armaflex SS, only the butt joints shall be adhered using Armaflex 520 or 520 BLV Adhesive, Armaflex HT 625 Adhesive shall be used with HT Armaflex.
- I. Insulation shall be pushed onto the pipe, never pulled. Stretching of insulation may result in open seams and joints.

- J. Tape the ends of the copper tubing before slipping the Armaflex insulation over the new pipes to prevent dust from entering the pipe.
- K. All edges shall be clean cut. Rough or jagged edges of the insulation shall not be permitted. Proper tools such as sharp, non-serrated knives must be used.
- L. On cold piping, insulation shall be adhered directly to the piping at the high end of the run using a two-inch strip of Armaflex 520 or 520 BLV Adhesive on the ID of the insulation and on the pipe. All exposed end cuts of the insulation shall be coated with Armaflex 520 or 520 BLV Adhesive. All penetrations through the insulation and termination points must be adhered to the substrate to prevent condensation migration.
- M. Sheet insulation shall be used on all pipes larger than 6" IPS. Insulation shall not be stretched around the pipe. On pipes larger than 12" IPS, adhere insulation directly to the pipe on the lower 1/3 of the pipe.
- N. Seams shall be staggered when applying multiple layers of insulation.

### **3.2 VALVES, FLANGES AND FITTINGS:**

- A. All fittings shall be insulated with the same insulation thickness as the adjacent piping. All seams and mitered joints shall be adhered with Armaflex 520 or 520 BLV Adhesive. Screwed fittings shall be sleeved and adhered with a minimum 1" overlap onto the adjacent insulation. Armaflex HT 625 Adhesive shall be used with HT Armaflex.
- B. Valves, flanges, strainers and Victaulic couplings shall be insulated using Armaflex donuts that shall then be covered with sheet or oversized tubular insulation.

### **3.3 HANGERS**

- A. Support piping system using high density inserts with sufficient compressive strength. The pipe support insulation shall be elastomeric foam with the same or greater thickness than the pipe insulation. All joints shall be sealed with Armaflex 520 or 520 BLV adhesive.
- B. Standard and split hangers: Piping supported by ring hangers shall have hangers insulated with the same insulation thickness as the adjacent pipe. All seams and butt joints shall be sealed with Armaflex 520 or 520 BLV Adhesive. Armaflex HT 625 Adhesive shall be used with HT Armaflex. Ring hangers may be sleeved using oversized tubular insulation. On cold piping, insulation shall extend up the hanger rod a distance equal to four times the insulation thickness. Insulation tape may be used to a thickness equal to the adjacent insulation thickness.
- C. Clevis Hangers or other pipe support systems: Saddles shall be installed under all insulated lines at unistrut clamps, clevis hangers or locations where the insulation may be compressed due to the weight of the pipe. All piping shall have wooden dowels or blocks of a thickness equal to the insulation inserted and adhered to the insulation between the pipe and the saddle.

It is highly recommended for continuous insulation protection to use hanger sizes equal to the outer diameter of the pipe plus insulation thickness

- D. Armafix IPH or Armafix NPH can be used to prevent compression of insulation at standard split, clevis hangers or other pipe support systems. To minimize the movement of Armafix, it is recommended that a pair of non-skid pads be adhered to the clamps. In addition, to prevent loosening of the clamps, use of an antivibratory fastener, such as a nylon-locking nut, is also recommended.

### 3.4 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.

### 3.7 PIPE INSULATION – TYPES & THICKNESSES

- A. Flexible Closed Cell:

| Piping System                                       | Up to 3" | Over 3" to 6" | Over 6" |
|-----------------------------------------------------|----------|---------------|---------|
| Cold Water                                          | 1/2"     | 1/2"          | 3/4"    |
| Hot Water (105°F - 140°F)                           | 1"       | 1"            | 1-1/2"  |
| Hot Water Return (105°F - 140°F)                    | 1"       | 1"            | 1-1/2"  |
| Hot Water (>140°)                                   | 1"       | 1"            | 1-1/2"  |
| Hot Water Return (>140°)                            | 1"       | 1"            | 1-1/2"  |
| Condensate Waste                                    | 1/2"     | 1/2"          | -       |
| Horizontal Storm (Primary)                          | 1/2"     | 1/2"          | 3/4"    |
| Horizontal Storm (Secondary) -----Not Required----- |          |               |         |
| Underside of Roof Drains                            | 1/2"     | 1/2"          | 3/4"    |
| Branch Waste From EWC's                             | 1/2"     | ---           | ---     |
| Handicap Lav Waste & Water                          | 1/2"     | ---           | ---     |

- B. Fiberglass:

| Piping System | Up to 3" | Over 3" to 6" | Over 6" |
|---------------|----------|---------------|---------|
|---------------|----------|---------------|---------|

|                                  |      |      |        |
|----------------------------------|------|------|--------|
| Cold Water                       | 1/2" | 1/2" | 3/4"   |
| Hot Water (105°F - 140°F)        | 1"   | 1"   | 1-1/2" |
| Hot Water Return (105°F - 140°F) | 1"   | 1"   | 1-1/2" |
| Hot Water (>140°F)               | 1"   | 1"   | 1-1/2" |
| Hot Water Return (>140°F)        | 1"   | 1"   | 1-1/2" |
| Condensate Waste                 | 1/2" | 1/2" | ---    |
| Horizontal Storm (Primary)       | 1/2" | 1/2" | 3/4"   |
| Horizontal Storm (Secondary)     | 1/2" | 1/2" | 3/4"   |
| Underside of Roof Drains         | 1/2" | 1/2" | ---    |

**END OF SECTION**

## **SECTION 22 0110**

### **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 0030 is included as work of this section.
  - 6. Trenching and backfilling required in conjunction with underground building drainage and site drainage piping as specified in Section 220000 is included as work of this section. Refer to Division I.
  - 7. Installation of detectable metallic underground tape for all exterior buried PVC drainage piping.

##### **1.3 REFERENCE STANDARDS**

- A. Refer to Section 22 0000 for a general description of requirements applying to this section.

##### **1.4 QUALITY ASSURANCE**

- A. Refer to Section 22 0010 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 0000.

- B. Submit the following:
  - 1. Product data on all systems equipment.
- C. See requirements for submission of cross-referencing information.

## **1.6 WARRANTY/GUARANTEE**

- A. All work and materials are subject to the general warranty as described in the General Conditions of the Contract and in Division 1, GENERAL REQUIREMENTS.

## **PART 2 – PRODUCTS**

### **2.1 PIPING UNDERGROUND**

- A. Interior:
  - 1. Sanitary, storm water and condensate waste drainage piping within the building and extending beyond the building wall, unless otherwise noted on the plans shall be an option selection of a, b, or c below:
    - a. Service weight hub and spigot pattern cast iron soil pipe and fittings with neoprene gaskets.
    - b. Hubless cast iron soil pipe and fittings with cast iron coupling clamps and gaskets or heavy duty 3.04-.016" thick stainless-steel bands.
    - c. PVC Schedule 40 pipe and fittings with solvent cement joints.
  - 2. 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.
    - 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, sanitary/soil, waste and vent piping shall be:
  - 1. Hubless cast iron soil pipe with cast iron drainage fittings, couplings and stainless steel clamp bands for piping 2" and larger.
  - 2. Copper tubing, type DWV with wrought copper solder type drainage fitting for piping smaller than 2" in size.

## **2.3 CONDENSATE WASTE PIPING SYSTEM**

- A. All aboveground condensate waste piping including connection to equipment shall be:
  - 1. Copper tubing, type DWV with wrought copper solder type drainage fittings.

## **2.5 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.

## **2.6 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.
- 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.

## **2.7 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:

### 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

C. Cross Reference Identification:

1. If the Contractor selects a manufacturer of drainage equipment products other than as identified on the Schedule but is selected from the available manufacturers listed above, a cover sheet shall be included with the submission of shop drawings indicating the cross referenced manufacturer and model number.
2. Shop drawings shall not be reviewed or accepted if not in compliance with this requirement.

**PART 3 – EXECUTION**

**3.1 INSTALLATION OF SOIL AND WASTE PIPING**

- A. The Plumbing Contractor shall install a complete system of sanitary drainage piping as shown on the drawings. All drainage lines shall be properly run, trapped and vented in accordance with the local Plumbing Code and all dry vents, back vents, loop vents, revents or special vents required by the Code shall be furnished and installed by the Plumbing Contractor.
- B. Drainage lines of the sizes shown on the drawings shall be extended within the building with branches connecting to the base of all soil, waste and vent stack, etc., leaving outlets for connection to all fixtures, floor drains, as required.
- C. All changes in direction of drainage piping shall be installed with "Y" branches and 1/8 bends. All stacks shall be supported with concealed pipe clamps or hangers as required and the openings in the roof for the vent pipes will be provided by this Contractor.



- D. All drainage piping which will be located above suspended ceilings shall be checked for slope to assure positive drainage, prior to installation of the ceilings. Pressure tests for leaks, as hereinafter specified, shall also be performed prior to ceiling installation.
- E. Install soil and vent piping pitched to drain at minimum slope of 1/4" per foot (2%) for piping 2-1/2" and smaller, 1/8" per foot (1%) for piping 3" to 6", and 1/16" per foot (0.58) for piping 8" 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. (NSPC Chapter 8)
- H. All hangers, anchors, support and guides for piping and equipment shall be securely fastened to the building structure and/or floors with concrete decking with the following exception: Hangers, anchors, support and guides shall not be fastened to or through metal roof decking (i.e. bare metal decking or metal deck supporting a roofing system).

### **3.2 INSTALLATION OF CONDENSATE DRAINAGE PIPING**

- A. Connect piping to HVAC equipment and/or appliance requiring condensate drainage and extend to condensate risers and/or underground storm building drainage as indicated. (Extend condensate drainage discharge to the back of exterior downspouts or to exterior grade where indicated.)
- B. Underground condensate building drains shall be extended to underground storm building drainage or from the building, terminating \_\_\_\_\_ beyond the building wall where indicated.
- C. Provide clean-outs on condensate drainage where indicated. Condensate drainage piping shall be configured to permit the cleaning of blockages and performance maintenance without requiring piping to be cut.
- D. All changes in direction of condensate drainage piping sizes 1-1/4" and above shall be installed with "Y" branches and 1/8 bends.
- E. All condensate drainage piping shall be hung and/or supported in accordance with the plumbing code. All stacks/risers shall be supported with concealed pipe clamps or hangers as required.
- F. All condensate 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 condensate drainage piping pitched to drain at minimum slope of 1/8" per foot (1 percent slope.)
- H. Condensate piping shall be trapped where, and as required, by HVAC equipment and/or appliance manufacturer. Provide trap in accordance with HVAC equipment and/or appliance manufacturer.
- I. Condensate piping shall be provided with an upright back water valves as indicated and/or where condensate piping connects to storm drainage (via direct connection to above ground storm piping or underground storm drainage piping.) or as required by, and in accordance with, HVAC equipment or appliance manufacture (i.e. ductless mini-split systems.) Where condensate backwater valves are installed, they shall be installed on above ground vertical piping in the vertical position in the direction of drain flow and in areas with access for inspection and maintenance.
- J. After the completed installation (including inspection and testing) and before placing connected HVAC and/or appliances into service, condensate piping shall be flushed with water for a period of approximately 10 to 15 minutes to remove construction debris, left-over solder flux, etc. and to verify proper operation. (Where non-water-based flux is use, flush with hot water.)

### **3.3 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.

### **3.4 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.

### **3.5 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.

### **3.6 INSTALLATION OF ROOF DRAINS**

- A. Install drains in accordance with manufacturer's written instruction and in location indicated.
- 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.

### **3.7 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.

### **3.8 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.

### **3.9 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.

### **3.10 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.

### **3.11 BUILDING DRAINAGE SYSTEM CLEANING AND CAMERA VIDEO TAPE/TRANSMITTER**

- A. The Plumbing Contractor shall hire the services of a qualified and approved utilities camera and locating service.
- 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.
- 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**



## **SECTION 22 0120**

### **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 0030 is included as work of this section.
- E. Trenching and backfill required in conjunction with exterior water piping as specified in Section 220000 is included as work of this section. Refer to Division 1.

##### **1.3 REFERENCE STANDARDS**

- A. Refer to Section 22 0000 for a general description of requirements applying to this section.

##### **1.4 QUALITY ASSURANCE**

- A. Refer to Section 22 0010 for a general description of requirements applying to this section.

## **1.5 SUBMITTALS**

- A. Submit shop drawings and product data in accordance with Section 220000.
- B. Submit the following:
  - 1. Product data on all specialties and systems equipment.

## **1.6 WARRANTY/GUARANTEE**

- A. All work and materials are subject to the general warranty as described in the General Conditions of the Contract and in Division 1, GENERAL REQUIREMENTS.

## **PART 2 – PRODUCTS**

### **2.1 DOMESTIC WATER PIPING MATERIALS AND PRODUCTS**

- A. Provide piping materials and factory fabricated piping products of sizes, types, pressure ratings, temperature ratings, and capacities as indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide sizes and types matching piping and equipment connections; provide fittings of materials which match pipe materials used in domestic water piping systems. Where more than 1 type of materials or products are indicated, selection is Installer's option.
- B. All products and equipment designed for the dispensing of potable water shall be ANSI/NSF 61 and ANSI/NSF 372 certified as "lead free." Lead free refers to the wetted surface of pipe, fittings and fixtures in potable water systems that have a weighted average lead content  $\leq 0.25\%$  per the federal law of the safe drinking water act (sec. 1417) amended 1-4-2011 and other equivalent state regulations. The federal law does not apply to pipes, pipe fittings, plumbing fittings or fixtures that are used exclusively for non-potable services such as manufacturing, industrial processing, irrigation, outdoor watering, or any other uses where water is not anticipated to be used for human consumption. The law specifically excludes toilets, bidets, urinals, fill valves, flushometer valves, tub fillers, shower valves, service saddles, or water distribution main gate valves that are 2 inches in diameter or larger.

### **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 (See Appendix):
  - Tube Size 4" and Smaller: Copper tube.
  - Wall Thickness: Type "L" hard-drawn temper.
  - Fittings: Wrought-copper, solder-joints.
- C. Exterior Water Service Piping:
  - Pipe Size 3" and Smaller: Copper tube.
  - Wall Thickness: Type "K" Soft Temper
  - Fittings: Wrought copper solder joint.
  - 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)<br>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)<br>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. Sectional Valves:

2-1/2" and Smaller: Ball Valves.  
Gate Valves.

3" and Larger: Ball Valves.  
Butterfly Valves.

C. Shutoff Valves:

2-1/2" and Smaller:                      Ball Valves.  
  
                                                 Gate Valves  
  
3" and Larger:                              Ball Valves.  
  
                                                 Butterfly Valves.

D. Drain Valves:

All                                              Hose End Threaded Gate or Ball Valves.

E. Balancing Valves:

2" and Smaller:                              Ball Valves (Circuit Setter Type).  
  
                                                 (w/ Memory Stop)

F. Check Valves:

All Sizes:                                      Swing Check Valves. Horizontal Installations  
  
                                                 Spring Check Valves. Vertical Installations

**2.6 SPECIAL VALVES**

- A. Special valves required for domestic water piping systems include the following types:
- B. Hose Bibbs: Threaded end, renewable composition disc, tee handle, 3/4" NPT inlet, 3/4" hose outlet with vacuum breaker.
1. Finished Areas: Chrome plated.
2. Unfinished Areas: Bronze finish.
- C. Wall Hydrants: Non-freeze, cast-bronze body, tee handle key, bronze casing, length to suit wall thickness, vacuum breaker, hinged locking cover, 3/4" inlet, hose outlet.

**2.7 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:
- Pressure gauges
- Glass thermometers
- Pressure and temperature connections

**2.8 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 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.



## **2.9 SYSTEMS EQUIPMENT MANUFACTURERS**

- A. Refer to Plumbing Fixture and Equipment Schedule for type, number, size and manufacturer of all equipment and accessories.
- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering equipment which may be incorporated in the work are limited to the following:

### Shock Absorbers:

Zurn

Josam

Watts

Smith

PPP Inc.

MIFAB

Sioux Chief

Oatey

### Hose Bibbs

Woodford

Zurn

Josam

Watts

J.R. Smith

MIFAB

### Wall Hydrants

Woodford

Zurn

Josam

Watts

J.R. Smith

MIFAB

### Backflow Preventers

Conbraco

Febco

Cla-Val

Wilkins

ITT Grinnell

Neptune

Watts

### **PART 3 – EXECUTION**

#### **3.1 INSTALLATION OF BASIC IDENTIFICATION**

- A. Install mechanical identification in accordance with Section 220010 Basic Materials and Methods.
- B. Support vertical piping at floor levels using approved riser clamps. Clamp material shall be compatible with pipe material. Maximum vertical spacing shall be 10'-0". Domestic water piping shall be supported in accordance with the International Mechanical Code, Section 305 and Table 305.4 Spacing Intervals, or in accordance with MSS-SP-69. International Plumbing Code's latest edition, Section 308.5, accept as follows:
  - 1. Copper tubing ½" to 1-1/4" nominal size, not to exceed 6 ft. horizontal intervals.
  - 2. Copper tubing 1-1/2" and larger nominal size, not to exceed 10 ft. horizontal intervals.
  - 3. Copper tubing ½" to 1-1/4" nominal size, not to exceed 10 ft. vertical intervals.
  - 4. Copper tubing 1-1/2" and larger nominal size not to exceed 10 ft. vertical intervals.

#### **3.2 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.

#### **3.3 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.

### **3.4 INSTALLATION OF EXPANSION COMPENSATION PRODUCTS**

- A. This project shall require the installation of expansion compensators.
- B. Furnish and install expansion compensation products in accordance with Section 220210 Basic Materials and Methods – HVAC

### **3.5 INSTALLATION OF THERMOMETERS AND GAUGES**

- A. Install thermometers and gauges in accordance with Section 220010 Basic Materials and Methods.

### **3.6 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.

### **3.7 SPARE PARTS**

- A. Furnish to Owner, with receipt, one valve key for each key operated hydrant, bibb, or faucet installed.

## **PART 4 – APPENDIX**

Design and calculations of interior domestic water piping systems are all based on using Type “L” copper pipe. If PEX plastic pipe and/or tube is used as a substitute material for interior domestic water pipe, the contractor will be responsible for confirming pipe sizes and domestic water piping equipment are adequate for flow and hydraulic friction loss for all cold water, hot water, and hot water circulation systems. It should be noted that the respective nominal pipe sizes internal diameters of PEX piping compared to Type “L” copper pie are significantly small. As a result, at equal flows (gpm) friction loss and flow velocities will be higher for PEX pipe. The following table, *Type “L” Copper Pipe vs PEX Tube*, has been approved as an acceptable substitution for the specified domestic water piping material. As noted in the Section 220000 General Provisions – Plumbing/Fire Protection, all substitutions must be submitted and approved by the Owner, Architect, and/or Design Engineer.

### **END OF SECTION**

| Type "L" Copper Pipe vs PEX Tube |                                                                              |                                            |                                                                  |                                                                     |                                                        |                                                                   |                                                                  |                                                                     |                                                        |                                                                   |                                                                                          |                                                              |                                                                              |                            |        |
|----------------------------------|------------------------------------------------------------------------------|--------------------------------------------|------------------------------------------------------------------|---------------------------------------------------------------------|--------------------------------------------------------|-------------------------------------------------------------------|------------------------------------------------------------------|---------------------------------------------------------------------|--------------------------------------------------------|-------------------------------------------------------------------|------------------------------------------------------------------------------------------|--------------------------------------------------------------|------------------------------------------------------------------------------|----------------------------|--------|
|                                  |                                                                              |                                            | Hot Water (HW)<br>maximum velocity and friction loss             |                                                                     |                                                        |                                                                   | Cold Water (CW)<br>maximum velocity and friction loss            |                                                                     |                                                        |                                                                   | Hot Water Recirculation<br>(HWR)<br>maximum velocity and<br>friction loss                |                                                              |                                                                              | Internal Pipe<br>Diameters |        |
| Nominal<br>Pipe<br>Size          | PEX<br>approximate<br>equivalent<br>length of 100<br>ft of "L"<br>Coper Pipe | PEX<br>ft/100 ft<br>"L"<br>Copper<br>Ratio | "L"<br>Copper<br>flow<br>(GPM)<br>of max<br>velocity<br>of 5 fps | "L"<br>Copper<br>friction<br>loss at<br>max<br>velocity<br>of 5 fps | PEX<br>flow<br>(GPM)<br>of max<br>velocity<br>of 5 fps | PEX<br>flow<br>friction<br>loss at<br>max<br>velocity<br>of 5 fps | "L"<br>Copper<br>flow<br>(GPM)<br>of max<br>velocity<br>of 8 fps | "L"<br>Copper<br>friction<br>loss at<br>max<br>velocity<br>of 8 fps | PEX<br>flow<br>(GPM)<br>of max<br>velocity<br>of 8 fps | PEX<br>flow<br>friction<br>loss at<br>max<br>velocity<br>of 8 fps | Flow<br>(GPM)<br>"L"<br>Copper<br>at 3 fps<br>max.<br>PEX at<br>approx.<br>4 fps<br>max. | "L"<br>Copper<br>friction<br>loss at<br>velocity<br>of 3 fps | PEX<br>flow<br>friction<br>loss at<br>max<br>velocity<br>approx.<br>of 4 fps | Type<br>"L"<br>Copper      | PEX    |
| Inches                           | Feet                                                                         |                                            | GPM                                                              | ft/ft                                                               | GPM                                                    | ft/ft                                                             | GPM                                                              | ft/ft                                                               | GPM                                                    | ft/ft                                                             | GPM                                                                                      | ft/ft                                                        | ft/ft                                                                        | Inches                     | Inches |
| 1/4                              | 24                                                                           | 0.24                                       | 1.2                                                              | 0.435                                                               | 0.67                                                   | 0.616                                                             | 1.94                                                             | 1.057                                                               | 1.08                                                   | 1.490                                                             |                                                                                          |                                                              |                                                                              | 0.315                      | 0.235  |
| 3/8                              | 42                                                                           | 0.42                                       | 2.25                                                             | 0.305                                                               | 1.9                                                    | 0.531                                                             | 3.6                                                              | 0.729                                                               | 2.53                                                   | 0.902                                                             |                                                                                          |                                                              |                                                                              | 0.430                      | 0.360  |
| 1/2                              | 72                                                                           | 0.72                                       | 3.63                                                             | 0.233                                                               | 3.15                                                   | 0.248                                                             | 5.8                                                              | 0.555                                                               | 5.05                                                   | 0.594                                                             |                                                                                          |                                                              |                                                                              | 0.545                      | 0.510  |
| 5/8                              | 53                                                                           | 0.53                                       | 5.42                                                             | 0.184                                                               | 4.17                                                   | 0.215                                                             | 8.67                                                             | 0.440                                                               | 6.67                                                   | 0.514                                                             |                                                                                          |                                                              |                                                                              | 0.666                      | 0.584  |
| 3/4                              | 49                                                                           | 0.49                                       | 7.5                                                              | 0.151                                                               | 5.6                                                    | 0.176                                                             | 12                                                               | 0.360                                                               | 9                                                      | 0.423                                                             | 4.5                                                                                      | 0.059                                                        | 0.117                                                                        | 0.785                      | 0.681  |
| 1                                | 45                                                                           | 0.45                                       | 12.8                                                             | 0.111                                                               | 9.3                                                    | 0.133                                                             | 25.7                                                             | 0.402                                                               | 14.9                                                   | 0.317                                                             | 7.7                                                                                      | 0.043                                                        | 0.094                                                                        | 1.025                      | 0.875  |
| 1-1/4                            | 44                                                                           | 0.44                                       | 19.5                                                             | 0.087                                                               | 13.9                                                   | 0.105                                                             | 31.2                                                             | 0.209                                                               | 22.3                                                   | 0.252                                                             | 11.7                                                                                     | 0.034                                                        | 0.076                                                                        | 1.265                      | 1.069  |
| 1-1/2                            | 43                                                                           | 0.43                                       | 27.7                                                             | 0.071                                                               | 19.5                                                   | 0.087                                                             | 44.2                                                             | 0.169                                                               | 31.2                                                   | 0.208                                                             | 16.5                                                                                     | 0.027                                                        | 0.064                                                                        | 1.505                      | 1.263  |
| 2                                | 42                                                                           | 0.42                                       | 48.2                                                             | 0.052                                                               | 33.4                                                   | 0.064                                                             | 77.1                                                             | 0.123                                                               | 53.5                                                   | 0.152                                                             | 28.9                                                                                     | 0.020                                                        | 0.049                                                                        | 1.985                      | 1.653  |
| 2-1/2                            | 41                                                                           | 0.41                                       | 72.5                                                             | 0.038                                                               | 50.9                                                   | 0.05                                                              | 116.1                                                            | 0.091                                                               | 81.5                                                   | 0.119                                                             | 44.6                                                                                     | 0.016                                                        | 0.039                                                                        | 2.465                      | 2.041  |
| 3                                | 39                                                                           | 0.39                                       | 106.1                                                            | 0.032                                                               | 72.3                                                   | 0.041                                                             | 169.8                                                            | 0.078                                                               | 115.7                                                  | 0.097                                                             | 63.7                                                                                     | 0.013                                                        | 0.032                                                                        | 2.945                      | 2.431  |

Friction Head Loss =  $[4.52 \times (Q)^{1.85}] / ([C]^{1.85} \times (D)^{4.87}) \times 2.31 = Pf$  (ft/ft)

Velocity =  $(0.4085 \times Q) / D^2 =$  ft per second (fps)

Q = flow (GPM); C = Hazen-Williams coefficient (140 for copper and PEX); D = internal diameter of pipe (inches)





## **SECTION 22 0130**

### **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. 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 0000 for a general description of requirements applying to this Section.

##### **1.4 QUALITY ASSURANCE**

- A. Refer to Section 22 0010 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 0000.
- B. Submit the following:
  - 1. Product data on gas valves.

##### **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: Medium-density polyethylene pipe.
3. Exterior Exposed or Roof Top Piping: Schedule 40 black steel with weather coating.

Fittings: Wrought steel, butt welded or malleable blade inch threaded.

## **2.4 BASIC PIPING SPECIALTIES**

- A. Provide piping specialties complying with applicable Division 22 Sections and in accordance with the following listing:

Pipe escutcheons

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

## **2.6 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 Sensus, or approved equal..

**B. AVAILABLE MANUFACTURES**

1. Subject to compliance with the requirements, manufacturer of gas 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.

Fisher

Sensus

Emerson

**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.
- 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 1/2" nominal size – not to exceed 6 ft.
  - b. Steel pipe 3/4" 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.
5. All hangers, anchors, support and guides for piping and equipment shall be securely fastened to the building structure and/or floors with concrete decking with the following exception: Hangers, anchors, support and guides shall not be fastened to or through metal roof decking (i.e. bare metal decking or metal deck supporting a roofing system).

### **3.3 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.

### **3.4 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 medium pressure (psi) to low pressure (WC). All regulators shall be provided with relief vent discharge piping of lengths as required for minimum distance of equipment air intake grilles.

### **3.5 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.

### **3.6 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. 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.

**END OF SECTION**

**SECTION 22 0140**  
**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
    - Electric Water Coolers
    - Sensor-Operated Flush Valves and Faucets
    - Manually Operated Flush Valves
    - Lavatory Shield Enclosure
  - 3. Refer to Section 22 0120 for domestic water piping systems used in conjunction with plumbing fixtures; not work of this section.
  - 4. Refer to Section 22 0110 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 0000 for a general description of requirements applying to this section.

**1.4 QUALITY ASSURANCE**

- A. Refer to Section 22 0010 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 22 0000.
- B. Submit the following:
  - 1. Product Data: Submit manufacturer's specifications for plumbing fixtures and trim, including catalog cut of each fixture type and trim item furnished, roughing-in dimensioned drawings, templates for cutting substrates, fixture carriers, and installation instructions.
  - 2. Color Selection Data: Submit charts or samples for color selection where applicable.
  - 3. Maintenance Data: Submit maintenance data and parts lists for each fixture type and trim item, including instructions for care of finishes. Include this data in maintenance manual.

## **1.6 WARRANTY/GUARANTEE**

- A. All work and materials are subject to the general warranty as described in the General Conditions of the Contract and in Division 1, GENERAL REQUIREMENTS.

## **1.7 PRODUCT DELIVERY, STORAGE AND HANDLING**

- A. Deliver plumbing fixtures individually wrapped in factory-fabricated containers.
- B. Handle plumbing fixtures carefully to prevent breakage, chipping and scoring the fixture finish. Do not install damaged plumbing fixtures; replace and return damaged units to equipment manufacturer.

## **PART 2 – PRODUCTS**

### **2.1 PLUMBING FIXTURES**

- A. Provide factory-fabricated fixtures of type, style and material indicated. For each type fixture, provide fixture manufacturer's standard trim, carrier, seats, and valves as indicated by their published product information; either as designed and constructed, or as recommended by the manufacturer and as required for a complete installation. Where more than one type is indicated, selection is Installer's option; but, all fixtures of same type must be furnished by single manufacturer. Where type is not otherwise indicated, provide fixtures complying with governing regulations.

### **2.2 MATERIALS**

- A. Unless otherwise specified, comply with applicable Federal Specification WW-P-541/-Series sections pertaining to plumbing fixtures, fittings, trim, metals and finishes. Comply with the requirements of WW-P-541/-specification relative to quality of ware, glazing, enamel, composition and finish of metals, air gaps, and vacuum breakers, even though some plumbing fixtures specified in this section are not described in WW-P-541/-.
- B. Provide materials which have been selected for their surface flatness and smoothness. Exposed surfaces which exhibit pitting, seam marks, roller marks, foundry sand holes, stains, decoloration, or other surface imperfections on finished units are not acceptable.
- C. Where fittings, trim and accessories are exposed or semi-exposed, provide bright chrome-plated or polished stainless-steel units. Provide copper or brass where not exposed.
- D. Stainless Steel Sheets: ANSI/ASTM A-167, Type 302/304, hardest workable temper. Finish: No. 4, bright, directional polish on exposed surfaces.
- E. Steel Sheets for Baked Enamel Finish: ANSI/ASTM A-591, coating Class C, galvanized-bonderized.
- F. Steel Sheets for Porcelain Enamel Finish: ANSI/ASTM A-424, commercial quality, Type 1.
- G. Vitreous China: High quality, free from fire cracks, spots, blisters, pinholes, and specks; glaze exposed surfaces, and test for crazing resistance in accordance with ANSI/ASTM C-554.
- H. Fiberglass: ANSI Z124 smooth surfaced, with color selected by Architect/Engineer.
- I. Aluminum: ANSI/ASTM B-209/B-221 sheet, plate and extrusions, as indicated; alloy, temper and finish as determined by manufacturer, except 0.40 mil natural anodized finish on exposed work unless another finish is indicated.
- J. Synthetic Stone: High quality free from defects, glaze on exposed surfaces, stain resistant.

## **2.3 PLUMBING FITTINGS, TRIM AND ACCESSORIES**

- A. Lavatory Protective Shield Covers:
  - 1. Fully molded enclosure "Lav Shields" as manufactured by Zurn or Truebro, Inc., complete with tamper-resistant stainless steel fasteners.
  - 2. Shield enclosure to meet A.D.A. #4.19.4, ANSI A117.1 and BOCA P- 1203.4.
- B. Water Outlets: At locations where water is supplied (by manual, automatic or remote control), provide commercial quality faucets, valves, or dispensing devices, of type and size indicated, and as required to operate as indicated. Include manual shutoff valves and connecting system pipes to permit outlet servicing without shut- down of water supply piping systems.
  - 1. Vacuum Breakers: Provide with flush valves where required by governing regulations, including locations where water outlets are equipped for hose attachment.
- C. P-traps: Include removable P-traps where drains are indicated for direct connection to drainage system. All traps shall be minimum 17 gauge.
- D. Carriers: Provide cast-iron and/or steel supports for fixtures. Carriers shall be provided for all wall-hung fixtures, and/or the carrier shall be selected to support the fixture independently of the wall. Carriers shall be adjustable type, complete with all fittings and foot supports. Carrier shall be single or double, back-to-back, horizontal offset and vertical stack type. Carrier shall be selected and used as best suited within the pipe chases. Where noted or indicated, stud mount type carriers shall be used and installed within stud wall s 8" and less.
- E. Fixture Bolt Caps: Provide manufacturer's standard exposed fixture bolt caps finished to match fixture finish.
- F. Escutcheons: Where fixture supplies and drains penetrate walls in exposed locations, provide chrome plated sheet steel escutcheons with friction clips.
- G. Aerators: Provide aerators of types approved by Health Departments having jurisdiction.
- H. Comply with additional fixture requirements contained in fixture schedule attached to this section.

## **2.4 FIXTURE LIST**

- A. Refer to the "Plumbing Fixture & Equipment Schedule" as indicated on the drawings.

## **2.5 SENSOR-OPERATED 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 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.

## **2.6 AVAILABLE MANUFACTURERS**

- A. Subject to compliance with requirements, manufacturers offering fixtures, trim and carriers which may be incorporated in the work include, and are limited to the following, or approved equal, unless noted otherwise:

### **Water Closets (Wall-Mounted Back Outlet – China)**

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.

Zurn

American Standard

Kohler

Toto

### China/Enameled Fixtures

Kohler

American Standard

ToTo

Zurn

### Faucets/Trim (Non-Sensor Operated)

Kohler

American Standard

Delta

Moen

Elkay

Speakman

Chicago

Zurn

Faucets/Trim (Sensor-Operated)

**\*\*Owner Provided\*\***

Flush Valves (Sensor Operated)

**\*\*Owner Provided\*\***

Fixture Carriers

Zurn

Josam

Wade

Watts

Smith

MIFAB

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. (unless client specifically indicates not to provide one)

Water Coolers

Elkay

Haws

Halsey-Taylor

Oasis

Acorn

Stainless Steel Sinks

Elkay

Just

Dayton

Acorn

Advanced-Tabco

Emergency/Safety Equipment

Bradley

Haws

Western

Speakman

Guardian

Washer & Appliance Utility Boxes

Symmons

Guy-Gray

Oatey

Precision Plumbing Products, Inc.

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.

**2.7 HANDICAP LAVATORY INSULATION**

- A. Fully molded "P" trap and angle valve insulation kit Handi-Lav Guard Truebro Model #101, 102 and 105 to suit, or approved equal.

### **PART 3 – EXECUTION**

#### **3.1 FIXTURE CONNECTIONS**

- A. Connections to plumbing fixtures shall be of the sizes indicated on the "Plumbing Fixture & Equipment Schedule".
- B. The sizes indicated on the Schedule are for drainage and water piping serving an individual fixture; the sizes of the mains and branches shall be as indicated on the drawings.

#### **3.2 FIXTURE SETTING HEIGHTS**

- A. The plumbing fixtures shall be set in accordance with the heights established by the latest edition of codes and ADA requirements.

Note: Height indicated is established as follows:

|                   |                                               |
|-------------------|-----------------------------------------------|
| Water Closets:    | From finished floor to top of seat.           |
| Urinals:          | From finished floor to rim of fixture.        |
| Lavatories & EWC: | From finished floor to rim of fixture.        |
| Receptor Fitting: | From finished floor to center of fitting.     |
| Shower:           | From finished floor to center of shower head. |

- B. Refer to Architectural drawings and sections for fixture elevations. Fixtures in various areas may be set at lower elevations. Confirm all rough-in elevations prior to any installation.

#### **3.3 LAVATORY PROTECTIVE SHIELD ENCLOSURES**

- A. Installation shall conform to manufacturer's written instructions.
- B. All items involved with wall-hung lavatory installations shall be roughed-in and installed within the enclosure. This includes the offset "P" trap assembly, thermostatic mixing valve, sensor faucet trim and accessories, electrical outlet. Coordinate all work required for complete concealment of all devices.

#### **3.4 INSPECTION AND PREPARATION**

- A. Examine roughing-in work of domestic water and waste piping systems to verify actual locations of piping connections prior to installing fixtures. Also examine floors and substrates, and conditions under which fixture work is to be accomplished. Correct any incorrect locations of piping, and other unsatisfactory conditions for installation of plumbing fixtures. Do not proceed with work until satisfactory conditions have been corrected.
- B. Install plumbing fixtures of types indicated where shown and at indicated heights; in accordance with fixture manufacturer's written instructions, roughing-in drawings, and with recognized industry practices. Ensure that plumbing fixtures comply with requirements and service intended purposes. Comply with applicable requirements of the International Plumbing Code pertaining to installation of plumbing fixtures.
- C. Fasten plumbing fixtures securely to indicated supports or building structure; and ensure that fixtures are level and plumb. Secure plumbing supplies behind or within wall construction so as to be rigid, and not subject to pull or push movement.

**3.5 CLEAN AND PROTECT**

- A. Fixture shall be thoroughly cleaned after completion of installation.
- B. Protect installed fixtures from damage during the remainder of the construction period.

**3.6 FIELD QUALITY CONTROL**

- A. Upon completion of installation of plumbing fixtures and after units are water pressurized, test fixtures to demonstrate capability and compliance with requirements. When possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units and proceed with retesting.
- B. Inspect each installed unit for damage to finish. If feasible, restore and match finish to original at site; otherwise, remove fixture and replace with new unit. Feasibility and match to be judged by Architect/Engineer. Remove cracked or dented units and replace with new units.

**END OF SECTION**



**SECTION 22 0150**  
**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:  
Packaged Domestic Water Heater

**1.3 REFERENCE STANDARDS**

- A. Refer to Section 22 0000 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.
- 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 0010 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 0000.
- 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 GAS-FIRED WATER HEATER**

- A. As noted in drawing schedule.

### **2.3 MANUFACTURERS**

- A. Subject to compliance with requirements, manufacturers offering plumbing equipment shall be limited to the following, or approved equal unless noted otherwise:
  - 1. Domestic Water Heaters – As noted in drawing schedule

## **PART 3 – EXECUTION**

### **3.1 INSTALLATION OF 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.
- 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.

**END OF SECTION**



**SECTION 22 0190**  
**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
  - 2. Exterior Piping
    - a. Gas service
- D. See Fire Protection Specifications for testing of Fire Protection Systems.
- E. See Medical Gas Systems for testing of Medical Gas Systems.

**1.3 REFERENCE STANDARDS**

- A. Refer to Section 22 0000 for a general description of requirements applying to this section.

**1.4 QUALITY ASSURANCE**

- A. Refer to Section 22 0010 for a general description of requirements applying to this section.

**1.5 SUBMITTALS**

- A. Submit test reports in accordance with Section 22 0000.

**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 0010 for replacement of any defective pipe or fittings. Replacement shall include all required uncovering, excavating, recovering and backfilling.

### **PART 3 – EXECUTION**

#### **3.1 GENERAL**

- A. All exterior or interior piping shall be tested and approved before backfilling or concealing. Failure to secure the approval of the Municipal Inspector, Utility Company's Inspector or the Inspector of the Architect/Engineer makes it mandatory for the Contractor to completely expose the piping for testing. All expense involved in the uncovering of the piping for the test and recovering shall be borne by the respective Contractor with no change in Contract.
- B. All equipment, material and labor required for testing a plumbing system or part thereof shall be furnished by the Plumbing Contractor responsible for installing the work.

#### **3.2 INTERIOR PIPING**

- A. Drainage Piping:

Rough Plumbing: The piping of all plumbing storm, condensate waste, sanitary drainage and venting systems shall be tested upon completion of the rough piping installation by water or air and proved watertight. Where required by the code official, the cleanout plugs shall be removed to ascertain if the pressure has reached all parts of the system. Either of the following methods shall be used:

1. Water Test: The water test shall be applied to the drainage system either in its entirety or in sections after rough piping has been installed. If applied to the entire system, all openings in the piping shall be closed, except the highest opening, and the system filled with water to the point of overflow. If the system is tested in sections, each opening shall be plugged except the highest opening of the section under test, and each section shall be filled with water, but a section shall not be tested with less than a 10-foot head of water.

In testing successive sections, at least the upper 10 feet of the next preceding section shall be tested, so that a joint or pipe in the building (except the uppermost 10 feet of the system) shall not have been subjected to a test of less than a 10-foot head of water. The water shall be kept in the system or in the portion under test for a minimum of 15 minutes before inspection starts. The system shall then be tight at all points.

2. Air Test: The air test shall be made by attaching an air compressor testing apparatus to an opening, and, after closing all other inlets and outlets to the system, forcing air into the system until there is a gauge pressure of 5 pounds per square inch (5 psi) or a minimum of 10-inch column of mercury. This pressure shall be held without introduction of additional air for a minimum period of 15 minutes.

Precautionary Note: The compressibility of air and/or other gases result in tremendous amounts of stored energy, even at lower pressures. Over-pressurizing creates a substantial hazard to personnel and property near the area should a failure occur. Consult with the Plastic Pipe Institute (PPI) for statements and alerts, along with State and local safety offices.

Finished Plumbing: Where required by the code official, after the plumbing fixtures have been set and their traps filled with water, their connections shall be tested and proved gas and water-tight by one of the following test methods.

1. The final test for gas and water-tightness of the completed drainage and vent systems shall be made by a smoke test or other approved method. The test shall be made by filling all traps with water, and then introducing into the system smoke produced by one or more smoke machines. When the smoke appears at stack openings on the roof, the stack openings shall be closed and a pressure equivalent to a 1" water column shall be built and maintained for the period of the inspection.

2. After the plumbing fixtures have been set and their traps filled with water, their connections shall be tested and proven gas and water-tight by plugging the stack openings on the roof and building drain where the drain leaves the building and with air introduced into the system equal to the pressure of a 1-inch water column. This shall be accomplished by the use of a "U" tube or manometer inserted in the trap of a water closet. Such pressure shall remain constant for the period of inspection without the introduction of additional air.

Building sewer test: The building sewer shall be tested by insertion of a test plug at the point of connection with the public sewer or individual sewage disposal system. The building sewer shall then be filled with water under a head of not less than 10 feet. The water level at the top of the test head of water shall not drop for at least 15 minutes.

- B. Domestic Water Piping: All new, altered, extended or replaced interior water piping installed shall be tested at 100 psig maintaining the pressure for four hours with not more than 1% drop in pressure. The system shall be filled with water which shall remain in the system until the water and the piping are the same temperature. If water pipe testing is under the jurisdiction of the local inspector, his requirements shall be used; however, they shall be not less than specified herein. The tests shall be performed in the presence of the representative of the Architect/Engineer and to his satisfaction.
- 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 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. 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 no 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.
  - 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**

**SECTION 22 0800  
COMMISSIONING OF PLUMBING**

**PART 1 - GENERAL**

**1.1 SECTION INCLUDES**

- A. Description
- B. Responsibilities
- C. Related Work
- D. Test Equipment

**1.2 DESCRIPTION**

- A. The purpose of this section is to specify Division 22 responsibilities in the commissioning process.
- B. The systems to be commissioned are listed in Section 01 91 00.
- C. Commissioning requires the participation of the Division 22 Contractor to ensure that all systems are operating in a manner consistent with the Contract Documents. The general commissioning requirements and coordination are detailed in Section 01 91 00. Division 22 Contractor shall be familiar with all parts of Section 01 91 00 and shall execute all commissioning responsibilities assigned to them in the Contract Documents.

**1.3 RESPONSIBILITIES**

- A. Refer to Section 01 91 00.

**1.4 RELATED WORK**

- A. Specific commissioning requirements are given in the following sections of these specifications. All the following sections apply to the Work of this section.
  - 1. Section 01 91 00 – General Commissioning Requirements
  - 2. Section 23 08 00 - Commissioning of HVAC
  - 3. Section 26 08 00 - Commissioning of Electrical

**PART 2 - PRODUCTS**

**2.1 TEST EQUIPMENT**

- A. The Contractor shall provide all test equipment necessary to fulfill the testing requirements of this Division. This equipment includes, but is not limited to, the following:
  - 1. Handheld temperature and relative humidity meter.
  - 2. Infrared thermometer gun.
  - 3. Analog differential pressure gauge and associated tubing.

4. Portable computer with access to the building automation system.
- B. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the related specifications. If not otherwise noted, the following minimum requirements apply:
1. Temperature sensors and digital thermometers shall have a certified calibration within the past year to an accuracy of 0.5°F and a resolution of +/- 0.1°F.
  2. Pressure sensors shall have an accuracy of +/- 2.0% of the value range being measured (not full range of meter) and have been calibrated within the last year.
  3. All equipment shall be calibrated according to the manufacturer's recommended intervals and when dropped or damaged. Calibration tags shall be affixed or certificates readily available.
- C. Refer to Section 01 91 00 for additional Division 22 requirements.

### PART 3 - EXECUTION

- A. Refer to Section 01 91 00.

END OF SECTION

## **SECTION 23 0200**

### **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. All Mechanical Systems shall be part of and included in all of the following: 23 0200 thru 23 0950

##### **1.2 WORK INCLUDED**

- A. Provide labor, materials, equipment and supervision necessary to install complete operating HVAC Systems, including all work at the site and within the proposed construction areas to accomplish the required work.
- B. Wherever the term "provide" is used, it shall be understood to mean both "furnish" and "install".

##### **1.3 REGULATIONS, CODES AND STANDARDS**

- A. Work shall be performed in accordance with latest adopted codes, regulations and ordinances by authorities having jurisdiction. Observe all safety regulations.
- B. Obtain all permits and inspection certificates and pay all charges.
- C. Latest editions of any referenced standards shall govern.

##### **1.4 RELATED WORK**

- A. Refer to equipment shown or specified in sections of Division 1 thru 14 and 26 that will require Mechanical services and provide such service.
- B. Refer to work related to HVAC as shown on the following contract drawings:
  - Architectural & Structural
  - Plumbing
  - Electrical
- C. This Contractor shall coordinate with the work of Division 26 and the Fire Alarm System vendor for locations and mounting of all duct smoke detectors. These devices are shown on the Mechanical Drawings for reference only to show the intent of the work. All locations shall be determined based on approved shop drawings from the Fire Alarm System vendor and the Contractor for the work of Division 26, Electrical.

##### **1.5 COORDINATION**

- A. The Mechanical, Plumbing and Electrical Contractors are responsible to coordinate all manufacturer's recommended circuit breakers, starters, disconnects and fuse sizes for all equipment. Submission of a shop drawing will certify that this has been completed. Any necessary changes required will be included as part of this contract.

- B. Mechanical Contractor shall coordinate scheduling, submittals and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of independent work elements, with provisions to accommodate items that may be installed at a later time.
- C. Mechanical Contractor shall verify utility requirements and all characteristics of operating equipment are compatible with the building utilities. Coordinate the work of all sections related and required for installing, connection and placing in service of all equipment.
- D. Mechanical Contractor shall coordinate all space requirements, supports and installation of all mechanical, electrical, plumbing and fire protection work, which are indicated diagrammatically on the Drawings. Verify routing of all pipes, ducts, conduits and equipment connections. Maximize accessibility for other work, and service requirements for maintenance and repairs.
- E. Obtain written confirmation from all related trade Contractors and the Owner or his representative that requirements, conflicts and coordination issues have been discussed and resolved.
- F. Submit coordination drawings to verify access and clearances.

## 1.6 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures. Examples include installation within unheated shelters.

## 1.7 SUBMITTALS

- A. Shop Drawings:
  - 1. Shop drawings shall be submitted in accordance with Division 1 of these specifications except where herein modified.

**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 HVAC equipment as required by other sections of Division 23, shall be submitted for review checking. The Contractor shall review these shop drawings for conformance to contract documents prior to submission and affix contractor's signature to each submittal certifying that this review has been done. By approving and submitting shop drawings, product data, samples and similar materials, the Contractor represents that the Contractor has determined and verified materials, field measurements and field construction data that relates to the work, and has checked and coordinated this information with all of the requirements contained in the contract documents for the work of all trades.



- a. The Contractor and equipment manufacturer shall clearly identify in all submittals and shop drawings any and all applications standards which require additional work to accommodate this equipment and provide a complete and operational system as described in the contract documents.
  - b. The Contractor shall be completely responsible for any and all additional costs associated with the changes required by this and all other trades.
3. All shop drawing submittals shall have the following identification data, as applicable, contained therein or permanently adhered thereto.
  - a. Project name.
  - b. Project number.
  - c. Sub-contractor's, vendor's and/or manufacturer's name and address.
  - d. Product identification.
  - e. Identification of deviation from contract documents.
  - f. Applicable contract drawings and specification section number.
  - g. Shop drawing title, drawing number, revision number, and date of drawing and revision.
4. Resubmit revised or additional shop drawings as requested.
5. Wherever shop drawings or vendor's standard data sheets indicate work to be done "by others", it shall be the responsibility of the contractor making the submission to identify by name, the contractor who is to do this work. If the contractor named is other than the contractor making the submission, the shop drawing submission must be reviewed by the named contractor and bear his mark of approval, prior to submission to the Architect/Engineer.
6. Where equipment proposed differs from that shown on the drawings or specified, he shall submit for approval drawings showing the manner in which the layout is affected by the substitution.
7. The Contractor shall keep a copy of approved shop drawings at the job site.
8. No equipment, ductwork or piping, 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.

## **1.8 SITE INSPECTION**

- A. The Contractor shall visit site, inspect, and become aware of all conditions which may effect the work during the estimation phase of his work prior to bid openings. Investigate utilities, protection requirements for adjacent facilities, storage locations, and access to the construction area.
- B. Submission of a bid will be deemed evidence of having complied with this requirement.

## **1.9 SUBSTITUTIONS**

- A. Whenever a material, article, piece of equipment or system is identified in the following specification or indicated on the drawings by reference to manufacturers' or vendors' names, trade names, catalog numbers or the like, it is so identified for the purpose of establishing the basis of the Bid.
- B. Substitution approval must be obtained and included as an addendum item prior to the submission of the bid. An approved substitution shall not be considered as an approval for the Contractor or an equipment vendor to deviate from the written portion of the specifications unless so stated in the addendum.
- C. The drawings illustrate the space allocated for equipment and the Contractor shall install the equipment accordingly. If changes are required in the building or arrangement due to substitution of equipment, the Contractor making the substitution must pay for the necessary modifications.
- D. The listed equivalent or substituted manufacturers along with the bidding related contractor shall be completely responsible to comply with all requirements on all contract documents. This shall include, but not be limited to all: space requirements, code clearances, type-horsepower-capacities-number and size of services required from other trades including all auxiliary items provided by this Contractor and all other trades, and all manufacturer's specific equipment applications standards and requirements, for approved equipment including that which is basis of design or a substitution. The bidding related contractor and equipment manufacturers shall clearly identify in all submittals and shop drawings any and all applications standards which require additional work to accommodate this equipment and provide a complete and operational system as described in the contract documents. If the bidding contractor or manufacturer does not comply with these requirements then they shall be completely responsible for any and all additional costs associated with the changes required by this and all other trades.

## **1.10 LUBRICATION**

- A. Provide and maintain all required lubrication of any equipment operated prior to acceptance by the Owner. Lubrication shall be as recommended by the equipment manufacturer.
- B. Provide one year's supply of lubricants to Owner at date of acceptance.
- C. Verify that required lubrication has taken place prior to any equipment start-up.

## **1.11 EQUIPMENT START-UP**

- A. Verify proper installation by manufacturer or his representative.
- B. Advise Construction Manager 2 days prior to actual start-up.
- C. Verify proper operation. Obtain signed statement by manufacturer or his representative that equipment is operating within warranty requirements. Submit statement to Construction Manager.
- D. Perform field mechanical balancing in accordance with Section 23 0950: TESTING AND BALANCING OF MECHANICAL SYSTEMS.
- E. The Mechanical Contractor shall own as part of his work, the following:  
  
Provide one (1) additional drive set, if necessary, to obtain final design balancing requirements. The Mechanical Contractor shall coordinate with Balancing Firm and equipment manufacturer for drive selection, including belts and pulleys.

#### **1.12 OPERATION & MAINTENANCE INSTRUCTIONS**

- A. Properly and fully instruct Owner's personnel in the operation and maintenance of all systems and equipment.
  - 1. Provide 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 written confirmation 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.
- F. Submit electronically for review a complete set of operating and maintenance manuals prior to operating instruction period. If required by Owner, provide three (3) hard copies of manuals, suitably bound.
- G. Provide to the Owner any special tools necessary for operation and routine maintenance of any of the equipment.
- H. Upon completion of the project, the Mechanical Contractor shall provide a complete set of legible as-built drawings for the Owner.

#### **1.13 TOOLS**

- A. All equipment furnished by the Mechanical Contractor which requires special tools or devices other than those normally available to the maintenance or operating staff shall be furnished in duplicate to the Owner, sufficiently marked, packed or boxed for staff usage. The tools provided shall be listed by the Mechanical Contractor identified as to their use or the equipment applicable in a written transmittal to the Owner.

#### **1.14 CLEANING AND FINISHING**

- A. After equipment start-up and all operating tests have been made and the system pronounced satisfactory, each respective Contractor shall go over the entire project, clean all equipment, etc., installed by him and leave in a clean and working condition. Any surfaces found marred after this final cleaning shall be refinished or replaced by each Contractor at no cost to the Owner.
- B. Provide for the safety and good condition of all materials and equipment until final acceptance by the Owner. Protect all materials and equipment from damage. Provide adequate and proper storage facilities during the progress of the work. Special care shall be taken to provide protection for bearings, open connections, pipe coils, pumps, compressors and similar equipment.
- C. All fixtures, piping, finished surfaces and equipment shall have all grease, adhesive labels and foreign materials removed.
- D. All piping shall be drained and flushed to remove grease and foreign matter. Pressure regulating assemblies, traps, and similar items shall be thoroughly cleaned. Remove and thoroughly clean and reinstall all liquid strainer screens after the system has been in operation ten (10) days.

- E. When connections are made to existing systems, the Mechanical Contractor shall do all cleaning and purging of the existing systems required to restore them to the condition existing prior to the start of work.
- F. Clean-up: Remove from the premises, all unused material and debris resulting from the performance of work under this section.

## **PART 2 – PRODUCTS**

### **2.1 GENERAL**

- A. All material and equipment shall be new and of present day manufacture, and shall conform to accepted standards of the trade where such a standard has been established for the particular type of equipment or material.
- B. Whenever equipment or material is referred to in the singular, such as "the fan", it shall be deemed to apply to as many such items as necessary to complete the work.

### **2.2 PRODUCT DELIVERY, STORAGE AND HANDLING**

- A. During loading, transporting and unloading exercise care to prevent damage to material.
- B. Store all materials in dry enclosures or under protective coverings out of way of work progress.
- C. Material shall not be allowed to be stored directly on ground.
- D. Deliver in manufacturer's original cartons or on skids.
- E. Handle and protect so as to prevent damage to product or any surrounding material.

### **2.3 CONCRETE**

- A. Concrete shall be in accordance with Section 03300.

### **2.4 WARRANTY**

- A. Wherever in the specification sections of this division, reference is made to a specific warranty period, this warranty shall be in addition to and not a limitation of other rights the Owner may have against the Mechanical Contractor under the contract documents.

## **PART 3 – EXECUTION**

### **3.1 PROTECTION**

- A. Plug or cap open ends of piping systems, conduit and ductwork.
- B. Stored materials shall be covered to prevent damage by inclement weather, sun, dust or moisture.
- C. Protect all installed work until accepted in place by the Owner.
- D. Plates, polished metal escutcheons, thermostats and other finished devices shall not be installed until masonry, tile, and painting operations are complete unless otherwise protected.
- E. Protect all work from operations which may cause damage such as hauling, welding, soldering, painting, insulating and covering.

### **3.2 WORKMANSHIP**

- A. Install all work neat, trim and plumb with building lines.
- B. Install work in spaces allocated.
- C. Cutting and patching shall be performed by skilled tradesmen normally employed for the work involved.
- D. This Contractor shall provide a complete weathertight seal to all new systems in the building including the necessary caulking, weather-stripping and insulation.

### **3.3 EQUIPMENT SETTING**

- A. Provide as a minimum, a 4 inch concrete pad beneath all floor-mounted equipment. Install anchor bolts in pour.
- B. Provide as a minimum, spring vibration isolation under any equipment 10 HP and over and rubber in shear vibration isolation on any equipment up to 10 HP. For further specifications and additional requirements, refer to other sections.
- C. Concrete shall be 3,000 psi, 28 day compressive strength in accordance with ACI-613. Reinforce with No. 4 rod 12" on centers both ways or as otherwise detailed.

### **3.4 FASTENERS, HANGERS AND SUPPORTS**

- A. Provide all hangers and supports required to suspend, mount, or hang the work. Drilling into the roof deck is not permitted.
- 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.

### **3.5 SLEEVES**

- A. Provide each pipe, duct or conduit passing through a masonry or concrete wall, floor or partition with a sleeve made from standard weight steel pipe for pipe or conduit and No. 12 gauge galvanized steel for ducts, with smooth edges, securely and neatly cemented in place. Provide each pipe, duct or conduit passing through a frame or metal partition with a sleeve made from No. 22 gauge galvanized sheet metal, securely fastened in place.

- B. Be responsible for the proper location and alignment of all sleeves.
- C. Install both piping and sleeve seals so as to maintain integrity of seals with expansion and contraction of piping.
- D. Extend wall and partition sleeves through and cut flush with each surface unless otherwise indicated or specified.
- E. 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.

### **3.6 PLATES**

- A. Provide chrome plated plates wherever piping passes into finished area.
- B. Plates shall be securely fastened to piping or building construction.
- C. Floor plates shall cover 1 inch sleeve extension.

### **3.7 OFFSETS, TRANSITIONS, MODIFICATIONS**

- A. Provide all offsets necessary to install the work and to provide clearance for other trades.
- B. Maintain adequate headroom and clearance.
- C. Incidental modifications necessary to the installation of the systems shall be made as necessary and as approved by the Architect.

### **3.8 RECESSES**

- A. Furnish information to the Construction Manager as to sizes and locations of recesses required to install panels, boxes, and other equipment or devices which are to be recessed in walls.
- B. Make offsets or modifications as required to suit final locations.

### **3.9 LABELING**

- A. All HVAC equipment such as pumps, fans, air handling units, and devices requiring identification for operating procedures shall be provided with permanent black laminated micarta white core labels with 3/8 inch letters.
- B. This shall also apply to all controllers, remote start/stop pushbuttons and equipment cabinets.
- C. This shall not apply to individual room thermostats.
- D. Provide equipment labels secured to ceiling tile grid to identify all units above (i.e. VAV Boxes, FCUs, AHUs, etc.). Letters shall be black in color and a minimum of 3/8" high (similar to Brother P-Touch). Coordinate unit tag names/numbers with Owner's Representative.

### **3.10 FLASHING AND COUNTERFLASHING**

- A. Roof curbs, etc., shall have counterflashing fittings. General Contractor shall provide flashing.
- B. Piping and conduit thru the roof shall be flashed by the General Contractor. Provide counterflashing.

- C. Provide curbs with base features required to match roof materials, finishes and configuration; e.g., flat, sloped, raised seam, etc.

### **3.11 ACCESS**

- A. Locate all equipment, valves, devices and controllers which may need service in accessible places.
- B. Where access is not available, access panels shall be provided. Furnish access panels to the Construction Manager for installation.
- C. Access panels shall be Nailor-Hart Industries, Karp Co., or Controlled Air Manufacturing Limited, with 16-gauge frames and 14-gauge steel door, prime painted.
- D. Maintain access clearances for 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.
- E. Control wiring shall be provided under this Division of the work.
- F. All wiring shall be in accordance with the National Electrical Code and as recommended by the equipment manufacturer.

### **3.13 UTILITIES**

- A. Do not interrupt any utility or service to the Owner without adequate previous notice and schedule.

### **3.14 OPENINGS - CUTTING, REPAIRING**

- A. This Contractor shall cooperate with the work to be done under other sections in providing information as to openings required in walls, slabs and footings for all piping, ductwork and equipment, including sleeves where required.
- B. Any drilling or cutting required for the performance of work under this Section, shall be the responsibility of this Contractor and the cost thereof shall be borne by him.
- C. Holes in Concrete: Sleeves shall be furnished, accurately located and installed in forms before pouring of concrete. This Contractor shall pay all additional costs for cutting of holes as the result of the incorrect location of sleeves. All holes through existing concrete shall be either core drilled or saw cut. All holes required shall have the approval of the Structural Engineer prior to cutting or drilling.
- D. It shall be the responsibility of this Contractor to ascertain that all chases and openings are properly located.

### **3.15 PAINTING**

- A. Refer to the Construction Manager's Scope of Work.

**3.16 GUARANTEE**

- A. All work shall be guaranteed to be free from defects for a period of two years 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 two years from date of acceptance of the work by the Owner unless otherwise specified in Division 1. Should any trouble develop during this period due to defective materials or faulty workmanship, the Mechanical Contractor shall furnish necessary labor and materials to correct the trouble without any cost to the Owner. Any defective materials or inferior workmanship noticed at time of installation and/or during the guarantee period shall be corrected immediately to the entire satisfaction of the Owner.
- D. In the event of occupancy by the Owner prior to final acceptance of the project, the guarantee date for equipment placed in operation shall be mutually agreed to by the Mechanical Contractor and the Owner's representative.

**3.17 DRAWINGS**

- A. The Mechanical Systems are indicated on the Contract Drawings. Certain pertinent information and details required by the Mechanical Work appear on the Architectural, Structural and Electrical Drawings; become familiar with all drawings, and incorporate all pertinent requirements.
- B. Drawings are diagrammatic and indicate the general arrangement of systems and requirements of the work. Do not scale drawings. Exact locations of fixtures and equipment, not specifically shown, shall be obtained before starting work.

**3.18 TESTING AND BALANCING OF MECHANICAL EQUIPMENT**

- A. Perform field mechanical balancing in accordance with Section 230950: TESTING AND BALANCING OF MECHANICAL SYSTEMS.
- B. The Mechanical Contractor shall own as part of his work, the following:

Provide one (1) additional drive set, if necessary, to obtain final design balancing requirements. The Mechanical Contractor shall coordinate with Balancing Firm and equipment manufacturer for drive selection, including belts and pulleys.

**END OF SECTION**



## **SECTION 23 0210**

### **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 23 0200 for HVAC General Provisions.
- C. Refer to other sections in Division 23 for materials and methods not specified herein.

##### **1.2 DESCRIPTION OF WORK**

- A. Included in this Section are the following:
  - 1. Steel Pipe and Fittings
  - 2. Copper Tubing & Fittings
  - 3. Grooved End Pipe (Gruvlok) or (Victaulic)
  - 4. Strainers
  - 5. Thermometers
  - 6. Gauges
  - 7. Test Stations - Pressure/Temperature
  - 8. Isolating Fittings
  - 9. Unions
  - 10. Motors

##### **1.3 REFERENCE STANDARDS**

- A. Refer to Section 23 0200 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. NFPA
  - 4. OSHA
  - 5. ASHRAE
  - 6. 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.

#### **1.5 SUBMITTALS**

- A. Submit piping layout shop drawings in accordance with Section 23 0200.

### **PART 2 – PRODUCTS**

#### **2.1 STEEL PIPE AND FITTINGS**

- A. Water Piping:
1. ASTM A53, Schedule 40.
  2. Fittings up to 2 inch shall be 150 lb. malleable iron, screwed pattern ASME B16.3. Butt weld , ASME B16.9, same thickness as pipe.
  3. Fittings 2-1/2" and larger shall be butt weld ASME B16.9, same thickness as pipe.
  4. Weld-O-Lets and Thread-O-Lets shall be maximum of two sizes smaller than main size; i.e., maximum of a 2-inch Weld-O-Let on a 3-inch pipe.
  5. Thread tape shall be teflon tape, 3 mils minimum thickness.

#### **2.2 COPPER TUBING & FITTINGS**

- A. Refrigeration Piping:
1. Copper tubing: Type ACR, hard drawn temper.
  2. Fitting: Wrought-copper, solder joints, ASME B16.22 or ASME B16.26.
  3. Joints: Brazed, American Welding Society (AWS) Class BCUP-5 for brazing filler metal.
- B. Water Piping:
1. Tubing: Hard drawn seamless ASTM B-88 Type "L" aboveground.
  2. Soft seamless ASTM B-88 Type "K" below-ground.
  3. Joint Material: Brazed joints, low temperature silver-bearing solder.
    - a. Flux shall be non-toxic type and non-corrosive.
  4. Fittings: ASME B16.15, B16.18, B16.22, or B16.26.

C. Condensate Drain Piping:

1. Pipe: Copper tubing Type DWV.
2. Fittings: Wrought copper solder type drainage fittings, ASME B16.23 or B16.29.

**2.3 GROOVED END PIPE (VICTAULIC) (For use in Boiler Room and Mechanical Room Only)**

- A. All pipe shall be prepared in accordance with (ANSI/AWWA C-606). (CSA B242-M1980). (MIL-P-11087C Grooved End Pipe), or Victaulic (manufacturer's) published specifications as appropriate according to pipe materials, wall thickness, size and method of joining, as further detailed in Paragraph G: Pipe Preparation. In the event of conflict, Victaulic data shall prevail.
1. Iron Pipe Size: Pipe shall conform in size (outside diameter) to ANSI B-36.10 (API-5L) and/or to Victaulic (Manufacturer's) published outside diameter tolerances.
    - a. Steel Pipe (CSI-15061): Steel pipe shall be black, conforming to ASTM A-53, Grade B, 3/4 - 1-1/2" (20-40 mm) Type F and 2 - 24" (50-600mm) Type E or S or hot-dip galvanized.
- B. Couplings shall consist of two ductile iron cast housings, a synthetic rubber gasket of a central cavity pressure-responsive design, with nuts, bolts, locking toggle or lugs to secure unit together.
1. Coupling Housings: Shall be cast of ductile iron conforming to ASTM A-536 (Grade 65-45-12) enamel coated, hot dip galvanized to ASTM A-153 or zinc electroplated to ASTM B-633, as manufactured by Victaulic Company of America. Refer to Victaulic product specifications for other materials.
    - a. Coatings: Shall consist of an enamel paint or hot dip galvanizing to ASTM A-153, or zinc electroplating to ASTM B-633 as specified.
  2. Couplings for End Steel Pipe: Shall be Victaulic couplings for grooved and steel pipe prepared under "Grooved End Pipe". Couplings shall comply with ASTM F1476 Standard Specification for the Performance of Gasketed Mechanical Couplings for Use In Piping Applications.
    - a. Sizes 2" through 12": Coupling housings cast with offsetting, angle pattern bolt pads shall be used to provide system rigidity and support and hanging in accordance with ANSI B31.1 and B31.9.
      - (1) Victaulic Style 107V, Installation-Ready, for direct stab installation without field disassembly, with grade EHP gasket, suitable for water service to +250 deg F.
    - b. Flexible Type: For use in locations where vibration attenuation and stress relief are required, thermal expansion and contraction, in riser piping and for elimination of flexible connectors. Victaulic Installation-Ready Style 177N or Style 77.
    - c. 14" and Larger: AGS Series, with lead-in chamfer on housing key and wide width FlushSeal gasket. Victaulic Style W07 (rigid) with Coupling housing key designed to fill the wedge shaped AGS groove and provide system rigidity, and Style W77 (flexible).
    - d. Reducing Joints: Shall be Victaulic Style 750 Reducing couplings for pipe to pipe joints or to create reducing fittings using straight fitting configurations.
    - e. Outlets: All joints designed Outlet Couplings or where feasible to replace reducing outlet tees, shall be Victaulic Style 72 Outlet couplings male threaded outlet.
    - f. Flanged Connections: Shall be Victaulic Style 741 /W741 (2 - 24") Vic-Flange adapters, engaging directly into grooved pipe and bolting directly to ANSI Class 125 cast iron or Class 150 steel flanged components.

- C. Couplings for Grooved End Ductile Iron Pipe: Shall be Victaulic couplings for radius cut grooved ductile iron pipe preparation.
  - 1. Line and Fittings Joints: Shall be Victaulic Style 31 couplings.
  - 2. Flanged Connections: Shall be Victaulic Style 341 (4-24") (100-600mm) Vic-Flange adapters, engaging directly into grooved end pipe and bolting directly to ANSI Class 125 cast iron or Class 150 steel flanged components. Installer to supply standard flange bolts.
  - 3. For direct connection to IPS steel pipe sizes, couplings shall be Victaulic Style 307 transition couplings.
- D. Coupling Components:
  - 1. Gaskets shall be molded of synthetic rubber in a central cavity, pressure-responsive configuration conforming to the pipe outside diameter and couplings housing, of elastomers having properties as designated in ASTM D-2000. Reference always shall be made to the latest published selection guide for Victaulic gaskets for proper gasket selection for the intended service.
    - a. Water Service: Gasket supplied for water services from -30 deg. F to +230 deg F (-34 deg. C to +110 deg. C) shall be a Grade "E" EPDM compound, with green color code, molded of materials conforming to ASTM D-2000, designation 2CA615A25B24F172, recommended for hot water service within the specified temperature range, plus a variety of dilute acids, oil-free air, and many chemical services. Not recommended for petroleum services.
  - 2. Bolts and Nuts shall be heat treated carbon steel, track head, conforming to physical properties of ASTM A-449 and A-183 minimum tensile 110,000 psi, zinc electroplated to ASTM B-633, as supplied or specified.
    - a. Other Fasteners: Fasteners to certain products may vary from the specification as noted with each product.
- E. Fittings: Shall be Victaulic full flow cast fittings, steel fittings or segmentally welded fittings with grooves or shoulders designed to accept Victaulic grooved end couplings and AGS couplings 14" through 24".
  - 1. Standard Fittings: Shall be cast of ductile iron conforming to ASTM A-536 (Grade 65-45-12) painted with enamel or hot dip galvanized to ASTM A-153 or zinc electroplated to ASTM B-633 as required.
  - 2. Standard Steel Fittings: Including large size elbows (16-24"/400-600mm) shall be forged steel conforming to ASTM A-234 Grade WPB (0.375" wall), painted with enamel or hot-dip galvanized to ASTM A-153.
  - 3. Standard Segmentally Welded Fittings: Shall be factory-fabricated of Schedule 40 carbon steel pipe as follows: 3/4 - 1-1/2" (20-40mm) conforming to ASTM A-53 Type F, 2 - 10" (50 - 250mm) Schedule 40 conforming to ASTM A-53, Type E or S, Grade B, 12 - 24" (300 - 600mm) 0.375" wall conforming to ASTM A-53, Type E or S, Grade B, painted with enamel or hot-dip galvanized to ASTM A-153.
- F. Branch outlets for hole cut steel pipe: Shall be Victaulic hole cut products, cast of materials as in Paragraph 4a, with gasket as detailed in Paragraph 3c, on pipe preparation in Paragraph G.
- G. Gauge, Meter Outlets for Hole Cut Steel Pipe: Shall be Victaulic strapless mechanical outlet products Style 923 Vic-Let, or 924 Vic-O-Well and shall provide a pipe outlet without a need for a strap or lower housing to wrap around the pipe.

- H. Pipe Preparation: Shall be prepared in accordance with the latest published Victaulic specifications, ANSI/AWWA C-606, CSA B-242, UL, FM, NFPA or other standards as applicable. Pressure ratings and end loads for cut grooved pipe are based upon tests on pipe prepared in accordance with Victaulic specifications.
- I. Steel Pipe: Shall be steel pipe conforming to ASTM A-53 Grade "B", 1-1/2" (25-40 mm) Type F, 2-14" (50 - 600 mm) Type E or S.
  - 1. Grooved End Pipe: Shall be grooved in accordance with Victaulic Standard Specifications.
    - a. Standard Weight Pipe shall be roll grooved or square cut grooved.
- J. Assembly: Couplings, fittings, valves and pipe shall be assembled in accordance with latest published instructions from Victaulic Company of America for the particular product installed.
  - 1. Pipe: Shall be checked to be certain it is sufficiently free of indentations, projections, grooves, weld seams, or roll marks on the exterior of the pipe over the entire gasket seating area to assure a leak-tight seat for the gasket, that pipe ends are square cut and that preparation is in accordance with Victaulic pipe preparation standards.
  - 2. Gasket: All gaskets shall be of the central cavity pressure-responsive design. Gasket style and elastomeric material (grade) shall be checked to be certain gasket supplied is suited for the intended service.
  - 3. Lubrication shall always be used for proper coupling/fitting assembly as follows:
    - a. Thorough lubrication of the gasket exterior including the lips and/or pipe ends and housing interiors, is essential to prevent pinching the gasket. Lubrication assists proper gasket seating and alignment during installation.
    - b. Use Victaulic Lubricant for installation. Other compatible materials such as silicone and others may be used; however, petroleum-based lubricants must not be used on Grade "E" or "M" gaskets.
    - c. A thin coat of Victaulic lubricant shall be applied by brush or by hand by: 1) brushing on the gasket lips (ID) and the entire exterior of the gasket; 2) brushing lubricant on the pipe ends around the entire pipe circumference and inside the coupling housing.
    - d. The coupling manufacturer's factory trained representative shall provide on-site training for the contractor's field personnel in the use of grooving tools and installation of product. The representative shall periodically visit the job site to ensure best practices in grooved product installation are being followed. (A distributor's representative is not considered qualified to conduct the training.)
- K. Support:
  - 1. The requirements of MSS-SP-69 "Pipe Hangers and Supports"- Selection and Application: shall, in general, govern the installation of hangers and supports, in accordance with the following recommendations:
    - a. Piping joined with grooved type couplings, like all other piping systems, requires support to carry the weight of pipes and equipment. Like all other methods of jointing pipes, the support or hanging method must be such as to eliminate undue stresses on joints, piping and other components. Additionally, the method of support must be such as to allow movement of pipes where required and to provide for other special requirements such as drainage, etc., as may be required by the designer. The support system for mechanical grooved type pipe couplings must consider some of the special requirements of these couplings.

**OR**

**2.5 GROOVED END PIPE**

- A. Couplings, fittings, valves and other grooved components may be used as a proprietary piping method, or listed as an option to welding, threaded or flanged piping methods.
- B. Grooved Piping products shall comply with ISO 9001 Certified standards. Grooved piping installation shall meet ANSI B-31.1 – ANSI B-31.9 standards for horizontal and vertical pipe support design criteria. Grooved products shall meet national and local piping and/or building codes. Grooved products shall conform to ASTM, ANSI Standards, and other applicable Product Piping standard. All mechanical commercial and industrial piping products shall have a minimum 300 psi working pressure with 3 to 1 or greater safety working pressure.
- C. Couplings and grooved flange adapters shall conform to ASTM A-536 Ductile Grade 65-45-12 or to ASTM A-47 malleable grade 32510. Coupling track head bolts shall conform to ASTM A-183 Grade 2. Hex nuts shall conform to ASTM A-563 Grade A. Bolts and nuts are zinc electroplated. Fittings shall conform to cast ductile ASTM A-536 or cast malleable ASTM A-47. Forged steel fittings shall conform to ASTM A-234 or A-106 Gr B. Segmental welded fittings shall conform to ASTM A-53. Coatings shall be standard (orange) Alkyd-enamel rust inhibiting lead-free paint. Hot dipped galvanized fittings shall conform to ASTM A-153. Standard coupling gaskets for building services shall be Grade “E” EPDM conforming to ASTM D-2000 with operating temperature range from -30°F to +230°F.
- D. Coupling gaskets shall be lubricated with approved lubricant as provided by the piping system manufacturer. “Extreme Temperature Lubricant” shall be used for all systems below minus 20°F, and above 180°F and systems subject to continuous cycle temperature.
- E. Black steel pipe conforming to ASTM A-53, Grade A or B, Standard Schedule 40 may be roll or cut grooved. Grooving must conform to Manufacturer’s Standards.
  - 1. Manufacturer’s Standard (rigid) couplings shall be used including flange adapters. Manufacturer’s Standard (flexible) couplings may be used for vibration attenuation and noise suppression at equipment locations.
    - a. Optional: Combination rigid, flexible and outlet couplings may be used for complete systems to aid in providing vibration, noise suppression and seismic tremor. Clamp type couplings may be used for branch outlets. Grade “E” EPDM gaskets. Flexible or other style couplings designed for axial motion or other movements must be engineered and supported in strict accordance with factory recommendations.
  - 2. Transition flange adapter from flange to groove shall conform to ANSI class 125 or 150 lb. bolt pattern. Sizes 2” – 20” 300 psig. Sizes 24” 250 psig. Style 7013 2” – 12” available for ANSI Class 250/or 300 lb. bolt pattern. 750 psig. Flanges are designed with internal anti-rotation “tangs” designated as a rigid connection 2” – 12”. Series 7012 flange adapters require sealing rings when used with certain flanged products.
  - 3. Fittings shall be cast ductile, malleable, forged steel, and/or segmentally welded steel fittings. Cast ductile conforms to ASTM A-536 or ASTM A-47. Forged steel conforms to ASTM A-234. Segmentally welded conforms to ASTM A-53. Fittings shall be coated with an Alkyd-enamel non-toxic paint. Zinc electroplated fittings conform to ASTM B-633. Hot dip galvanized fittings conform to ASTM A-153. Standard Fittings are Schedule 40 or standard wall. Other fittings are schedule 80 or lightwall as specified.
  - 4. Grooved x grooved or grooved x thread insulating nipples. Inhibits the formation of a galvanic cell between dissimilar metals. Housing: Steel Tube to ASTM A513. Liner: Polypropylene to ASTM D4140. Operating temperature -40°F to +230°F. Size range is 2” – 6” diameter.

5. Branch outlets shall be Clamp T Branch and Clamp T Cross with grooved or threaded outlets. Sizes 2" – 8". Branch outlets from ½" – 4" diameter. Designated as a bolted-on positive pipe engagement branch outlet. Working pressure to 500 psi.
  6. Outlet couplings shall have grooved or threaded outlets. Run sizes 1-1/2" – 6". Branch outlets from ½" – 2" diameter. Working pressure to 500 psig.
  7. Plain end couplings and fittings shall be Manufacturer Standard coupling and plain-end fittings to match. Size range is 2" – 8" diameter. Materials conform to ASTM A-536 and A-47. Fittings are cast or forged steel. Intended for working pressures 300 – 750 psig with factory recommended torque requirement on plain-end standard wall pipe. Fittings match coupling working pressure.
  8. Plain end method shall be Manufacturer's Standard fitting. Size range is 1" – 2" diameter. Material conforms to ASTM A-126 Class A cast iron. Working pressures from 175-300 psi UL/ULC listed FM approved.
- F. Gaskets shall be Grade "E" EPDM pressure responsive design for all water and non-oily air service. EPDM gaskets are color-coded green. Material conformance to grooved industrial standards ASTM D-2000, designation 2CA615A25B24F17Z. Temperature operating range minus 30° to +230°F. Non-toxic lubricant must be used to insure non-pinching of gaskets during product installation. "Extreme Temperature Lubricant" must be used for all system installations, below -20°F, installations above 180°F and installations that are subject to temperature cycles.
- G. Standard products shall be furnished with alkyd enamel, rust inhibiting non-toxic paint. Galvanized material conforms to ASTM A-153. Bolts and nuts are zinc electroplated to ASTM A-164.
- H. Couplings shall be furnished with heat treated, oval neck track head bolts conforming to ASTM A-183 Grade 2. Bolts meet minimum tensile strength of 110,000 psi. Hex nuts are carbon steel conforming to ASTM A1-563 Grade A. Bolts and nuts are electroplated.
- I. Assembly: Couplings, fittings, valves and pipe shall be assembled in accordance with latest published instructions from the piping system manufacturer for the particular product installed.
1. Pipe: Shall be checked to be certain it is sufficiently free of indentations, projections, grooves, weld seams, or roll marks on the exterior of the pipe over the entire gasket seating area to assure a leak-tight seat for the gasket, that pipe ends are square cut and that preparation is in accordance with pipe manufacturer's preparation standards.
  2. Gasket: All gaskets shall be of the central cavity pressure responsive design. Gasket style and elastomeric material (grade) shall be checked to be certain gasket supplied is suited for the intended service.
  3. Lubrication shall always be used for proper coupling/fitting assembly as follows:
    - a. Thorough lubrication of the gasket exterior including the lips and/or pipe ends and housing interiors, is essential to prevent pinching the gasket. Lubrication assists proper gasket seating and alignment during installation.
    - b. Use manufacturer's lubricant for installation. Other compatible materials such as silicone and others may be used; however, petroleum-based lubricants must not be used on Grade "E" or "M" gaskets.
    - c. A thin coat of lubricant shall be applied by brush or by hand by: 1) brushing on the gasket lips (ID) and the entire exterior of the gasket; 2) brushing lubricant on the pipe ends around the entire pipe circumference and inside the coupling housing.

J. Support:

1. The requirements of MSS-SP-69 "Pipe Hangers and Supports"- Selection and Application: shall, in general, govern the installation of hangers and supports, in accordance with the following recommendations:
  - a. Piping joined with grooved type couplings, like all other piping systems, requires support to carry the weight of pipes and equipment. Like all other methods of jointing pipes, the support or hanging method must be such as to eliminate undue stresses on joints, piping and other components. Additionally, the method of support must be such as to allow movement of pipes where required and to provide for other special requirements such as drainage, etc., as may be required by the designer. The support system for mechanical grooved type pipe couplings must consider some of the special requirements of these couplings.

K. Manufacturers: Anvil Gruvlok or Tyco Grinnell.

**2.4 STRAINERS (WATER)**

- A. Perforations: .033" pipe size to 2", .057" pipe size 2-1/2" to 4", 1/8" pipe size 6" and up.
- B. Self-cleaning "Y" type screwed end up to 2 inch with machined seats with blow-off outlet, stainless steel screen, iron body.
- C. Self-cleaning "Y" type flanged 2-1/2 inch and up, with bolted cover flange, blow-off outlet, 125 psi ANSI, brass screen.
- E. Manufacturer: Muesco, Sarco, Hoffman Specialties, Metraflex, Armstrong, Watson McDaniel.

**2.5 THERMOMETERS**

- A. Separable socket, inserted into fluid flow, adjustable, hermetically sealed, red or blue indicating fluid, non-toxic, die-cast, baked enamel finish, double strength glass lens, white scale and black graduations.
- B. Scale: Heating Water - 30 deg. to 240 deg. F  
Chilled Water - 0 deg. to 100 deg. F  
Dual Temperature Water – 30 deg. to 240 deg. F.
- C. Manufacturer: U.S. Gauge, H.O. Trerice, Moeller, Duro, Miljoco Corp., Winter Instruments.

**2.6 GAUGES**

- A. Phosphor bronze bourdon tube, polypropylene case, gasketed glass crystal, aluminum dial, black graduations 4-1/2 inch diameter.
- B. Range: 0 to 60 psi, 5 pound intervals, 1/2 pound graduations.
- C. Install with bronze gauge cock.
- D. Manufacturers: Danton, U.S. Gauge, H.O. Trerice, Moeller, Miljoco Corp., Winter Instruments, Weksler Instruments.

**2.7 TEST STATIONS – PRESSURE/TEMPERATURE**

- A. Provide a SISCO 1/4" or 1/2" NPT fitting (Test Plug) of solid brass at desired indicated locations. Test plug shall be capable of receiving either a pressure or temperature probe 1/8" o.d. Dual seal



core shall be neoprene for temperature to 200 degrees F. Nordel to 350 degrees F and shall be rated zero leakage from vacuum to 1000 psig. P/T plug to have grooved cap and chain.

- B. P/T plugs shall be provided with extensions as required by insulation.
- C. Mechanical Contractor shall also provide the following: pressure gauge adapters with 1/8" o.d. probe, 5" stem pocket testing thermometers for 25° to 125° F (tower and chilled water) for 0° to 220° F (hot water) for 50° - 500° F (temperatures above 220° F).
- D. One (1) Master Test Kit shall be furnished to the Owners. Kit shall contain one (1) 2-1/2" test gauge of suitable range, one (1) Gauge Adapter 1/8" o.d. probe, and 5" stem pocket testing thermometers - one (1) 0° - 220° F and one (1) 50° - 550° F.
- E. Manufacturer: Sisco P/T Plugs.

## **2.8 ISOLATING FITTINGS**

- A. Provide isolating fittings between all sections of dissimilar piping materials or piping and equipment where one material is ferrous and the other is non-ferrous.
- B. Manufacturer: Epco Sales, Inc., or insulated unions by Central Plastic Co.

## **2.9 UNIONS**

- A. Up to and including 2-inch pipe size: Screwed pattern, bronze-to- bronze seat.
- B. Above 2-inch pipe size: Flanged pattern, A.S.A. forged steel, with gaskets, bolts and nuts.
- C. Copper tubing unions shall have sweated type ends. Flanged unions on copper tubing may be soldered connections.
- D. Materials and pressure ratings shall be the same as specified for the respective pipe and fitting system unless otherwise specified.

## **2.10 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 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<br>Rated 600 Volts or Less (Random Wound) |                 |          |          |                             |          |          |
|-----------------------------------------------------------------------------------------------------|-----------------|----------|----------|-----------------------------|----------|----------|
|                                                                                                     | Open Drip-Proof |          |          | Totally Enclosed Fan-Cooled |          |          |
| HP                                                                                                  | 3500 RPM        | 1800 RPM | 1200 RPM | 3500 RPM                    | 1800 RPM | 1200 RPM |
| 1                                                                                                   | 82.5            | 85.5     | 77.0     | 82.5                        | 85.5     | 77.0     |
| 1.5                                                                                                 | 86.5            | 86.5     | 84.0     | 87.5                        | 86.5     | 84.0     |
| 2                                                                                                   | 87.5            | 86.5     | 85.5     | 88.5                        | 86.5     | 85.5     |
| 3                                                                                                   | 88.5            | 89.5     | 85.5     | 89.5                        | 89.5     | 86.5     |
| 5                                                                                                   | 89.5            | 89.5     | 86.5     | 89.5                        | 89.5     | 88.5     |
| 7.5                                                                                                 | 90.2            | 91.0     | 88.5     | 91.0                        | 91.7     | 89.5     |
| 10                                                                                                  | 91.7            | 91.7     | 89.5     | 91.0                        | 91.7     | 90.2     |
| 15                                                                                                  | 91.7            | 93.0     | 90.2     | 91.7                        | 92.4     | 91.0     |
| 20                                                                                                  | 92.4            | 93.0     | 91.0     | 91.7                        | 93.0     | 91.0     |

G. Motor Characteristics: Refer to Equipment Schedules for specific data.

120/208 Volt System: Motors 1/2HP & Larger - 208V, 3 Phase, 3 Wire

Motors Less than 1/2HP- 120V, 1 Phase, 2 Wire

277/480 Volt System: Motors 1/2HP & Larger - 480V, 3 Phase, 3 Wire

Motors Less than 1/2HP-120/277V, 1 Phase, 2 Wire.

H. All motors rated less than 1/2HP shall have thermal protection of the auto-reset type as an integral part of the motor.

I. All motors rated 1/2HP and larger shall have thermal protection provided by an external device.

J. Whenever a variable frequency PWM drive is installed to control an AC motor, a maintenance-free, circumferential, conductive micro fiber shaft grounding ring shall be installed on the AC motor drive end to discharge shaft currents to ground. Recommended part: AEGIS SGR™ Bearing Protection Ring, as made by Electro Static Technology. Install in accordance with the manufacturer's written instructions.

### PART 3 – EXECUTION

#### 3.1 PIPING SYSTEMS

A. All piping to drain to low points. Low points shall be provided with drain valves with hose thread.

B. All piping shall be arranged to have air vents at high points.

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.
- 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. Support piping from building structure with expansion bolts, rods, steel angles, or channels installed to meet existing or new building conditions.
- O. Drilling into the roof deck is not permitted.
- P. Strainers shall be installed on suction of all pumps, inlets of control valves, and where indicated on drawings.
- Q. Thermometers and gauges shall be installed where indicated on the drawings, required by equipment specifications and where indicated elsewhere in the specifications.
- R. Flexible connectors shall be provided on suction and discharge piping of all base mounted pumps.
- S. Unions shall be provided adjacent to all valves, at equipment connections, and where necessary to facilitate dismantling of the piping system.
- T. 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.

U. Material Requirements for Systems:

1. Heating Hot Water Supply & Return Piping:
  - a. Schedule 40 black steel.
  - b. Type L hard copper.
  - c. Grooved End black steel.
2. Chilled Water Supply & Return Piping:
  - a. Schedule 40 black steel.
  - b. Type L hard copper.
  - c. Grooved End black steel.
3. AC Condensate Drain (including pumped condensate):
  - a. Type DWV copper.
4. Refrigerant Piping: Type ACR hard copper.

**3.2 TAGS, CHARTS AND IDENTIFICATION**

- A. See Paragraph "Labeling" in GENERAL PROVISIONS for equipment labeling.
- B. Identify each valve in all systems with black, numbered and stamped 1- 1/2" brass or aluminum tags fastened to valve by brass chain and S-hook.
- C. Provide 1/8" scale diagrams showing location, number and service or function of each tagged item.
  1. Provide Owner with one (1) electronic copy of diagram.
    - a. Include one (1) additional copy in the Operation and Maintenance Manuals.
- D. Piping Identification: Identify piping with Seton "Setmark" or Brimar, semi-rigid plastic, wraparound pipe markers with flow arrows and conforming to ANSI A13.1. Locate marker at each valve, changes in direction, where pipes pass thru barriers and every 25' of horizontal runs. Lettering on background shall be in accordance with the following colors:

| Legend |                      | Background | Lettering |
|--------|----------------------|------------|-----------|
| 1.     | Chilled Water Supply | - Green    | - White   |
| 2.     | Chilled Water Return | - Green    | - White   |
| 3.     | Heating Water Supply | - Yellow   | - Black   |
| 4.     | Heating Water Return | - Yellow   | - Black   |
| 5.     | Refrigerant Liquid   | - Yellow   | - Black   |
| 6.     | Refrigerant Gas      | - Yellow   | - Black   |

- E. Provide color coded 1" diameter markers on ceiling tile grids to indicate system and valve locations.

Chilled Water: - Blue

Hot Water: - Red

- F. Manufacturers: Seton "Setmark", Brimar, B-Line MSI.

### **3.3 SOLDERING/BRAZING**

- A. Connections between copper tubing and copper fittings shall be made with the appropriate filler metal. Flux shall be non-corrosive type as recommended by the manufacturer of the filler metal, and conforming to AWS A5.8.
- B. Tubing shall be cut square and then reamed and deburred. End of tubing and inside of fitting cup shall be cleaned with steel wool and the flux shall be applied to the clean surface before joining. After joining, the excess filler metal shall be wiped off while still plastic.
- C. Silver brazing alloy shall be equal to Easy-Flo by Handy and Harmon or Sta-Brite silver solder and shall be used for joints in:
1. Hot water heating piping
  2. Chilled water piping
  3. Air conditioning condensate drain piping
  4. Dual temperature 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**



## **SECTION 23 0215**

### **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 0200 for HVAC General Provisions.
- C. Refer to other sections in Division 23 for materials and methods not specified herein.

##### **1.2 DESCRIPTION OF WORK**

- A. This Section includes the following:
  - 1. General
  - 2. Chilled Water Systems
  - 3. Hot Water Heating System
  - 4. Refrigerant Valves and Specialties
  - 5. Grooved End Specialties
  - 6. Automatic Flow Control Valves (Flow Limiting Devices)

##### **1.3 QUALITY ASSURANCE**

- A. Provide adequate supervision of labor force to assure that all aspects of the specifications are being fulfilled.
- B. Verify that all work and equipment is installed in accordance with manufacturer's warranty requirements.

#### **PART 2 – PRODUCTS**

##### **2.1 GENERAL**

- A. All gate and globe valves shall be designed for repacking under pressure when fully opened, and shall be equipped with packing suitable for the intended service. When the valve is fully opened, the back seat shall protect the packing and the stem threads from the fluid. All gate and globe valves shall have a gland follower. The pressure- temperature rating of valves shall be not less than the design criteria applicable to all components of the system.
- B. Insofar as possible, all valves of the same type shall be of the same manufacturer.
- C. Valves installed above 7 ft. in Mechanical Rooms shall have chain operators.
- D. All valves shall be provided with stem extensions. Valve handle shall be clear of insulation jacket.
- E. Manufacturers:

Stockham

Milwaukee

Hammond

Apollo

Watts

Walworth

Nibco

Jamesbury

## 2.2 CHILLED WATER SYSTEMS

### A. Gate Valves - 2" and smaller:

Valves 2" and smaller shall be of Class 125, body and bonnet shall be of ASTM-B-62 cast bronze composition, threaded or solder ends, solid disc, copper-silicon alloy stem, brass packing gland, Teflon- impregnated packing and malleable handwheel.

Recommended Valves:

Threaded:

Solder:

Stockham B-100 (RS)

Stockham B-108 (RS)

or

or

Stockham B-103 (NRS)

Stockham B-104 (NRS)

RS

NRS

RS

NRS

Hammond IB690 IB609 Nibco

S111 S113

Milwaukee 148 105 Hammond IB691 IB613

### B. Gate Valves - 2-1/2" and Larger:

Valves 2-1/2" and larger shall be Class 125 iron body, bronze mounted, with body and bonnet conforming to ASTM A-126 Class B cast iron, flanged ends with Teflon-impregnated packing and two-piece packing gland assembly.

Recommended valves:

Stockham G-623 OS&Y RS

Stockham G-612 NRS

OS&Y

NRS

Hammond IR1140 ---

Nibco F617-0 F639-31

### C. Ball Valves - 3" and Smaller:



Valves 3" and smaller shall be 600 psi CWP, have cast brass bodies, replaceable reinforced Teflon seats, conventional port, blowout proof stems, chrome plated brass ball, and threaded or solder ends. Provide extended valve handle to accommodate up to 2" of insulation with non-thermal conductive material, insulation plug, cap and protective sleeve.

Recommended valves:

| Threaded:            | Solder:              |
|----------------------|----------------------|
| Stockham S-216-BR-RT | Stockham S-216-BR-RS |
| NIBCO T-580-70EL     | NIBCO S-580-70EL     |
| Jamesbury II 1100TT  | ----                 |
| Apollo 70-100        | Apollo 70-200        |
| Inline 334           | ----                 |

Alternative is Stockham S-217-BR-RT (threaded).

Drain valves, 1/2" or 3/4" shall be 600 psi CWP, with stainless steel trim, cast bronze body, 2-piece with cap and chain, full port stainless steel ball and stem, RTFE ball seat, threaded or soldered inlet connection, cap rated for 150 psi.

Recommended valve:

Stockham S-285-BR-R-66-HC.

D. Globe Valves - 2" and Smaller:

Valves 2" and smaller shall be of Class 125, body and bonnet of ASTM B-62 cast bronze composition, threaded or soldered ends, copper silicon alloy stem, brass packing gland, Teflon-impregnated packing, and malleable handwheel.

Recommended valves:

| Threaded:      | Solder:        |
|----------------|----------------|
| Stockham B-13T | Stockham B-14T |
| (Teflon Disc)  | (Teflon Disc)  |
| Stockham B-16  | Stockham B-17  |
| (Bronze Disc)  | (Bronze Disc)  |
| Nibco T211B    | Jenkins 1200   |
| Hammond IB440  | Nibco S211Y    |

E. Globe Valves - 2-1/2" and Larger:

Valves 2-1/2" and larger shall be Class 125 iron body, bronze mounted with body and bonnet conforming to ASTM A-126 Class B cast iron, flanged ends, with Teflon-impregnated packing and two-piece packing gland assembly.

Recommended valves:

Stockham G-512 (Bronze disc)

Stockham G-514T (Teflon disc)

Bronze Disc:                      Comp. Disc.:

Hammond IR116                      ---

Nibco F718B                      ---

F. Butterfly Valves - 2-1/2" and Larger: (Chilled Water)

Valves 2-1/2" and larger shall be high performance, bubble-tight, wafer type body or grooved-end, 200 psi CWP, conforming to ASTM A-126 Class B cast iron, field replaceable EPDM sleeve, with ductile nickel-plated disc, 410 stainless steel stem, and EPDM O-ring stem seals. Sizes 2 - 6" shall be lever operated and 8 - 24" shall have gear operators.

Recommended valves:

Stockham LG-512-DS3-B Lever operated

Stockham LG-522-DS3-B Gear operated

Victaulic 300 Masterseal and AGS VIC300-Grooved-end

Lever:                                      Gear:

Demco NE-150-1215351                      NE-150-1215359-2097

Norris R1010-13SS-1F                      R1010-13SS-2K

Keystone Fig. 239                      239

Center Line Series A                      Series A

Nibco WD3110-3                      WD3110-5

G. Check Valves - 2" and Smaller:

Valves 2" and smaller shall be of Class 125, threaded or solder ends, body and caps shall be ASTM B-62 cast bronze composition, swing type disc.

Recommended valves:

Threaded:                                      Solder:

Stockham B-319                      Stockham B-309

Hammond IB490                      IB941

Milwaukee 509                      1509

If composition disc is preferred, specify Stockham B-320B - threaded end, or B-310B - solder end, for Class 125 service.

H. Check Valves - 2-1/2 and Larger:

Valves 2-1/2" and larger shall be iron body, bronze mounted with body and cap conforming to ASTM A-126 Class B cast iron, flanged or grooved ends, swing type disc.

Recommended valves:

Stockham G-931

Hammond IR1124

Milwaukee F2974

Victaulic 716, 779, or W715 – Grooved end

## 2.3 HOT WATER HEATING SYSTEM

### A. Gate Valves - 2" and smaller:

Valves 2" and smaller shall be of Class 150 with body and union bonnet of ASTM B-62 cast bronze composition, threaded or solder ends, solid disc, copper-silicon stem, brass packing gland, Teflon- impregnated packing, and malleable handwheel.

Recommended valves:

Threaded:

Solder:

Stockham B-120 (RS)

Stockham B-124

Stockham B-130 (RS)

----

Hammond IB629

IB648

Nibco T134

S134

### B. Ball Valves - 3" and smaller:

Valves 3" and smaller shall be 600 psi CWP, have cast brass bodies, replaceable reinforced Teflon seats, conventional port, blowout proof stems, chrome plated brass ball, and threaded or solder ends with extended solder cups. Provide extended valve handle to accommodate up to 2" of insulation with non-thermal conductive material, insulation plug, cap and protective sleeve.

Recommended valves:

Threaded:

Solder:

Stockham S-216-BR-RT

Stockham S-216-BR-RS

Worcester 4112 RT

---

Jamesbury II 1100TT

----

Apollo 70-100

Apollo 70-200

Nibco T580-70EL

S580-70EL

Inline 334

----

Drain valves, 1/2" or 3/4", shall be 600 psi CWP, with stainless steel trim, cast bronze body, 2-piece with cap and chain, full port stainless steel ball and stem, RTFE ball seat, threaded or soldered inlet connection, cap rated for 150 psi.

Recommended valve:

Stockham S-285-BR-R-66-HC

C. Gate Valves - 2-1/2" and larger:

Valves 2-1/2" and larger shall be Class 125 iron body, bronze mounted, with body and bonnet conforming to ASTM A-126 Class B cast iron, flanged ends, with Teflon-impregnated packing and two-piece packing gland assembly.

Recommended valves:

Stockham G-623 (OS&Y) RS

Stockham G-612 (NRS)

|                | OS&Y   | NRS     |
|----------------|--------|---------|
| Nibco          | F617-0 | F639-31 |
| Hammond IR1140 |        |         |

D. Globe Valves - 2" and smaller:

Valves 2" and smaller shall be of Class 150 with body and union bonnet of ASTM B-62 bronze, copper-silicon alloy stem, brass packing gland, Teflon-impregnated packing and malleable handwheel.

Recommended valves:

Threaded:

Solder:

Stockham B-22 (Teflon Disc)      Stockham B-24 (Teflon Disc)

Stockham B-29 (Stainless trim) ----

Comp. Disc.:                      S.S. Trim:

Nibco T-235-Y                      Milwaukee 591A

E. Globe Valves - 2-1/2" and Larger:

Valves 2-1/2" and larger shall be Class 125 body, bronze mounted, with body and bonnet conforming to ASTM A-126 Class B cast iron, flanged ends, with Teflon - impregnated packing and two-piece packing gland assembly.

Recommended valves:

Stockham G-512 (bronze disc)

Stockham G-514 (Teflon disc)

Hammond IR 116

Nibco F7181B

F. Butterfly Valves - 2-1/2" and Larger:

Valves 2-1/2" and larger shall be high performance, bubble-tight, wafer type body or grooved-end, 200 psi CWP, conforming to ASTM A-126 Class B cast iron, replaceable EPDM sleeve, with ductile nickel-plated disc, 410 stainless steel stem, and EPDM O-ring stem seals. Sizes 2 - 6"

shall have lever operators and 8 - 24" shall have gear operators.

Recommended valves:

Stockham LG-512-DS3-B      Lever operated

Stockham LG-522-DS3-B      Gear operated

Victaulic 300 Masterseal and AGS VIC300 – Grooved end

Lever:

Gear:

Demco NE 150-1215351

NE-150-121359-2097

Norris R1010-13SS-1F

R1010-13SS-2K

Keystone Fig. 239

239

Center Line Series A

Series A

Nibco WD 3110-3

WD 3110-5

Note: In Treated Systems, valves with aluminum bronze disc (ASTM B-148 Alloy 954) and EPT or EPDM sleeve may be preferred.

Recommended valves:

Stockham LG-512-BS3-E      Lever operated

Stockham LG-522-BS3-E      Gear operated

Victaulic 300 Masterseal and AGS VIC300 – Grooved end

G. Check Valves - 2" and smaller:

Valves 2" and smaller shall be Class 150 with bodies and caps of ASTM B-62 bronze composition and threaded ends. Class 150 valves shall have lift-type Buna-N-disc and union caps, and are to be used in lines with globe valves.

Recommended valves:

Stockham B-322-B

Hammond IB948

Milwaukee 510

For backflow prevention in lines with gate valves, Y-pattern valves with swing-type disc are recommended.

For Class 150 Service, threaded ends:

Stockham B-321

H. Check Valves - 2-1/2" and Larger:

Valves 2" and larger shall be iron body, bronze mounted, with body and cap conforming to ASTM A-126 Class B cast iron, flanged or grooved ends, and swing-type disc.

Recommended valves:

Stockham G-931

Hammond IR1124

Nibco F918-B

Victaulic 716, 779, or W715 – Grooved end

## **2.4 REFRIGERANT VALVES & SPECIALTIES**

### **A. Service Valves:**

1. Globe Shutoff Valves: Forged brass, packed, back seating, winged seal cap, 300 degrees F (149 degrees C) temperature rating, 500 psi working pressure.
2. Check Valves: Forged brass, accessible internal parts, soft synthetic seat, fully guided brass piston and stainless-steel spring, 250 degrees F (121 degrees C) temperature rating, 500 psi working pressure.
3. Manufacturers:  
  
Henry Valve Co.  
  
Parker Hannifin Corp., Refrigeration & Air-Conditioning  
  
Sporlan Valve Co.

### **B. 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.

**OR**

3. Refrigerant Filter-Driers: Corrosion-resistant steel shell, steel flange ring and spring, wrought copper fittings, ductile iron cover plate with steel cap screws, replaceable filter-drier core, 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.

## **2.5 GROOVED-END SPECIALTIES**

### **A. Strainers**

1. T-Type Strainer: 2" and larger sizes, 300 PSI (2065 kPa) T-Type Strainer shall consist of ductile iron (ASTM A-536, Grade 65-45-12) or carbon steel (ASTM A-53) body, Type 304 stainless steel frame and mesh removable basket with No. 12 mesh, 2"-3" strainer sizes, or No. 6 mesh, 4"-16" strainer sizes, 57% free open area. Victaulic Style 730. For 14" through 24", use T-Type W730 AGS with stainless steel removable basket.
  2. Y-Type Strainer: 2" through 12" sizes, 300 PSI (2065 kPa) Y-Type Strainer shall consist of ductile iron body, ASTM A-536, Grade 65-45-12, Type 304 stainless steel perforated metal removable baskets with 1/16" (1.6mm) diameter perforations and 41% open area 2"-3" strainer sizes or 1/8" (3.2mm) strainer sizes diameter perforations and 40% open area 4"-12" strainer sizes. Victaulic Style 732.
- B. Suction Diffuser – Grooved/Flanged End. Rated to 300 psi (2065kPa). Ductile iron (ASTM A-536) body. 304 stainless steel frame and perforated sheet diffuser with 5/32" (4.0mm) diameter holes 3"-12" inlet sizes or 3/16" (4.8mm) diameter holes 14" and 16" inlet sizes. Removable 20 mesh 304 stainless steel start-up prefilter, outlets for pressure/temperature drain connections, and base supports boss. Victaulic Series 731-G. For sizes 14" through 24", use W731G AGS.

## **2.6 AUTOMATIC FLOW CONTROL VALVES (FLOW LIMITING DEVICES)**

### **A. Design:**

1. Automatic flow control valves shall be factory set and shall automatically limit the rate of flow to within 5% of the specified amount. For 1/2" - 2-1/2", the flow cartridge shall be removable from the valve body to provide access for regulator changeout, inspection and cleaning without breaking the main piping. (Access shall be similar to that provided for removal of a Y-strainer screen.) Each valve shall have P/T ports. All automatic flow control devices shall be supplied by a single source and certified tests witnessed by a Professional Engineer shall be available.
2. IMI 'AC' automatic balancing valve is a combination of ball valve, regulator, union, and two pressure/temperature ports. Valve to be bronze and flow regulator cartridge to be accessible without disturbing piping. On the supply side of the coil, install an IMI 'YC' combination Y-strainer, ball valve, union, pressure/temperature port, and ball valve blowdown.

B. Construction:

1. All internal parts of the valve shall be stainless steel for corrosion and wear resistance.
2. For 1/2" through 2" pipe sizes: DZR Brass Y-body. Connections shall be sweat or threaded to match piping system specified. DZR brass or bronze Y-body with chrome plated brass body ball valve.
3. 2-1/2" and Larger: Ductile iron body (IMI model WS).
4. Strainer: 20 mesh stainless steel.

C. Minimum Ratings:

1. 1/2" – 2" connections 400 psig at 250 deg. F
2. 2 1/2" – 14" connections 600 psig at 250 deg. F

D. Flow Verification: The flow shall be verified by measuring the differential pressure across the coil served or the wide-open temperature control valve and calculating the flow using the coil or valve Cv.

E. Test Kit: A differential pressure test kit shall be supplied to verify flow and measure over heading. The kit shall consist of a 4-1/2" diaphragm gauge with three ball valves, two 10' hoses with shut-off valves, and a pair of P/T adapters.

F. Manufacturers: IMI Flow Design, Inc., Griswold, Hays Fluid Controls, Nexus Valve.

### **PART 3 – EXECUTION**

#### **3.1 PIPING SYSTEMS**

- A. All piping to drain to low points. Low points shall be provided with drain valves with hose thread.
- B. Valve body construction shall match piping system material.
- C. Install isolating fittings between sections of ferrous and non-ferrous pipe or connected equipment.
- D. Valves shall be installed with stems above horizontal.
- E. Valves shall be installed on all sides of equipment and control valves to allow isolation for repair.
- F. Unions shall be provided adjacent to all valves, at equipment connections, and where necessary to facilitate dismantling of the piping system.

#### **3.2 TAGS, CHARTS AND IDENTIFICATION**

- A. Identify each valve in all systems in accordance with requirements of Section 23 0210.

### **END OF SECTION**



## **SECTION 23 0230**

### **INSULATION AND 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 0200 for HVAC General Provisions
- C. Refer to Section 23 0210 for HVAC Basic Materials & Methods.

##### **1.2 DESCRIPTION OF WORK**

- A. Included in this section are the following:
  - 1. Pipe Insulation Material
  - 2. Duct Insulation
  - 3. Reusable Valve Covers
- B. This Section includes insulation and covering provided on the following piping and equipment:
  - 1. Hot Water Heating Piping
  - 2. Chilled Water Piping
  - 3. Refrigerant Piping.
  - 4. Cold Equipment Surface
  - 5. Hot Equipment Surfaces.
  - 6. Reusable Valve Covers
- C. 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.

##### **1.3 REFERENCE STANDARDS**

- A. Refer to Section 23 0200 for a general description of requirements applying to this section.

##### **1.4 QUALITY ASSURANCE**

- A. Refer to Section 23 0210 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 0200.
- B. Submit fabrication instructions for pipe fitting and valve insulation.
- C. Submit manufacturer's joining recommendations for butt joints and longitudinal seams.

## **1.6 WARRANTY/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.
- 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.

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. Manufacturers: Johns Manville Corp., Certain-Teed, Owens- Corning, Knauf.

## **2.2 DUCT INSULATION**

A. Concealed Supply, Return, Relief, and Outside Air Ductwork: Fiberglass duct wrap bonded with resins, 3/4-pound density, aluminum foil facing reinforced with fiberglass scrim, laminated to Kraft, 2" thick.

1. Thermal Conductivity: 0.27 Btu/Hr./SF/Inch at 75 degrees F. Min. installed "R" value shall be 6.0 and have a min. 25% compression of 5.6.

2. Duct wrap shall be cut to stretch-out dimensions as provided in manufacturer's instructions.

B. Exposed supply, return, relief, and outside air ductwork, shall be insulated in finished conditioned spaces, penthouse, mechanical rooms, mezzanine areas, equipment closets, and non-conditioned spaces with 2" thick rigid fiberglass board. Insulation shall be 6 P.C.F. density with a "K" value of 0.25 Btu/Hr./SF/Inch at 75 degrees F. mean temperature and shall be U.L. listed at 25 maximum for flame spread, and 50 maximum for smoke developed. Insulation shall be applied using Graham Pins or Stik-Clips and all seams, edges and breaks shall be sealed with 4" matching tape and sealed with Vicryl CP-10 to match ASJ jacket. Insulation shall be provided with all-service jacket facing.

C. Manufacturers: Johns Manville Corp., Certain-Teed or Owens- Corning, Knauf.

## **2.3 REUSABLE VALVE COVERS**

A. All valves, strainers, combination valves, etc. in chilled water and heating hot water systems shall be insulated with a factory fabricated removable and reusable cover. (This product shall not be used for pipe and fittings.)

B. Insulation shall be either fiberglass blanket or flexible elastomeric thermal insulation as listed in Paragraph 3.2 of this specification, or prefabricated fitting from the supplier. Flame and smoke spread shall be 25/50 per ASTM 84.

C. Outer jacket shall be made of material equal to Tychem QC, overlap and completely cover the insulation, with seams joined by tabs made from Velcro or fabric straps per manufacturer's standards.

D. Outer jacket shall overlap adjoining sections of pipe insulation, and shall be non-combustible, impermeable to water, and prevent mold, mildew and condensation.

E. Installation shall not require the use of any special hand tools.

F. Manufacturers: Corick Valve Covers, NoSweat Valve Wraps.

## **PART 3 – EXECUTION**

### **3.1 INSTALLATION – GENERAL**

A. Do not install until systems have been tested and meet requirements.

- B. Heavy work which may damage insulation shall have been completed in the vicinity of the insulation work.
- C. Provide non-compressible insulation saddles at all piping hanger locations, and at all piping hanger locations where piping is insulated with flexible closed cell insulation.  
  
Option: Provide insulation coupling system as made by Klo-Shure Co.
- D. All installations shall be made by skilled craftsmen regularly engaged in this type of work.
- E. Insulation shall be continuous thru-wall, ceiling and floors.
- F. Metal shields, 16 gauge galvanized, shall be installed between hangers and pipe insulation.
- G. Pipe, ductwork and equipment shall be clean and dry prior to insulating.
- H. Install all insulation per manufacturer's instructions.
- I. To avoid undue compression of insulation, provide solid core inserts at all supports as recommended by the insulation manufacturer. Provide insulation shields between the insulation jacket and the hanger.
- J. Apply vapor proof mastic as recommended by the insulation manufacturer on all longitudinal and butt joints of sectional pipe insulation. Apply similar mastic to the end of every third length of sectional pipe insulation on all chilled water and dual temperature pipe insulation to prevent the migration of condensation that might occur.
- K. Provide insulation on all piping, equipment, and fixtures that are part of a factory assembly package not otherwise insulated by the manufacture of such packaged equipment. Insulation type and thickness shall comply with all of the requirements of this section.

### **3.2 PIPE INSULATION – TYPES & THICKNESSES**

- A. Provide fiberglass insulation of thickness specified on:
  - 1. Heating Hot Water: (Up to 140°F)
    - 1" for piping less than 1-1/2"
    - 1-1/2" for pipes 1-1/2" and over.
  - 2. Heating Hot Water: (141°F to 200°F)
    - 1-1/2" for piping less than 1-1/2"
    - 2" for pipes 1-1/2" and over.
  - 3. Chilled Water:
    - 1" for piping less than 1-1/2".     Option: Flexible closed cell insulation
    - 1" for piping 1-1/2" and over
  - 4. 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
    - a. Low Pressure Gas Line:

1" for piping less than 1"

1" for piping 1" to 6"

1-1/2" for piping 8" and over

b. High Pressure Gas Line (141°F to 200°F):

1-1/2" for piping less than 1-1/2"

2" for piping 1-1/2" and over

2-1/2" if temperature is above 200°F

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.)

a. Low Pressure Gas Line:

1" for piping less than 1"

1" for piping 1" to 6"

1-1/2" for piping 8" and over

b. High Pressure Gas Line (141°F to 200°F):

1-1/2" for piping less than 1-1/2"

2" for piping 1-1/2" and over

2-1/2" if temperature is above 200°F

2. Cold surfaces of refrigeration equipment, air separators for chilled and heating hot water, and chilled water pumps. 3/4" thickness

3. 1" thickness for all water piping within terminal unit cabinets.

4. 1/2" thickness for condensate drain lines.

**3.3 PIPE COVERING (FOAMED PLASTIC TYPE)**

A. All joints and seams shall be sealed with a compatible adhesive. Approved adhesives are as follows:

Armstrong World Industries      No. 520

Benjamin Foster Company      No. 85-75 up to 200 degrees F.

Contractor may use Armstrong Self-Seal Armaflex 2000 insulation in lieu of the above wherever 1/2" is specified.

B. Fitting covers shall be fabricated from the foamed plastic pipe insulation or from sheet insulation of the identical material. The fabrication shall be in accordance with manufacturer's instructions, and all seams mitered joints shall be joined using the adhesives described hereinbefore.

C. Pipe insulation in concealed spaces shall require no finish coatings.

- D. Pipe insulation in all other areas shall receive two coats of finish of color selected by Architect. Approved finishes are as follows:

Armstrong World Industries      WB Armaflex Finish

### **3.4 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.

### **3.4 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.

**END OF SECTION**

## **SECTION 23 0300**

### **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 0200 for HVAC General Provisions
- C. Refer to Section 23 0210 for HVAC Basic Materials & Methods.

##### **1.2 DESCRIPTION OF WORK**

- A. This Section includes providing the following vibration and sound isolation material on items furnished and installed under HVAC work:
  - 1. Pump-mounted inertia pads
  - 2. Suspended Fans, Air Handling Units

##### **1.3 REFERENCE STANDARDS**

- A. Refer to Section 23 0200 for a general description of requirements applying to this section.

##### **1.4 QUALITY ASSURANCE**

- A. Refer to Section 23 0210 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 0200.
- 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.

#### **PART 2 – PRODUCTS**

##### **2.1 GENERAL**

- A. All vibration control apparatus shall be furnished by a single recognized manufacturer. The manufacturer shall submit to the Architect/Engineer evidence affirming that he has been a supplier of vibration control devices of the type required for the past five years.

- B. The vibration control apparatus manufacturer shall supervise, inspect, measure, and approve the installation and shall submit a report to the Architect/Engineer substantiating that all the equipment has been adequately isolated.
- C. Any requests for changes in the specifications must be submitted in writing in time for review and approval through a written addendum to the specifications prior to bid closing.
- D. Unless otherwise indicated or specified, all equipment mounted on vibration isolator bases shall have a minimum operating clearance of 1 inch between the base and the floor or housekeeping and beneath. Clearance space shall be checked to insure that no scrap, rubbish, hardware, etc., has been left to possibly short circuit isolated base.
- E. In connecting isolated HVAC equipment to rest of system, care must be exercised to insure proper installation.
  - 1. Equipment connected to water piping shall be erected on isolators or isolated foundations to correct operating height prior to making piping connections to avoid misalignment problems. To facilitate this, equipment shall be blocked-up with temporary shims to final operating height. When full load is assembled and water is in system, isolators shall then be adjusted to take up load just enough to allow removal of shims.
  - 2. Air handling equipment such as centrifugal fans shall be erected on isolators and leveled with fan operating before flexible duct connection is made. Insure that duct position is in proper alignment and providing proper clearance in proportion to flexible duct connector length. When fan is shut off, misalignment with ductwork is allowable providing it does not strain or damage flexible duct connector. In cases of high static pressure, fans requiring position stabilizers are to be adjusted when fan is operating to achieve the results as described above with isolator adjustment.
- F. Vibration isolator sizes and location shall be determined by the vibration control products manufacturer or as specified herein.
- G. Model numbers of Amber/Booth Co., are given for identification. Products of specified manufacturers will be acceptable, provided they comply with all of the requirements of this specification.

## **2.2 ISOLATOR TYPES**

- A. Pump Mounted Inertia Pads:
  - 1. Frame to be structural steel with built-in height saving bracket for recessing into a CPF concrete inertia block for side access.
  - 2. Spring to be adjustable, free-standing, open-spring mounting with combination leveling bolt and equipment fastening bolt. The spring shall be rigidly attached to the spring mounting baseplate and compression plate. The isolator shall be designed for a minimum  $K_x/K_y$  (Horizontal-to-Vertical spring rate) of 1.0. A neoprene pad having a minimum thickness of 1/4" shall be bonded to the baseplate. Amber/Booth Type CPF with RSW-1.
- B. Suspended Fans and Air Handling 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. Manufacturers: Amber/Booth, Kinetics Noise Control, Mason Industries, Vibration Mounting & Controls, Vibration Eliminator, Inc., Vibro-Acoustics.

## **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.
- 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**



## **SECTION 23 0450**

### **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 0200 for HVAC General Provisions
- C. Refer to Section 23 0210 for HVAC Basic Materials & Methods.

##### **1.2 DESCRIPTION OF WORK**

- A. This Section includes labor, material, equipment and supervision to for the following:
  - 1. Ductless Split System Heat Pump Units
- B. Provide complete refrigeration system including chillers, cooling towers, underground pre-insulated pre-fabricated piping, aboveground piping and all required accessories.

##### **1.3 REFERENCE STANDARDS**

- A. Refer to Section 230200 for a general description of requirements applying to this section.
- B. Comply with applicable provisions of:
  - 1. International Mechanical Code
  - 2. ASME Codes for Pressure Vessels
  - 3. A.R.I. Capacity Ratings
  - 4. NFPA Pamphlets
  - 5. ASHRAE Standard 15
  - 6. ASHRAE Standard 90.1, Section 6, Table 6.8.1A thru J, minimum equipment efficiency.

##### **1.4 QUALITY ASSURANCE**

- A. Refer to Section 230210 for a general description of requirements applying to this Section.
- B. Whenever a variable frequency PWM drive is installed to control an AC motor, a maintenance-free, circumferential, conductive micro fiber shaft grounding ring shall be installed on the AC motor drive end to discharge shaft currents to ground. Recommended part: AEGIS SGR™ Bearing Protection Ring, as made by Electro Static Technology. Install in accordance with the manufacturer's written instructions.

## **1.5 SUBMITTALS**

- A. Submit shop drawings and product data in accordance with Section 230200.
- B. Submit the following:
  - 1. Shop drawings and product data for all equipment in this section.
  - 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 DUCTLESS SPLIT SYSTEM HEAT PUMP UNIT**

- A. Air conditioning system shall be a variable capacity (cool/heat) ductless split system heat pump. 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 240 and bear the ARI label. A full charge of R-32 refrigerant for 25 feet of refrigerant tubing shall be provided in the condensing unit. Additional refrigerant may be required based on lengths of refrigerant lines. A dry nitrogen holding charge shall be provided in the evaporator. System SEER shall meet or exceed 2021 IECC ratings.
- B. Wall Mounted Indoor Unit:
  - 1. The indoor unit shall be factory assembled, wired, and run tested. Unit shall contain all factory wiring, piping, control circuit board, and fan motor.
  - 2. The unit shall have a self-diagnostic function and auto restart function.
  - 3. Casing shall be certified to UL94 VO with a white finish.
  - 4. The indoor fan assembly shall be a cross-flow fan, direct driven by a single motor. Fan shall be statically and dynamically balanced and run on a motor with permanently lubricate bearings. The fan shall be capable of providing a minimum of 3 fan speeds (L/M/H).

5. Motorized air sweeps and guide vanes shall provide an automatic change in airflow.
  6. The unit shall be provided with a washable permanent filter.
  7. The indoor coil shall be nonferrous construction with slit fins on copper tubing. All tube joints shall be brazed with phos-copper or silver alloy.
  8. Both refrigerant lines to the indoor unit shall be insulated.
  9. The electrical power shall be 208/230 volt, 1 phase, 60 hertz supplied from the remote condensing unit.
- C. Condensing Unit:
1. Unit shall be equipped with multiple circuit boards to perform all functions of operation.
  2. Both refrigerant lines from condensing unit to indoor evaporator shall be insulated.
  3. Unit shall have a high-pressure safety switch, fuse, over-current protection, over-voltage protection, temperature limit protection logic, compressor overload sensing, and crank case heater.
  4. Unit shall be capable of operating in outside ambient temperature between 0 deg. F to 115 deg. F in cooling mode with optional wind baffles.
  5. The chassis shall be fabricated of galvanized steel, finished with a powder coated baked enamel.
  6. Unit shall be furnished with a direct drive, variable speed propeller type fan.
  7. Unit shall contain a single electronic expansion valve to control refrigerant flow.
  8. The electrical power shall be 208/230 volts, 1 phase, 60 hertz.
- D. Controls: The control system shall be microprocessor based. The wall mounted controller shall provide a continuous display of operation status and condition. Controller shall control On/Off, operation mode (auto, cool, heat, dry, and fan), temperature setpoint, fan speed setting, and On/Off timer.
1. The auto restart feature shall automatically restart after a power failure.
- E. Factory installed controls shall include connections for 24-volt, hard-wired, wall-mounted thermostat, control board featuring anti-short cycle timer, 60 second post purge fan relay, on-board 30 AMP electric heat relay, and relays and connectors for condensing unit control. Provide wall-mounted solid state thermostat for field mounting and wiring to the indoor unit; the thermostat shall be capable of one-stage cooling; one-stage cooling, one-stage heating with manual changeover; one-stage cooling, two-stage heating with heat pump operation for the first stage of heat, as scheduled on the drawings.
- G. Manufacturers: Carrier, Daikin McQuay, LG HVAC, Mitsubishi Electric, Samsung.
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 DUCTLESS SPLIT SYSTEMS**

- A. Install packaged and split system units in accordance with manufacturer's installation instructions. Install units plumb and level, firmly anchored in locations indicated, and maintain manufacturer's recommended clearances.
- B. Electrical Wiring: Install electrical devices furnished by manufacturer but not specified to be factory mounted.
  - 1. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements. Do not proceed with equipment start-up until wiring installation is acceptable.

**END OF SECTION**

## **SECTION 23 0500**

### **PIPING SYSTEMS AND 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 0200 for HVAC General Provisions
- C. Refer to Section 23 0210 for HVAC Basic Materials & Methods.

##### **1.2 DESCRIPTION OF WORK**

- A. This Section includes the following equipment:
  - 1. Base-Mounted End Suction Pumps
  - 2. Suction Diffusers
  - 3. Balancing Valves
  - 4. Combination Valve Package for Pumps
  - 5. Flexible Pump Connectors

##### **1.3 REFERENCE STANDARDS**

- A. Refer to Section 23 0200 for a general description of requirements applying to this section.

##### **1.4 QUALITY ASSURANCE**

- A. Refer to Section 23 0210 for a general description of requirements applying to this Section.
- B. Whenever a variable frequency PWM drive is installed to control an AC motor, a maintenance-free, circumferential, conductive micro fiber shaft grounding ring shall be installed on the AC motor drive end to discharge shaft currents to ground. Recommended part: AEGIS SGR™ Bearing Protection Ring, as made by Electro Static Technology. Install in accordance with the manufacturer's written instructions.

##### **1.5 SUBMITTALS**

- A. Submit shop drawings and product data in accordance with Section 23 0200.
- B. Submit the following:
  - 1. Shop Drawings
  - 2. Manufacturers Product Data
  - 3. Test Reports on Piping System Tests

## **1.6 SUBSTITUTIONS**

- A. The listed equivalent or substituted manufacturers along with the bidding related contractor shall be completely responsible to comply with all requirements on all contract documents. This shall include, but not be limited to, space requirements, code clearances, the type, horsepower, capacities, number and size of services required from other trades, including all required ancillary items furnished and installed by other trades. If the manufacturer or related bidding contractor does not comply with these requirements, this Contractor shall be responsible for any and all additional costs associated with the changes required by other trades.

## **1.7 WARRANTY/GUARANTEE**

- A. All work and materials are subject to the general warranty as described in the General Conditions of the Contract and in Division 1, General Requirements.

## **PART 2 – PRODUCTS**

### **2.1 BASE-MOUNTED END SUCTION PUMPS**

- A. Provide frame-mounted end suction pumps where indicated, and of capacities and having characteristics as scheduled.
- B. Horizontal mount, single stage, flexible coupling, base-mounted, designed for 175 psi working pressure.
- C. Cast iron casing 125 psi ANSI flanges, tappings for gauge and drain connections.
- D. Steel shaft with replaceable shaft sleeve, regreasable ball bearings and mechanical seals with carbon seal ring and ceramic seat.
- E. Non-overloading motor at any point on pump curve, open, drip-proof, ball bearings, 15,000 hours bearing life, with lifting lug on top of motor.
- F. Provide open drip-proof motor with regreasable ball bearings.
- G. Enclosed type impeller hydraulically and dynamically balanced, keyed to shaft and secured with locking screw.
- H. Structural steel baseplate with welded cross members, and open grouting area.
- I. Flexible coupling capable of absorbing torsional vibration, equipped with coupling guard.
- J. Manufacturers: Subject to compliance with requirements, provide pumps of one of the following:  
  
Armstrong Pumps  
  
Bell & Gossett  
  
Peerless  
  
Taco

### **2.2 SUCTION DIFFUSERS**

- A. Provide at each base-mounted pump, a suction diffuser of size required for pump connection. Units shall consist of angle type body with straightening vanes and combination diffuser-strainer-orifice cylinder with 3/16" diameter openings for pump protection. A permanent magnet shall be located within the flow stream and shall be removable for cleaning. The orifice cylinder shall be equipped



with a disposable fine mesh strainer which shall be removed after system start-up. Orifice cylinder shall be designed to withstand pressure differential equal to pump shutoff head and shall have a free area equal to five times cross section area of pump suction opening. Straightening vanes shall extend the full length of the orifice cylinder and shall be replaceable. Unit shall be provided with adjustable support foot to carry weight of suction piping.

- B. Manufacturers: by pump manufacturer.

## **2.3 BALANCING VALVES**

- A. Balancing valves shall be installed where indicated.
- B. Provide, as shown on the plans, balancing valves with provision for connecting a portable differential (Ft. of Head) pressure meter. Each meter connection shall have pressure/temperature readout ports.
- C. The balancing valves shall be either a bronze body/brass ball valve, or a Y-pattern globe valve style design and all metal parts of non-ferrous, pressure die-cast, nonporous Ametal copper alloy. Each valve can be installed in any direction without affecting flow measurement and shall provide four (4) functions:
1. Precise flow measurement
  2. Precision flow balancing
  3. Positive shut-off with no drop seat and teflon disc
  4. Drain port suitable for hose bib fitting.
- D. The valves shall have four (4) 360 deg. adjustment turns of handwheel for maximum setting with hidden memory feature to program the valve with precision tamperproof balancing setting.
- E. Design Pressure/Temperature:
- 1/2" - 3" NPT connections 300 psig at 250 deg. F.
- 1/2" and 3/4" sweat connections 200 psig at 250 deg. F.
- 2" – 4" flanged or grooved connections 250 psig at 250 deg. F
- 4" flanged connections 175 psig at 250 deg. F.
- F. Flow sensor: For installation in piping 5" and larger, a precision wafer type orifice insert installed between standard 125 psi at 250 deg. F ANSI flanges to monitor system flow; cast iron body with integral brass EPT check valves to accommodate a differential pressure meter; furnish with calibrated nameplate with flow range through a range of differential head pressures; provide globe valve at each sensor to adjust flow to design conditions.
- G. Manufacturers: Tour & Andersson, Armstrong, Bell & Gossett, Nexus Valve, Taco, Victaulic, Wheatley.

## **2.4 COMBINATION VALVE PACKAGE FOR PUMPS**

- A. Each centrifugal pump shall be provided with the following valve assemblies:
1. Combination silent check valve, balancing valve and shut-off valve on pump discharge.

- B. The combination units shall be flanged assemblies of 125 lb. ASA Class, 175 psi. W.O.G. @ 300 degrees F. The combination units shall be suitable for vertical or horizontal installation with the stem pointing up.
- C. The body and bonnet shall be cast semi-steel; and the stem, seat and disc shall be bronze. The valve shall be designed for repacking under pressure.
- D. The unit shall be provided with a calibrated stem indicator, and the check valve shall have a stainless-steel spring and be provided with disc designed for quiet operation at low flow rates.
- E. Manufacturers: by Pump Manufacturer.

## 2.5 FLEXIBLE PUMP CONNECTORS

- A. Flexible hose connectors shall be provided on suction and discharge piping of all base-mounted pumps. The flexible connectors shall be spring steel wire reinforced rubber compound in accordance with the following descriptions.
- B. Construction: The flexible connectors of reinforced rubber compound shall be a compression molded elastomer material with wire and rayon cord reinforcing and designed for a service temperature of 240 degrees F and a minimum pressure of 150 psi. Screwed end type shall have metal screwed connections molded into the elastomer material. Flanged units shall be one-piece construction whereby the elastomer material is molded to form the flanges.
- C. The flexible connections shall have approximate length in accordance with the following tabulation:

| Pipe Size    | Live-Length   |
|--------------|---------------|
| 1 inch       | 6-1/4 inches  |
| 1-1/4 inches | 6-1/4 inches  |
| 1-1/2 inches | 6-1/2 inches  |
| 2 inches     | 8-1/4 inches  |
| 2-1/2 inches | 10-3/8 inches |
| 3 inches     | 12-3/8 inches |
| 4 inches     | 16-1/2 inches |
| 5 inches     | 17-5/8 inches |
| 6 inches     | 18-3/5 inches |

- D. Manufacturers: Mason Industries, Moyno-RKL, Amber Booth, Metraflex, Patterson, Proco Products, Inc., Twin City Hose, Inc.

### OR

- A. Provide braided stainless steel pump connector(s) manufactured with annular corrugated stainless steel close-pitch hose with stainless steel overbraid. The corrugated metal hose, braid(s), and a stainless steel ring-ferrule/band (material gauge not less than .048") must be integrally seal-welded using a 100% circumferential, full-penetration TIG weld.
- B. End fittings shall be flat-face plate steel flanges with 150# ANSI drilling and outside diameter. Fittings must be attached using a 100% circumferential TIG weld. Braided stainless steel pump connector(s)

must be suitable for operating temperatures up to 850°F. The rated working pressure of the braided metal hose must have a minimum 4:1 safety factor.

- C. Each braided stainless steel pump connector shall be individually leak tested by the manufacturer using air-under-water or hydrostatic pressure. Flanged pump connectors shall be prepared for shipment using cut-to-length spacers, securely positioned between the flanges to prevent axial compression damage and maintain the manufactured length. Spacers must be removed prior to system start-up.
- D. Manufacturers: Amber/Booth, Flex-Hose Co., Inc., Mason Industries, Metra-Flex, Patterson, Proco Products, Inc., Twin City Hose, Inc.

### **PART 3 – EXECUTION**

#### **3.1 CIRCULATING PUMPS**

- A. Pump shall be installed in accordance with recommendations of the Hydraulic Institute.
- B. Suction reducers shall be eccentric and located at the pump suction. Discharge increasers shall be concentric and located at the pump discharge.
- C. Suction and discharge piping shall be adequately supported without imposing any load on the pump casing.
- D. Pressure gauges shall be installed at the suction and discharge of each pump.
- E. Vibration isolation equipment shall be provided where noted.
- F. Impeller diameter used shall be approximately 85% of the maximum impeller diameter capable of being supplied for each pump.
- G. The motor nameplate horsepower shall not be exceeded under any conditions of pump operation.
- H. Prior to shipment, each pump shall be tested to insure its capability to produce the required capacity at the design head, and when requested written verification of this test shall be supplied.
- I. Before grouting and piping the pump, the Contractor shall check to insure pump alignment is satisfactory, and where required, realign the pump. Fill baseplate with non-shrink grout to the top of the base rail.
- J. Start-up service shall be provided by the pump manufacturer or his representative. This service shall include the following:
  - 1. Check alignment
  - 2. Check absence of pipe strain
  - 3. Check lubrication
  - 4. Check rotation
  - 5. Take suction and discharge pressure gauge readings and compare with pump nameplate for operating head.
  - 6. Take voltage and current readings and compare with motor nameplate.
  - 7. Insure proper maintenance manuals are available if required.

### **3.2 BYPASSES**

- A. Three-valve bypasses shall be provided in piping at main system control valves, at control valves for heat exchangers, domestic hot water generators, central station air handling units, and where indicated on drawings.
- B. The bypasses shall consist of two gate valves and one globe or angle valve. The bypass pipe size shall be at least equal to the control valve size.

### **3.3 PIPING SYSTEM DRAINS**

- A. All piping shall be graded or pitched toward drain locations which shall be provided with gate valve unless otherwise indicated on drawings or specified. Individual risers may be drained through removable plugs or caps.
- B. Drain valves shall be provided at all major components in systems including boilers, pumps, heat exchangers, cooling towers, and similar equipment.

### **3.4 ECCENTRIC PIPE FITTINGS**

- A. Eccentric pipe fittings shall be furnished and installed in all piping and circulated water piping where a change in pipe size occurs in a horizontal run. In water systems the top of the adjacent pipe sections shall be maintained level.

**END OF SECTION**

## **SECTION 23 0600**

### **AIR DISTRIBUTION AND 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 0200 for HVAC General Provisions
- C. Refer to Section 23 0210 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. Roof-Mounted Intake/Exhaust Ventilators
  - 6. Prefabricated Roof Curbs, Equipment Supports, and Pipe Curb Assembly

##### **1.3 REFERENCE STANDARDS**

- A. Refer to Section 23 0200 for a general description of requirements applying to this section.
- B. Requirements established within the portions of the Project Manual titled Division 1, General Requirements, are collectively applicable to the work of this section.
- C. IMC (International Mechanical Code).
- D. SMACNA (Sheet Metal and Air Conditioning Contractors National Association, Inc.)
- E. American Society of Heating, Refrigerating and Air Conditioning Engineers' recommendations in ASHRAE Guide shall apply to this work.
- F. ARI Standard 885 - Standard for Estimating Occupied Sound Levels in the Applications of Air Terminals and Air Outlets.
- G. UL (Underwriter's Laboratories, Inc.)

- H. NFPA 90A shall apply to this work.
- I. State Fire Prevention Regulations.

#### **1.4 QUALITY ASSURANCE**

- A. Refer to Section 23 0210 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 0200.
- B. Submit the following:
  - 1. Shop drawings of all sheet metal. Indicate all steel, piping, conduit, and Architectural/Structural features to demonstrate complete coordination. Scale shall not be less than 1/4".
    - a. Shop drawings shall indicate the sizes and lengths of each section of ductwork as well as all system components such as 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, 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 3" W.G. Ductwork systems shall be sealed to SMACNA "Seal Class "B" Standards. Alternatively, "Ductmate" System 45 can be used in accordance with manufacturer's specifications. Drive slip joints are not permitted.

Exception: For ductwork smaller than 12" x 8", Contractor may provide slip and drive joints with all joints sealed with Hardcast tape and mastic system.

- B. Rectangular ducts for 3" W.G. or less, positive or negative pressure shall be per SMACNA Table 1-6. Longitudinal seams shall be Pittsburgh Lock Type L-I per SMACNA Figure 1-5. Transverse joints shall be standing seam type T -15 per Figure 1-4.
  - 1. In the event that material size is not compatible with duct size and segmenting must be utilized to fabricate duct, use SMACNA Figure 1-5, seam L-4 (Standing Seam).
- C. Joints:
  - 1. Per SMACNA Transverse Joint Reinforcement Table 1-12, only joints T -22, T -25a, T -25b and Proprietary slip on flanges will be acceptable.
  - 2. Joints T -25a and T -25b that have stress fractures from bending will not be accepted.
  - 3. All joints will have butyl gasket 3/16" thick by 5/8" wide installed per 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 not scheduled for insulation, duct material shall be galvanized, suitable for field painting by the General Contractor.
- E. The size and configuration of each duct shall be indicated on design drawings. Where thicker sheets or different types of materials are required, they shall be specified on the design drawings or in the project specifications.
- 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.

## **2.2 DUCTWORK (SINGLE WALL, SPIRAL ROUND)**

- A. Design Pressure: 3"
- 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, 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 3-5 for Positive pressure and Table 3-7 for Negative pressure.
3. Where the outer surface of the duct is exposed in finished spaces and is not scheduled for insulation, duct material shall be galvanized, suitable for field painting by the General Contractor.

D. Joints:

1. Duct up to 36" diameter - Male/Female beaded slip joint similar to SMACNA Figure 3-1, joint RT-1 or RT-5, as long as it meets the criteria for the system design pressure. Fittings shall be undersized to fit into spiral duct. All joints shall be secured with a minimum of 4 screws on each duct section (equally spaced). Seal joint with an approved sealant compound, continuously applied prior to assembly of joint and after fastening, making certain that the majority of the sealant resides on the interior of the joint.
2. 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 air handlers, inline fans, and where shown on drawings.
- 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. Damper 10" and below shall be single-blade. 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 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.

## **2.6 PREFABRIACTED ROOF CURBS, EQUIPMENT SUPPORTS, AND PIPE CURB ASSEMBLY**

- A. Factory fabricated by the manufacturer of the respective roof-mounted equipment when available and capable of meeting the following requirements:
  - 1. Thermally and acoustically insulated, rubber isolating pads.
  - 2. Built to suit slope of roof and type of roofing; i.e. standing metal seam with integral cant strip and flashing extension.
  - 3. 24" height unless otherwise indicated.
  - 4. Support rails shall be aluminum, or sheet steel, with continuous wood nailer and removable counterflashing.
- B. Curbs shall be a product of a custom manufacture in the following cases:
  - 1. Curbs specified are not available from the respective equipment manufacturer.
  - 2. Piping or ducts penetrating roof.
  - 3. Prefabricated equipment supports are required.
  - 4. Step flashing assembly, EPDM for normal use and silicone for pipe temperatures above 200°F stainless steel clamp, suitable for single or multiple pipes.
- C. Pipe supports shall be a product of a custom manufacture equal to Pipe Prop as made by JMB Industries, or Anvil International Hadon H-Block.
- D. Pipe curb assembly shall be a 24" high, 18-gauge sloped hood box with 1-1/2" thick rigid fiberglass insulation and pressure treated wood nailer strip. Assembly shall be provided with an 8" high insulated roof curb. Curbs shall be similar to Pate 'CPBA-1'.
- E. Manufacturers: Pate, Shipman, Custom Curb, Portals Plus, Lloyd Industries, Inc., PHP Systems/Design.

## **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. Ductwork that is lined with acoustic lining is insulated.
- B. Ducts shall be concealed unless otherwise indicated.
- C. Changes in direction shall be made with radius bends or turning vanes.
- D. Supports shall be galvanized steel for steel ductwork and aluminum for aluminum ductwork.
- E. Do not install ductwork directly above any electrical equipment.
- F. Ductwork shall be supported per SMACNA Standards including the following:

1. Rivet or screw to side and bottom of duct when using flat strap hangers. Rivet or screw to bottom of duct when using trapeze hangers.
  2. Strap hangers shall pass under duct 1" minimum or shall loop around duct.
  3. Hangers
    - a. For ductwork less than 4 square feet in area, hangers shall be spaced not more than 8' on center.
    - b. For ductwork 4-10 square feet in area, hangers shall be spaced not more than 6' on center.
    - c. For ductwork greater than 10 square feet in area, hangers shall be spaced not more than 4' on center.
  4. Wire/Cable 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 degree slope on sides of transitions.

### **3.2 FLEXIBLE AIR DUCT**

- A. When flexible duct is used for final connection between duct mains on branches and diffusers on registers. The maximum length of flexible ductwork shall be 5'-0" in length.
- B. Flexible ductwork shall be properly hung at the tap collar in order to prevent eventual wear and damage to the flexible duct.
- C. The ceiling tile system should not be considered a support on which to lay flexible duct. Refer to SMACNA Standards for proper installation.

### **3.3 DUCT SYSTEM LEAK SEALING**

- A. Joints in duct systems at duct heaters, air monitors, fire dampers, sound traps, supply air terminals including air handling light fixtures, shall be sealed to prevent air leakage.

- B. All duct joints and seams in medium pressure and high-pressure duct systems shall be sealed to SMACNA Seal Class "A" Standards to prevent air leakage.
- C. In the event there is in excess of 5% air leakage indicated in low pressure duct systems, it shall be the Contractors responsibility to seal the duct system. The amount of sealing necessary shall be that required to obtain the design air quantity at each terminal.
- D. Duct sealing shall be by means of high velocity duct sealants such as Hardcast and/or Neoprene gaskets. Type of sealant and method of application shall conform to recommendations in SMACNA high velocity duct construction standards.

### **3.4 DUCTWORK TESTING**

- A. The following duct systems shall be pressure leak tested:
  - 1. Supply ductwork
  - 2. Return ductwork
  - 3. Exhaust ductwork
  - 4. Outside air intake ductwork
- B. Pressure leak test the following:
  - 1. All ductwork within chases
  - 2. 50% of all ducts (Small Projects)
- C. All tests shall be conducted in accordance with AABC National Standards.
- D. Ducts to be tested at 100% maximum of static pressure before any duct is insulated externally and concealed in accordance with SMACNA Standards.
- E. Calculate the allowable leakage using leakage factor of 5% of Design Air Flow.
- F. Select a limited section of duct for which the estimated leakage will not exceed capacity of the test apparatus.
- G. Connect the blower and flow meter to the duct section and provide temporary seals at all openings of the ductwork.
- H. Start the blower motor with the inlet damper closed. Increase pressure until the required level is reached.
- I. 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.
- J. 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.
- K. Complete test reports and obtain Owner's witness signature.
- L. Remove all temporary blanks and seals.
- M. Warning: Do not overpressure duct.

### **3.5 EQUIPMENT**

- A. Test apparatus shall consist of an airflow measuring device, flow producing unit, pressure indicating devices and accessories necessary to connect the metering system to the test specimen.
- B. The Contractor conducting tests shall arrange for or provide all temporary services, all test apparatus, all temporary seals and all qualified personnel necessary to conduct the specified testing.
- C. Test apparatus shall be accurate within plus or minus 7.5% at the indicated flow rate and test pressure and shall have calibration data or a certificate signifying manufacture of the meter in conformance with the ASME Requirements for Fluid Meters. Verification of above, to be supplied to Owner upon request.
- D. Pressure differential sensing instruments shall be readable to 0.05" scale division for flow rates below 10 cfm or below 0.5" w.g. differential. For flows greater than 10 cfm scale divisions of 0.1" are appropriate. U-tube manometers should not be used for reading less than 1" of water.
- E. Liquid for manometers shall have a specific gravity of 1 (as water) unless the scale is calibrated to read in inches of water contingent on use of a liquid of another specific gravity, in which case the associated gauge fluid must be used.
- F. Instruments must be adjusted to zero reading before pressure is applied.

### **3.6 TEST REPORT**

- A. Log the project and system identification data.
- B. Enter the fan CFM, the test pressure, and the leakage class specified by the designer.
- C. Enter an identification for each duct segment to be tested.
- D. Calculate the allowable leakage factor. Enter this number on the report for each test segment.
- E. Conduct and record the field tests. If the sum of the CFM measured is less than or equal to the sum of the allowable leakage, the test is passed. Record the date(s), presence of witnesses and flow meter characteristics.
- F. Maintain a mechanical duct plan of all tested duct segments. Plan to include duct segment identification and dates tested.
- G. Test reports shall be submitted as required by the project documents.

### **3.7 LABELING**

- A. At all fire damper locations, access doors in ductwork shall be identified with a permanent placard of red-white-red laminated commercial grade plastic construction, minimum one-half inch high capital letters, reading, "FIRE DAMPER", as appropriate for the installation. Attach securely to face of access door with brass screws at each corner, sealed airtight.

**END OF SECTION**

## **SECTION 23 0605**

### **FANS - 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 0200 for HVAC General Provisions
- C. Refer to Section 23 0210 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. Roof-Mounted Exhaust Fans

##### **1.3 REFERENCE STANDARDS**

- A. Refer to Section 23 0200 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 0210 for a general description of requirements applying to this Section.
- B. Whenever a variable frequency PWM drive is installed to control an AC motor, a maintenance-free, circumferential, conductive micro fiber shaft grounding ring shall be installed on the AC motor drive end to discharge shaft currents to ground. Recommended part: AEGIS SGR™ Bearing Protection Ring, as made by Electro Static Technology. Install in accordance with the manufacturer's written instructions.

##### **1.5 SUBMITTALS**

- A. Submit shop drawings and product data in accordance with Section 23 0200.
- 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 ROOF MOUNTED EXHAUST FANS – BELT DRIVE**

- A. Fan shall be a spun aluminum, roof mounted, belt driven, down blast centrifugal exhaust fan.
- B. Fan shall be constructed of minimum 16 gauge marine alloy aluminum, bolted to a rigid aluminum support structure. The motor, bearings, and drives shall be mounted to a steel assembly, isolated with rubber vibration isolators.
- C. Unit shall have an engraved nameplate indicating fan number, CFM, static pressure, and maximum fan RPM at a minimum.
- D. Wheel shall be centrifugal, backwards inclined.
- E. Motor shall be NEMA design B with class B insulation rated for continuous duty.
- F. Bearings shall be constructed of heavy duty re-greaseable ball type in a cast iron pillow block housing.
- G. Drives shall be sized for 150 percent of installed motor horsepower.
- H. Accessories: Disconnect switch, insulated roof curb, backdraft damper. Curb to match roof configuration (flat, sloped, raised -seam, etc.).
- I. Manufacturers: Penn Ventilator Co., Greenheck, Loren Cook.

**OR**

### **2.2 ROOF MOUNTED EXHAUST FAN – DIRECT DRIVE**

- A. Fan shall be a spun aluminum, roof mounted, direct driven, down blast centrifugal exhaust fan.
- B. Fan shall be constructed of minimum 16-gauge marine alloy aluminum, bolted to a rigid aluminum support structure. The motor shall be enclosed in a weather-tight compartment, separated from the exhaust air stream.

- C. Unit shall have an engraved nameplate indicating fan number, CFM and static pressure at a minimum.
- D. Wheel shall be centrifugal, backwards inclined.
- E. Motor shall be NEMA design B with class B insulation rated for continuous duty.
- F. Motor shall be an electronically communicated motor rated for continuous duty and furnished with internally mounted potentiometer speed controller or with leads for connection to 0-10 VDC external controller.
- G. Accessories: Disconnect switch, insulated roof curb, backdraft damper. Curb to match roof configuration (flat, sloped, raised -seam, etc.).
- H. Manufacturers: Penn Ventilator Co., Greenheck, Loren Cook.

### **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 0950: TESTING AND BALANCING OF MECHANICAL SYSTEMS.
- D. Install units in accordance with manufacturer's installation instructions. Install units plumb and level, firmly anchored in locations indicated, and maintain manufacturer's recommended clearances.
- E. Support: Install and secure roof curb structure, in accordance with National Roofing Contractor's Association (NRCA) installation recommendations and shop drawings. Install and secure units on curbs and coordinate roof penetrations and flashing.
- F. The Mechanical Contractor shall own as a part of his work, the following:  
  
Provide one (1) additional drive set, if necessary, to obtain final design balancing requirements. The Mechanical Contractor shall coordinate with Balancing Firm and equipment manufacturer for drive selection, including belts and pulleys.

**END OF SECTION**





## **SECTION 23 0725**

### **TERMINAL HEATING UNITS - 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 0200 for HVAC General Provisions
- C. Refer to Section 23 0210 for HVAC Basic Materials & Methods.

##### **1.2 DESCRIPTION OF WORK**

- A. This Section includes work necessary and/or required and materials and equipment for construction of a complete system. Such work includes, but is not limited to the following:
  - 1. Unit Heaters
  - 2. Cabinet Heaters
  - 3. Convectors (Fin-Tube Type)
  - 4. Hot Water Coils
  - 5. Fin-Tube Radiation
  - 6. Electric Radiant Heating Panel
  - 7. Electric Fin Radiation

##### **1.3 REFERENCE STANDARDS**

- A. Refer to Section 230200 for a general description of requirements applying to this section.

##### **1.4 QUALITY ASSURANCE**

- A. Refer to Section 230210 for a general description of requirements applying to this Section.

##### **1.5 SUBMITTALS**

- A. Submit shop drawings in accordance with Section 230200.
- B. Submit shop drawings and descriptive data for all equipment specified in this section.

##### **1.6 SUBSTITUTIONS**

- A. The listed equivalent or substituted manufacturers along with the bidding related contractor shall be completely responsible to comply with all requirements on all contract documents. This shall include, but not limited to, space requirements, code clearances, the type, horsepower, capacities, number

and size of services required from other trades, including all required ancillary items furnished and installed by other trades. If the manufacturer or related bidding contractor does not comply with these requirements, this Contractor shall be responsible for any and all additional costs associated with the changes required by other trades.

## **1.7 WARRANTY/GUARANTEE**

- A. All work and materials are subject to the general warranty as described in the General Conditions of the Contract and in Division 1, General Requirements.

## **PART 2 – PRODUCTS**

### **2.1 UNIT HEATERS**

- A. Propeller type, direct drive, resilient-mounted motor, arranged for horizontal discharge, double-deflection louvers.
- B. Tested at 400 psig hydrostatic and 200 psig air under water.
- C. Enclosure shall be steel, cleaned, phosphated, primed and finished in baked enamel.
- D. Manufacturers: Airtherm Manufacturing Co., American Air Filter, Embassy Industries, Daikin McQuay, Modine, Rittling, Sterling, Trane, Vulcan.

### **2.2 CABINET HEATERS**

- A. Provide cabinet heaters including chassis, heating elements, fans, motor and insulation.
- B. Chassis: Galvanized steel wraparound structural frame with edges flanged.
- C. Insulation: Faced, heavy density glass fiber.
- D. Cabinet: Horizontal/Vertical semi-recessed/recessed/surface-mounted model as scheduled on the drawings, 16 gauge four sided overlap front panel with stiffeners. Clean cabinet parts, bonderize, phosphatize, and flow-coat with baked-on primer.
- E. Coils: Aluminum fins, copper tubes, mechanically expanded for a permanent bond. Provide manual air vent.
- F. Grilles: Intake and outlet grilles shall be integral, stamped 15 degrees deflection.
- G. Fans: Provide direct drive centrifugal, forward curved double width fan.
- H. Motors: Provide two-speed permanent split capacitor type motors (or variable speed) with integral overload protection and motor cords for plug-in to junction box in unit.
- I. Provide HI/LO/OFF fan control (concealed).
- J. Manufacturers: Daikin McQuay, Modine, Rittling, Sterling, Trane, Vulcan.

### **2.3 CONVECTORS (FIN-TUBE TYPE)**

- A. Fin-tube heating element shall consist of a single seamless copper tube as the primary heating surface, and rectangular plate type aluminum fins as the secondary heat transfer surface. The fins shall be mechanically fastened and equally spaced along the tubes to form a permanently tight bond

between tube and fins. Heating element capacities shall be I-B-R approved.

- B. The enclosure shall be not less than 16-gauge steel which shall be supported from a 20 gauge steel continuous backplate fastened to wall. A die-formed outlet grille in the enclosure shall extend from top to partly around front.
- C. Accessories according to installation requirements shall include end caps, corner pieces, wall sleeves, wall strip, column enclosures and support hangers.

Factory Applied - Prime coat for field paint

- Baked enamel (Color selected by Architect)

- D. Manufacturers: Daikin McQuay, Modine, Rittling, Sterling, Trane, Vulcan.

## **2.4 HOT WATER COILS**

- A. Provide coils of size and in location indicated, and of capacities and having performance data as scheduled. Certify coil capacities, pressure drops and selection procedures in accordance with AHRI 410.
- B. Construct fins of continuous aluminum configured plate-fin type with full fin collars for accurate spacing and maximum fin-tube contact.
- C. Construct tubes of 5/8" or 1/2" seamless copper tubing, .025" nominal wall thickness, arranged in parallel pattern with respect to airflow.
- D. Construct headers of gray cast iron. Hydrostatically test to 400 psi before assembly.
- E. Construct casings of 14-gauge continuous coated galvanized steel with formed end supports and top and bottom channels.
- F. Proof test coils at 300 psi, leak test at 200 psi under water.
- G. Manufacturers: Carrier, York/Johnson Controls, Trane, USA Coil.

## **2.5 FIN-TUBE RADIATION**

- A. Provide fin-tube heating elements and enclosures, together with required mounting components and accessories.
- B. Heating Elements shall consist of full-hard aluminum plate fins not less than .016" thick and actually embedded in copper seamless-drawn tube guaranteed for working pressure of at least 150 psi at 300 deg. F temperature.
- C. Enclosures and accessories:
  - 1. Shall be of style and dimensions indicated on plans and shall be fabricated from 16-gauge zinc-coated steel. Top of enclosures and 90 deg. corners shall consist of a heavy continuous enclosure aluminum extrusion deep-etched and hard anodized 204 R-1, with vanes sloped toward room, factory assembled to steel front skirts. Aluminum extrusion on enclosure top shall have pencil-proof air discharge slots.

2. Bottom of enclosure skirt shall have a double break for lateral stiffness, top shall be provided with deep-web gussets, and vertical stiffeners with 1/2" deep flanges shall be provided at enclosure joints.
  3. Enclosures and 90 deg. corners shall have flush joints with no exposed fasteners. End enclosures and end trims shall have roll- flanged edges, allowing enclosures to telescope within, and shall have no visible fasteners.
- D. Support components:
1. Shall consist of continuous mounting channel and bracket and element hangers installed every 3 to 4 feet.
  2. Continuous 20-gauge roll-formed mounting channel, fabricated from zinc-coated steel, shall position extruded aluminum top 7/8" from wall.
  3. The mounting channel shall be provided with a 16-gauge back plate, covering all holes and slot in channel, and flanged at bottom.
  4. Support brackets shall be die-formed from 3/16" thick steel, 1-1/2" wide and shall be lanced to receive bottom flange of enclosure, which shall be held securely with set screw.
  5. 16-gauge die-formed saddle shall positively position heating element away from brackets and enclosure joints and allow 1-5/8" lateral movement for expansion and 1-1/2" height adjustment for pitch. Nylon-coated support arm shall allow free-sliding of saddle.
- E. Access doors shall be provided where indicated. Doors shall be at least 8" x 8" size, hinged, located in enclosure front skirt and provided with tamperproof operator.
- F. Finish: All parts of the enclosure shall be primed and painted.
1. Factory applied enamel finish, color as selected by the Architect from manufacturer's standard color chart.
- G. Manufacturers: Vulcan, Rittling, Slant/Fin, Sterling, Trane.

## **2.6 ELECTRIC RADIANT HEATING PANEL**

- A. Provide radiant heating panels scheduled on the drawing. U.L. Listed.
- B. Panel shall be constructed as follows:
- Front - 24-gauge galvanized steel.
- Back - 24-gauge galvanized steel.
- Sides - Shall be overlapping front and back, riveted together.
- C. Wire - internal 200 degree C, 14 gauge, Teflon insulated. External - pigtails with 40" of 3/8" flexible, seal-tight conduit and connector for junction box.
- D. Element - graphite based, uniform temperature distribution over entire panel surface.
- E. Insulation - 1-1/4" thick, 4.2 pound density, high temperature fiberglass.

- F. Surface - heat modules textured with ceiling white flame resistant finish.
- G. Manufacturers: Q-Mark, Aztec, TPI/Markel.

## **2.7 ELECTRIC FIN RADIATION**

- A. UL listed and shall meet all applicable requirements of the latest National Electrical Code.
- B. Galvanized steel casing, 16-gauge, including terminal box, heating element assembly, safety controls and operating controls. Removable top cover with grille supports and extruded aluminum grille. Bottom cover locks into place with screws.
- C. Heating elements shall be steel sheath with aluminum fins, centered anchored and floating freely on high temperature Noryl bushings. Mesh screen located under outlet grille shall prevent insertion of objects through grille.
- D. Provide safety controls with primary thermal cut-out and automatic reset for over-temperature with linear type, full length sensing element. Units shall be prewired with built-in wireway and compartment for unit-mounted disconnect switch and DPST line voltage thermostat.
- E. Matching end caps, blank sections and filler sections for compete enclosures or continuous wall-to-wall appearance. Housing and accessories shall be finished in baked enamel with color selected by Architect.
- F. Manufacturers: Indeeco, Berko, Q-Mark, TPI/Markel, Electromode.

## **PART 3 – EXECUTION**

### **3.1 INSPECTION**

- A. Examine areas and conditions under which equipment is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

### **3.2 INSTALLATION OF UNIT HEATERS**

- A. Install heaters in accordance with manufacturer's installation instructions.
- B. Uncrate units and inspect for damage. Verify that nameplate data corresponds with unit designation.
- C. Hang unit from building substrate.
- D. Protect units with protective covers during balance of construction.

### **3.3 INSTALLATION OF CABINET HEATERS**

- A. Install cabinet heaters in accordance with manufacturer's installation instructions.
- B. Locate cabinet heaters as shown on the drawings. Coordinate with other trades.
- C. Protect units with protective covers during balance of construction.

### **3.4 CONVECTORS AND FIN TUBE RADIATION**

- A. Handle and install units in accordance with manufacturer's written instructions.

- B. Support units rigidly so they remain stationary at all times. Crossbracing or other means of stiffening shall be provided as necessary. Method of support shall be such that distortion and mal-operation of units cannot occur.
- C. Installed height shall be in accordance with manufacturer's recommendations.
- D. Fin tube radiation: Enclosures shall be run continuously, wall-to-wall.

### **3.5 DUCT HEATING COILS**

- A. Install in accordance with manufacturer's recommendations.
- B. Coil casing dimensions shall not be less than approach duct dimensions.
- C. Comb fins if damaged. Install safing to eliminate air bypass or leakage at coil sections.

### **3.6 INSTALLATION OF ELECTRIC HEATERS**

- A. Install heaters in accordance with manufacturer's installation instructions.
- B. Uncrate units and inspect for damage. Verify that nameplate data corresponds with unit designation.
- C. Hang unit from building substrate.
- D. Protect units with protective covers during balance of construction.
- E. Perform field mechanical balancing in accordance with Section 230950: TESTING AND BALANCING OF MECHANICAL SYSTEMS.

**END OF SECTION**

**SECTION 23 0800  
COMMISSIONING OF HVAC**

**PART 1 - GENERAL**

**1.1 SECTION INCLUDES**

- A. Description
- B. Responsibilities
- C. Related Work
- D. Test Equipment

**1.2 DESCRIPTION**

- A. The purpose of this section is to specify Division 23 responsibilities in the commissioning process.
- B. The systems to be commissioned are listed in Section 01 91 00.
- C. Commissioning requires the participation of the Division 23 Contractor to ensure that all systems are operating in a manner consistent with the Contract Documents. The general commissioning requirements and coordination are detailed in Section 01 91 00. Division 23 Contractor shall be familiar with all parts of Section 01 91 00 and shall execute all commissioning responsibilities assigned to them in the Contract Documents.

**1.3 RESPONSIBILITIES**

- A. Refer to Section 01 91 00.

**1.4 RELATED WORK**

- A. Specific commissioning requirements are given in the following sections of these specifications. All the following sections apply to the Work of this section.
  - 1. Section 01 91 00 – General Commissioning Requirements
  - 2. Section 22 08 00 - Commissioning of Plumbing
  - 3. Section 26 08 00 - Commissioning of Electrical

**PART 2 - PRODUCTS**

**2.1 TEST EQUIPMENT**

- A. The Contractor shall provide all test equipment necessary to fulfill the testing requirements of this Division. This equipment includes, but is not limited to, the following:
  - 1. Handheld temperature and relative humidity meter.
  - 2. Infrared thermometer gun.
  - 3. Analog differential pressure gauge and associated tubing.

4. Portable computer with access to the building automation system.
- B. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the related specifications. If not otherwise noted, the following minimum requirements apply:
1. Temperature sensors and digital thermometers shall have a certified calibration within the past year to an accuracy of 0.5°F and a resolution of +/- 0.1°F.
  2. Pressure sensors shall have an accuracy of +/- 2.0% of the value range being measured (not full range of meter) and have been calibrated within the last year.
  3. All equipment shall be calibrated according to the manufacturer's recommended intervals and when dropped or damaged. Calibration tags shall be affixed or certificates readily available.
- C. Refer to Section 01 91 00 for additional Division 23 requirements.

### PART 3 - EXECUTION

- A. Refer to Section 01 91 00.

END OF SECTION



**SECTION 23 0900**  
**BUILDING AUTOMATION SYSTEM - HVAC**

**PART 1 – GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract apply to this Section.
- B. Coordinate BAS work with Divisions 21, 22, 23, 26, and 27.
- C. The Mechanical Contractor shall coordinate with the work of Division 26 and the Fire Alarm System vendor for locations and mounting of all duct smoke detectors. These devices are shown on the Mechanical Drawings for reference only to show the intent of the work. All locations shall be determined based on approved shop drawings from the Fire Alarm System vendor and the Contractor for the work of Division 26, Electrical.

**1.2 DESCRIPTION OF WORK**

- A. Provide all labor, materials, supervision, software, programming, graphics, commissioning, training, and warranty necessary to furnish a complete direct digital control Building Automation System (BAS).
- B. The BAS shall be an extension of the Owner's existing Niagara Tridium system and shall utilize Johnson Controls FX Series native Niagara controllers.
- C. The system shall provide centralized monitoring, control, scheduling, trending, alarm management, and reporting for all HVAC systems.
- D. The Building Automation System (BAS) Contractor shall be responsible for all JACE licensing associated with this project, including the procurement, installation, configuration, and activation of any required licenses to support the new systems and devices provided under this Contract.
- E. The BAS Contractor shall also be responsible for performing all Niagara software updates, patches, and revisions required to support the project for the entire duration of the warranty period. Software updates shall be performed in coordination with the Owner and shall not disrupt normal building operations.
- F. The BAS Contractor shall furnish and install all new BACnet communication wiring required to integrate new equipment and controls installed as part of this project into the existing BAS. This shall include, but not be limited to, BACnet/IP and BACnet MS/TP communication cabling, terminations, addressing, labeling, and testing. All communication wiring shall be installed in accordance with applicable codes, manufacturer recommendations, and Division 26 requirements.

**1.3 SUBMITTALS**

- A. Submit complete shop drawings and manufacturer data sheets for all BAS components.
- B. Submit compliance matrix indicating conformance with this specification.
- C. Submit detailed point-to-point wiring diagrams and network architecture diagrams.
- D. Submit valve, damper, and sensor schedules.
- E. Submit graphic samples and alarm text samples for approval prior to programming.
- F. Submit cybersecurity compliance documentation coordinated with District IT.

**1.4 QUALITY ASSURANCE**

- A. BAS Contractor shall be an authorized Niagara-certified Johnson Controls FX integrator.
- B. BAS Contractor shall have a minimum of ten (10) years of K–12 public school BAS experience.
- C. All work shall be performed by factory-trained personnel regularly employed by the BAS Contractor.
- D. Provide local service support with response within 24 hours.

## **1.5 CODES AND STANDARDS**

- A. Comply with all applicable codes and standards including:
  - 1. ASHRAE 135 (BACnet)
  - 2. ASHRAE 55, 62.1, 90.1
  - 3. UL 916
  - 4. FCC Part 15
  - 5. NFPA 70 (NEC)
  - 6. State and Local Education Facility Requirements

## **1.6 CYBERSECURITY & IT REQUIREMENTS**

- A. BAS shall comply with Red Clay Consolidated School District IT standards.
- B. Provide role-based user access, password complexity enforcement, HTTPS/TLS encryption, audit logging, and VLAN coordination.
- C. No default passwords or unmanaged remote access shall be permitted.
- D. Coordinate all IP addressing, firewall rules, and port usage with District IT.

## **PART 2 – PRODUCTS**

### **2.1 BUILDING AUTOMATION SYSTEM**

- A. Basis of Design: Extension of Existing Niagara Tridium Johnson FX JACE by ModernControls.
- B. Approved equals must meet all functional, cybersecurity, serviceability, and performance requirements.

### **2.2 CONTROLLERS**

- A. Supervisory Controllers: JACE FX80 or FX90 with BACnet/IP communications.
- B. Field Controllers: F4-CGM09090, F4-CGM04060, F4-XPM04060-0, F4-XPM09090-0, F4-XPM18000-0, F4-CVx03050-0
- C. Controllers shall retain programming and operate autonomously upon network failure.
- D. Controllers shall be UL listed and battery-free.
- E. System Software.
  - 1. Web Server Operating System. Web server shall have an industry-standard professional grade operating system. Acceptable systems include Microsoft Windows Server, Red Hat Linux, or Sun Solaris. This web server will be accessible by all existing owner PC's throughout their LAN/WAN with unlimited simultaneous users, and unlimited overall user license.
  - 2. Individual Operator Workstation Interface. Web server shall be accessible from any workstation on the client network, and utilize windows-based operating system. All owner workstations throughout the owner's Ethernet LAN/WAN will be capable of accessing the Web Server, with unlimited simultaneous users. In addition, each owner workstation will be able to utilize Internet Explorer, Firefox, Safari, or Chrome web browsers. In addition, the operator interface will be a true thin client, with no additional software required beyond the web browser, and no dongles or license files required to be installed on any operator workstation accessing the web server.
  - 3. System Graphics. Operator interface shall be graphically based and shall include at least one graphic per piece of equipment or occupied zone, graphics for each chilled water and hot water system, and graphics that summarize conditions on each floor of each building included in this contract. Indicate thermal comfort on floor plan summary graphics using dynamic colors to represent zone temperature relative to zone setpoint.

## 2.3 SENSORS & TRANSMITTERS

- A. Space Temperature Sensors, Humidity Sensors, CO<sub>2</sub> Sensors Suitable for Classroom Use ( $\pm 0.5^{\circ}\text{F}$  accuracy)
  - 1. Solid state room sensors shall be of the wire wound resistance type element. Sensors shall be of the completely solid state type with no moving contacts. Printed circuit board under thermostat cover shall contain a low mass resistance type setpoint dial and amplifier. Provide test points for measuring output voltage. Sensors shall be direct or reverse acting as required for the sequence of operation.
  - 2. Sensors shall provide the application for night setback override.
  - 3. Sensors shall be mounted at ADA height (48" above floor).
- B. Duct and immersion temperature sensors
  - 1. Duct and immersion sensors shall have minimum spans as required to meet the temperature requirements. Duct sensors shall have sensing elements of sufficient length and accuracy to measure average duct temperature in each location.
  - 2. Sensors shall be of corrosion resistant construction, tamperproof, suitable for mounting on a vibrating surface. Exposed capillaries shall be temperature compensated, and armored or installed in protective tubing.
  - 3. All sensing elements for water pipe mounting shall be of the rod and tube type with linear output and shall be furnished complete with separable protecting wells filled with heat conductive compound. Sensors shall be factory calibrated and tamperproof. If easily adjustable sensors are provided, they shall be located inside metal enclosures with cylinder lock and key to prevent unauthorized setting.
- C. Freeze Protection Devices and Leak Detection Sensors, Differential Pressure Transmitters Current Sensors and Flow Switches
  - 1. Low limit, electric type, with 20' long serpentine element, with manual reset, set for 37F for "freeze" protection and 55F for fan discharge application, unless otherwise noted.
  - 2. Air and water duty flow switches: Current sensor type for fan and pump status.
  - 3. Carbon dioxide sensor/transducer suitable for wall or duct mounting.
    - a. Analog output of 4 to 20 milliamps corresponding to 0 to 2000 ppm CO<sub>2</sub>.
    - b. ABS plastic housing, suitable for an operating environment of 0 to 125 F/ 0 to 100% RH, non-condensing.
    - c. Repeatability less than  $\pm 20$  ppm.
    - d. Response time less than 60 seconds.
    - e. Power supply, 24 VAC.
  - 4. Liquid Leak Detection System: Kele, Raychem, Trace Tek.
    - a. Mechanical float devices attached to or inserted within the auxiliary pan are not acceptable.
    - b. Sensor shall be activated when there is at least  $\frac{1}{4}$  inch of water, but no more than  $\frac{1}{2}$  inch of water in the auxiliary pan.
    - c. Weatherproof cast aluminum enclosure with adjustable mounting feet.
    - d. 11-27VAC/VDC, 60 Hz, SPDT alarm contacts.
    - e. LED indicators for power (green) and alarm (red).
    - f. Fully adjustable detection level.

## **2.4 ACTUATORS, VALVES & DAMPERS**

- A. Actuators shall be electronic, sized for application, with spring return where required.
- B. Valves shall be rated for a minimum of 150 percent (150%) of system operating pressure at the valve location but not less than 125 psig.
- C. 2" and Smaller: Valves shall be bronze body with screwed or flared connections.
- D. 2½ " and Larger: Valves shall be bronze or iron body, flanged.
- E. Flow characteristics:
  - 1. Three-way valves shall have a linear relation of flow vs. valve position.
  - 2. Two-way valve position vs. flow relation shall be equal percentage for water flow control.
- F. Maximum pressure drop through valve:
- G. Modulating water flow control: ½ the pressure drop through the apparatus with maximum of 10 feet of water. Two position water valves shall be line size.
- H. Provide integral, auxiliary switches for direct coupled actuators to indicate when a desired position is reached or to interface additional controls for a specific sequence.
- I. Control valves shall be ANSI rated, bronze or iron body, stainless steel stems.
- J. Dampers shall be low-leakage, AMCA rated, galvanized steel construction with blade seals.
- K. Align actuator with drive shaft, provide permanent mark to identify closed position of end device.
- L. The ATC Sub-contractor shall furnish all the controlled dampers of the type and sizes indicated on the drawings for installation by the sheet metal Sub-contractor.
- M. All 2-position control dampers shall be parallel blade and sized for minimum pressure drop, at the specified duct size.
- N. All modulating dampers shall be opposed blade and sized for an effective linear air flow control characteristics within the angle of rotation and maximum pressure drops specified.
- O. Information shall be provided to the sheet metal Subcontractor for determining the proper duct reductions or baffles used.
- P. Damper frames shall not be less than 16 gauge galvanized steel, formed with corner braces for extra strength, with mounting holes for enclosed duct mounting.
- Q. All damper blades shall be of not less than 16-gauge galvanized steel formed for strength and high velocity performance. Blades on all dampers must not be over 8" in width. Blades shall be secured to 1/2" diameter zinc plated axles by zinc plated bolts and nuts. All blade bearings shall be nylon or oilite. Blade side edges shall be sealed off against spring stainless steel seals. Teflon coated thrust bearings shall be provided at each end of every blade to minimize torque requirements and insure smooth operation. All blade leakage hardware shall be constructed of corrosion resistant, zinc plated steel and brass.
- R. Dampers shall be suitable for operation between -40 and 200 degrees. The control manufacturer shall submit leakage and flow characteristics plus a size schedule for all controlled dampers.
- S. All blade edges shall have inflatable seal edging that shall be rated for leakage less than 10 cubic feet per minute per square foot of damper area at a differential pressure of 4" of water when the damper is being held by a torque not to exceed 50 inert lbs. Leakage shall not exceed 1/2 of 1% of total flow.
- T. Provide permanent mark or scribe end of drive shaft to align damper with actuator in closed position.

## **2.5 CONTROL PANELS & ENCLOSURES**

- A. Provide NEMA-rated, lockable steel enclosures. All wiring shall be labeled and terminated on numbered terminal strips.
- B. Control cabinets shall be constructed of 18-gauge steel with locking hinged door. Unless otherwise specified, all controllers, electric relays, switches and other equipment furnished as part of the control system which are not required to be mounted on mechanical equipment, shall be cabinet mounted. The temperature indicators and switches shall be flush mounted on the door tagged with plastic labels. All electrical devices shall be wired to a numbered terminal strip and all devices shall be completely adjusted and checked for proper operation prior to shipment to job site. All wiring shall be numbered according to the control diagram.

## **2.6 ELECTRICAL WIRING**

- A. Provide all Class 2 control wiring and control power unless otherwise noted.
- B. Comply with NEC and Division 26 requirements.
- C. Provide plenum-rated cable where required and maintain separation from line voltage.
- D. Provide all interlock wiring including smoke detectors, condensate pumps, and safeties.

## **2.7 SEQUENCES OF OPERATION**

### **A. WATER-COOLED CHILLER CH-2**

#### **1. GENERAL DESCRIPTION**

- a. CH-2 shall be a factory-assembled water-cooled chiller complete with evaporator and condenser sections, provided with a native BACnet interface for integration with the Building Automation System (BAS).
- b. The BAS shall interface with CH-2 via BACnet as provided by the manufacturer. The chiller manufacturer's internal controller shall retain all primary safety and capacity control functions.
- c. The BAS shall:
  - (1) Enable and disable the chiller
  - (2) Reset leaving chilled water temperature
  - (3) Monitor chiller status, performance, and alarms
  - (4) Provide scheduling, trending, alarming, and operator interface
- d. The chiller shall operate safely in standalone mode in the event of BAS or communication failure.

#### **2. MODES OF OPERATION**

- a. Occupied Mode
  - (1) CH-2 shall be enabled by the BAS when the plant schedule is in Occupied mode.
  - (2) The chiller shall modulate to maintain the Leaving Chilled Water Temperature (LCHWT) setpoint.
  - (3) Condenser water flow and heat rejection equipment (cooling tower, condenser pumps) shall be enabled and interlocked per the mechanical sequence.
- b. Unoccupied Mode
  - (1) CH-2 shall be disabled during unoccupied periods unless overridden by:
    - (a) Freeze protection
    - (b) Emergency cooling demand

- (c) Operator manual override
- c. Manual / Override Mode
  - (1) BAS operators shall be able to manually enable or disable CH-2.
  - (2) Manual overrides shall be logged and require confirmation.
  - (3) Overrides shall automatically release upon return to schedule unless locked by operator.
- 3. CHILLER ENABLE / DISABLE LOGIC
  - a. CH-2 shall be enabled when all of the following conditions are met:
    - (1) BAS schedule = Occupied
    - (2) No active critical chiller alarms
    - (3) Chilled water flow proven (via flow switch or manufacturer BACnet status)
    - (4) Condenser water flow proven (if applicable)
    - (5) BAS Chiller Enable Command = TRUE
  - b. CH-2 shall be disabled upon any of the following:
    - (1) BAS schedule transitions to Unoccupied
    - (2) BAS Enable Command = FALSE
    - (3) Emergency Stop activation (if provided)
    - (4) Critical safety shutdown reported by chiller
- 4. TEMPERATURE CONTROL
  - a. Primary Control
    - (1) CH-2 shall control capacity to maintain the Leaving Chilled Water Temperature (LCHWT).
    - (2) Default LCHWT setpoint: 44°F, adjustable via BAS.
  - b. Chilled Water Temperature Reset (Optional / Selectable)
    - (1) The BAS shall provide a configurable reset strategy based on one of the following:
      - (a) Average AHU chilled water valve position
    - (2) Reset limits:
      - (a) Minimum LCHWT: 42°F
      - (b) Maximum LCHWT: 48°F
- 5. CONDENSER WATER INTERFACE
  - a. CH-2 condenser water temperature and pressure shall be monitored via manufacturer BACnet points.
  - b. The BAS shall enable condenser water pumps and cooling tower systems per the mechanical design.
  - c. CH-2 shall not be enabled unless condenser water flow is proven.
- 6. Primary CHW Pump Interlock Freeze Protection
  - a. Enable Conditions
    - (1) Freeze Protection Mode shall be Enabled when:

- (a) Freeze Disable OAT:  $\geq 38^{\circ}\text{F}$
- (b) CHW Loop Temp  $\leq 40^{\circ}\text{F}$
- (2) Freeze Protection Mode shall be Disabled when:
  - (a) OAT  $\geq 38^{\circ}\text{F}$  OR CHW Loop Temp  $\geq 42^{\circ}\text{F}$  (with min run/off timers satisfied)
- (3) When Freeze Protection Mode is enabled:
  - (a) Command Lead Primary CHW Pump on
  - (b) Maintain pump operation until Freeze Protection Mode is disabled and minimum on-time is satisfied.
  - (c) Freeze Protection Pump Min ON time: 30 minutes
- (4) When Freeze Protection Mode is enabled AND Primary CHW Pump proof is proven:
  - (a) Command Chiller Enable = ON (allow chiller to run if needed)
- (5) Alarms / Escalation
  - (a) If Freeze Protection Mode enabled; a freeze alarm shall be initiated

#### 7. CHILLER FREEZE PROTECTION

- a. Freeze Protection Mode shall be enabled when any of the following conditions are true:
  - (1) Outside Air Temperature (OAT) is less than  $38^{\circ}\text{F}$  (adjustable).
  - (2) Chilled Water Loop Temperature is less than  $40^{\circ}\text{F}$  (adjustable).
- b. Freeze Protection Mode shall be disabled when both of the following conditions are satisfied:
  - (1) Outside Air Temperature is greater than  $40^{\circ}\text{F}$  (adjustable).
  - (2) Chilled Water Loop Temperature is greater than  $42^{\circ}\text{F}$  (adjustable).
- c. When Freeze Protection Mode is enabled:
  - (1) The chiller shall command the lead primary chilled water pump ON.
  - (2) Pump status proof shall be verified within 30 seconds.
  - (3) A Freeze Protection Active status indication shall be displayed at the BAS front end.
- d. If the primary chilled water pump is proven ON and the Chilled Water Loop Temperature remains below  $40^{\circ}\text{F}$  (adjustable):
  - (1) The BAS shall command the associated chiller Enable point ON.
  - (2) The chiller shall be allowed to operate under its internal controls to maintain the factory minimum chilled water temperature setpoint.
- e. The chiller Enable command shall be removed when the Chilled Water Loop Temperature rises above  $42^{\circ}\text{F}$  (adjustable).
- f. The primary chilled water pump shall continue to operate until:
  - (1) Freeze Protection Mode is disabled.
  - (2) A minimum pump ON time of 30 minutes (adjustable) has elapsed.
- g. Alarms
  - (1) If the primary chilled water pump is commanded ON and proof is not received within 30 seconds, a critical alarm shall be generated.
  - (2) If the chiller is commanded ON and fails to start, a critical alarm shall be generated.

(3) If Freeze Protection Mode remains active for more than 60 minutes (adjustable), a warning alarm shall be generated.

(4) If Chilled Water Loop Temperature falls below 36°F (adjustable), a critical freeze alarm shall be generated.

h. Adjustable Setpoints

(1) Freeze Protection Enable OAT: 38°F

(2) Freeze Protection Disable OAT: 40°F

(3) CHW Loop Temperature Enable: 40°F

(4) CHW Loop Temperature Disable: 42°F

(5) Critical Low Temperature Alarm: 36°F

(6) Minimum Pump ON Time: 30 minutes

(7) Freeze Protection Alarm Delay: 60 minutes

8. SAFETIES & INTERLOCKS

a. The BAS shall monitor and alarm the following conditions at a minimum:

(1) Chiller Fault / Shutdown

(2) Loss of Chilled Water Flow

(3) Loss of Condenser Water Flow

(4) High Condenser Pressure

(5) Low Evaporator Pressure

(6) Freeze Protection Alarm

(7) High Motor Current

(8) Communication Failure

b. Upon a critical safety alarm:

(1) CH-2 shall be disabled

(2) Alarm shall annunciate at the BAS front end

(3) Alarm shall require operator acknowledgement

9. ALARMS & NOTIFICATION

a. Alarm Priorities

(1) Critical: Chiller shutdown, safety trip

(2) Warning: Sensor failure, high temperature deviation

(3) Advisory: Maintenance or service reminders

b. Alarm Handling

(1) Alarms shall display in Niagara with clear descriptors

(2) Time-stamped alarm logs shall be retained

(3) Optional email/text notification if enabled by Owner

10. TRENDING

a. The BAS shall trend the following:

(1) Leaving Chilled Water Temperature



- (2) Return Chilled Water Temperature
- (3) Chiller Capacity
- (4) Compressor Status
- (5) Condenser Water Entering Temperature
- (6) Condenser Water Leaving Temperature
- (7) Chiller Enable Status

#### 11. FAILURE MODES

##### a. BAS Communication Failure

- (1) CH-2 shall continue autonomous operation using last valid setpoints.
- (2) BAS shall alarm loss of communication.

##### b. Power Failure

- (1) Upon power restoration, CH-2 shall return to last commanded BAS state after safety checks.

#### B. SYSTEM POINT LIST: CH-2 – WATER-COOLED CHILLER(Manufacturer Native BACnet Interface)

##### 1. ANALOG INPUTS (AI)

| Point Name         | Description                       | Units |
|--------------------|-----------------------------------|-------|
| CH-2 LCHWT         | Leaving Chilled Water Temperature | °F    |
| CH-2 RCHWT         | Return Chilled Water Temperature  | °F    |
| CH-2 Evap Pressure | Evaporator Pressure               | PSIG  |
| CH-2 Cond Pressure | Condenser Pressure                | PSIG  |
| CH-2 Cond EWT      | Condenser Water Entering Temp     | °F    |
| CH-2 Cond LWT      | Condenser Water Leaving Temp      | °F    |
| CH-2 Motor Current | Compressor Motor Current          | Amps  |
| CH-2 Capacity      | Chiller Capacity                  | %     |

##### 2. ANALOG OUTPUTS (AO)

(Writable only if supported by manufacturer BACnet interface)

| Point Name          | Description               | Units |
|---------------------|---------------------------|-------|
| CH-2 LCHWT SP       | Leaving CHW Temp Setpoint | °F    |
| CH-2 Capacity Limit | Capacity Limit Command    | %     |

3. BINARY INPUTS (BI)

| Point Name          | Description                 |
|---------------------|-----------------------------|
| CH-2 Run Status     | Chiller Running             |
| CH-2 Available      | Chiller Available           |
| CH-2 Alarm Status   | General Fault               |
| CH-2 CHW Flow Proof | Chilled Water Flow Proven   |
| CH-2 CDW Flow Proof | Condenser Water Flow Proven |

4. BINARY OUTPUTS (BO)

| Point Name       | Description                |
|------------------|----------------------------|
| CH-2 Enable      | Chiller Enable Command     |
| CH-2 Alarm Reset | Alarm Reset (if permitted) |

5. MULTI-STATE / STATUS POINTS

| Point Name          | Description                 |
|---------------------|-----------------------------|
| CH-2 Operating Mode | Off / Standby / Running     |
| CH-2 Alarm Code     | Manufacturer Alarm Code     |
| CH-2 Comm Status    | BACnet Communication Status |

6. CALCULATED / SOFTWARE POINTS

| Point Name         | Description                  |
|--------------------|------------------------------|
| CH-2 $\Delta T$    | CHW Temperature Differential |
| CH-2 Alarm Summary | Aggregated Alarm Status      |
| CH-2 Runtime       | Accumulated Runtime Hours    |
| CH-2 Starts        | Compressor Start Count       |

7. ADJUSTABLE SETPOINTS

- a. LCHWT Setpoint
- b. LCHWT Reset Enable
- c. Reset Min / Max Limits

- d. Alarm Enable / Disable
- e. Trend Interval
- 8. GRAPHICS REQUIREMENTS
  - a. Provide Niagara graphics including:
  - b. Chiller overview graphic
  - c. Evaporator and condenser temperature/pressure display
  - d. Enable/disable control
  - e. Alarm summary
  - f. Trend access
- C. HYDRONIC PUMPING SYSTEM P-1 to P-17
  - 1. GENERAL
    - a. Provide variable-speed pumping systems for chilled water, hot water, condenser water, and zone circulation. All pumps shall be equipped with VFDs and controlled by the BAS using Johnson Controls FX controllers and integrated into the Niagara Tridium front end.
    - b. Pumps shall be capable of safe standalone operation upon loss of BAS communication. All safeties and factory protections shall remain integral to the pump and VFD.
  - 2. SYSTEM CONFIGURATION
    - a. Chilled Water Pumps (CHWP-x)
      - (1) Serve chilled water distribution loop.
      - (2) Operate as lead/lag or duty/standby as scheduled.
      - (3) Control based on system differential pressure.
      - (4) A minimum pump speed shall be established with the balancer
    - b. Hot Water Pumps (HWP-x)
      - (1) Serve heating hot water distribution loop.
      - (2) Operate as lead/lag or duty/standby.
      - (3) Control based on system differential pressure.
    - c. Condenser Water Pumps (CWP-x)
      - (1) Serve water-cooled chillers and cooling towers.
      - (2) Interlocked with chiller operation.
      - (3) Control based on condenser water flow or pressure.
    - d. Zone Pumps (ZP-x)
      - (1) Serve terminal units or localized hydronic zones.
      - (2) Enabled based on zone demand.
      - (3) Variable-speed operation for energy efficiency.
  - 3. MODES OF OPERATION
    - a. Occupied Mode
      - (1) Pumps shall operate as required to satisfy cooling or heating demand.
      - (2) Lead pump shall modulate speed to maintain system differential pressure setpoint.

- (3) Lag pump shall be enabled automatically if lead pump cannot maintain setpoint.
- b. Unoccupied Mode
  - (1) Pumps shall be off unless required for:
  - (2) Freeze protection
  - (3) System exercise
  - (4) Demand from zone or terminal equipment
- c. Manual / Override Mode
  - (1) Operators may manually enable or disable pumps via BAS.
  - (2) Overrides shall be logged and time-limited unless locked.
- 4. PUMP START / STOP LOGIC
  - a. Enable Conditions
    - (1) A pump shall be enabled when:
    - (2) BAS schedule is occupied or system demand is present
    - (3) No active critical pump or VFD alarms
    - (4) BAS Pump Enable command is TRUE
  - b. Disable Conditions
    - (1) Pump shall stop upon:
    - (2) Loss of system demand
    - (3) BAS disable command
    - (4) Critical fault or safety shutdown
- 5. SPEED CONTROL & DIFFERENTIAL PRESSURE CONTROL
  - a. Differential Pressure Control
    - (1) Pump speed shall modulate to maintain system DP setpoint as measured by differential pressure sensors.
    - (2) DP setpoint shall be adjustable and reset based on:
      - (a) Most open control valve position, or
      - (b) Time of day / load conditions
  - b. Minimum & Maximum Limits
    - (1) Minimum speed and maximum speed limits shall be enforced to protect equipment.
    - (2) Pumps shall not short-cycle.
- 6. LEAD / LAG OPERATION (MULTIPLE PUMPS)
  - a. BAS shall automatically rotate lead/lag assignment based on runtime or calendar schedule.
  - b. Lag pump shall start if:
    - (1) Lead pump fails, or
    - (2) DP cannot be maintained
  - c. Upon lead failure, alarm shall be generated.
- 7. CONDENSER WATER PUMP INTERLOCKS

- a. CWP-x shall start prior to chiller enable.
  - b. Chiller shall not enable unless condenser water flow is proven.
  - c. CWP-x shall stop after chiller shutdown following adjustable delay.
8. ZONE PUMP CONTROL
- a. Zone pumps shall be enabled based on:
    - (1) Zone demand
    - (2) Terminal unit valve position
  - b. Speed shall modulate to maintain zone DP or flow setpoint.
  - c. Pumps shall shut down when no demand exists.
9. SAFETIES & ALARMS
- a. The BAS shall monitor and alarm:
    - (1) Pump run status
    - (2) VFD fault
    - (3) Loss of flow or pressure
    - (4) Differential pressure sensor failure
    - (5) Motor overload
    - (6) BAS communication failure
  - b. Critical alarms shall stop the affected pump and require manual reset.
10. TRENDING
- a. The BAS shall trend:
    - (1) Pump speed
    - (2) Differential pressure
    - (3) Flow (if provided)
    - (4) Pump runtime and starts
    - (5) Alarm status
11. FAILURE MODES
- a. BAS Communication Failure
    - (1) Pumps shall continue safe operation using last valid command.
    - (2) BAS shall generate communication failure alarm.
  - b. Power Failure
    - (1) Upon power restoration, pumps shall return to last commanded state after safety checks.
- D. BUILDING AUTOMATION SYSTEM POINT LIST: TYPICAL – PER PUMP
1. ANALOG INPUTS (AI)
- | Point Name | Description           | Units |
|------------|-----------------------|-------|
| System DP  | Differential Pressure | PSID  |

| Point Name    | Description             | Units |
|---------------|-------------------------|-------|
| Flow Rate     | Pump Flow (if provided) | GPM   |
| Motor Current | Motor Current           | Amps  |
| Pump Speed FB | VFD Speed Feedback      | %     |

## 2. ANALOG OUTPUTS (AO)

| Point Name     | Description        | Units |
|----------------|--------------------|-------|
| Pump Speed Cmd | VFD Speed Command  | %     |
| DP Setpoint    | System DP Setpoint | PSID  |

## 3. BINARY INPUTS (BI)

| Point Name  | Description         |
|-------------|---------------------|
| Pump Status | Pump Running Proof  |
| VFD Fault   | VFD Fault Status    |
| Flow Proof  | Flow Switch / Proof |

## 4. BINARY OUTPUTS (BO)

| Point Name  | Description        |
|-------------|--------------------|
| Pump Start  | Pump Start Command |
| Pump Enable | Pump Enable        |
| VFD Reset   | VFD Fault Reset    |

## 5. MULTI-STATE / STATUS POINTS

| Point Name      | Description          |
|-----------------|----------------------|
| Pump Mode       | Off / Auto / Manual  |
| Lead/Lag Status | Lead / Lag / Standby |
| Comm Status     | Normal / Failed      |

6. CALCULATED / SOFTWARE POINTS

| Point Name    | Description             |
|---------------|-------------------------|
| Pump Runtime  | Accumulated Runtime     |
| Pump Starts   | Start Count             |
| Alarm Summary | Aggregated Alarm Status |

7. ADJUSTABLE SETPOINTS

- a. Differential Pressure Setpoint
- b. Minimum Speed Limit
- c. Maximum Speed Limit
- d. Lead/Lag Rotation Interval
- e. Alarm Enable / Disable

8. GRAPHICS REQUIREMENTS

- a. Provide BAS graphics including:
  - (1) Pump status and speed
  - (2) Differential pressure
  - (3) Lead/lag indication
  - (4) Alarm summary
  - (5) Trend access

E. ROOF-MOUNTED AIR HANDLING UNITS AHU-1-01, 03, 05, 06, & 07

1. GENERAL

- a. Each AHU shall be roof-mounted and equipped with a variable-speed supply fan with VFD, chilled water-cooling coil, hot water heating coil, outside air and return air dampers, airflow measuring stations, and space temperature, humidity, and CO<sub>2</sub> sensors.
- b. Each AHU shall be controlled by the BAS using Johnson Controls FX controllers and integrated into the Niagara Tridium front end. Units shall be capable of safe standalone operation upon loss of BAS communication.

2. MODES OF OPERATION

- a. Occupied Mode
  - (1) AHU shall operate per BAS schedule.
  - (2) Supply fan shall operate and modulate to maintain Supply Airflow (SA CFM) setpoint using the supply airflow station.
  - (3) OA damper shall modulate to maintain Outside Airflow (OA CFM) setpoint using the outside airflow station.
  - (4) Cooling and heating coils shall modulate to maintain space temperature and humidity setpoints.
  - (5) CO<sub>2</sub>-based demand control ventilation (DCV) shall dynamically reset the OA airflow setpoint.

- b. Unoccupied Mode
    - (1) AHU shall be off unless required for:
      - (a) Night setback or setup
      - (b) Freeze protection
      - (c) IAQ purge (if enabled)
  - c. Warm-Up / Cool-Down
    - (1) BAS may initiate adaptive early start to achieve occupied conditions.
    - (2) OA airflow shall be reduced to minimum required for equipment protection unless IAQ purge is enabled.
3. SUPPLY FAN & AIRFLOW CONTROL
- a. Supply Fan Control
    - (1) Supply fan shall be controlled by VFD.
    - (2) Fan speed shall modulate to maintain SA CFM setpoint.
    - (3) SA CFM setpoint shall be adjustable and may be reset based on occupancy or system demand.
  - b. Outside Airflow Control
    - (1) OA damper shall modulate to maintain the required OA CFM as measured by the airflow station.
    - (2) Minimum OA airflow shall comply with ASHRAE 62.1. (15%)
    - (3) Maximum OA airflow shall be limited to prevent coil freezing and excessive load.
  - c. Return Air Control
    - (1) Return air damper shall operate in a complementary manner to the OA damper to maintain proper mixing and building pressure.
4. TEMPERATURE, HUMIDITY & CO<sub>2</sub> CONTROL
- a. Space temperature shall be controlled via modulating CHW and HW valves.
  - b. Discharge air temperature limits shall be enforced to protect equipment.
  - c. Space humidity shall be monitored; cooling coil bias and reheat shall be used as required.
    - (1) Dehumidification Mode shall enable when:
      - (a) Unit is in Occupied Mode, and
      - (b) Space humidity  $\geq$  (55% RH + 3%) for 5 minutes, and
      - (c) Cooling is available
    - (2) Dehumidification Mode shall disable when:
      - (a) Space humidity  $\leq$  (55% + 1%) for 10 minutes, OR
      - (b) Unit leaves Occupied Mode
    - (3) When Dehumidification Mode is active:
      - (a) Reset the discharge air temperature setpoint down toward 50°F minimum discharge air temperature.
      - (b) The chilled water valve shall modulate to maintain the current discharge air temperature setpoint.



- (c) Enable reheat using the hot water coil to prevent overcooling.
  - (4) During dehumidification mode if the mixed air temperature < 45°F, reduce OA toward minimum and reduce cooling demand.
- d. Space CO<sub>2</sub> shall reset OA airflow setpoint:
  - (1) Default CO<sub>2</sub> setpoint: 1000 ppm (adjustable)
  - (2) CO<sub>2</sub> demand control ventilation shall be enabled at: 900 ppm (adjustable)
  - (3) On a rise in CO<sub>2</sub> above 1000 ppm (adjustable) the OA damper shall be modulated open to its maximum position until dropping below the CO<sub>2</sub> setpoint
  - (4) The limits shall be as follows:
    - (a) if OAT < 20°F, limit OA damper to its minimal position.
    - (b) if space RH is above high limit (55% RH, adjustable), prevent OA damper to its minimal position.
- 5. FREEZESTAT PROTECTION
  - a. Freezestat Input
    - (1) Each AHU shall be provided with a manual-reset freezestat located downstream of the cooling coil.
    - (2) Freezestat shall be wired as a hardwired safety input to the BAS.
  - b. Freezestat Sequence
    - (1) Upon freezestat trip:
      - (a) Supply fan shall immediately stop
      - (b) Outside air damper shall close
      - (c) Hot water valve shall drive open 100%
      - (d) Chilled water valve shall close
      - (e) Unit shall be locked out
      - (f) Critical alarm shall annunciate at BAS
  - c. Reset
    - (1) Unit shall not restart until:
      - (a) Freezestat is manually reset at the device
      - (b) Alarm is acknowledged at the BAS
- 6. FILTER MONITORING
  - a. Each AHU shall include filter differential pressure monitoring.
  - b. Dirty filter alarm shall be generated at an adjustable DP setpoint.
  - c. Unit shall continue to operate.
- 7. CONDENSATE PAN MONITORING (CHW COIL)
  - a. Each AHU shall include a condensate pan high-level float switch.
  - b. Upon condensate alarm:
    - (1) Chilled water valve shall close
    - (2) Cooling shall be locked out

- (3) Critical alarm shall annunciate
  - c. Manual acknowledgement and reset required.
- 8. SAFETIES & ALARMS
  - a. The BAS shall monitor and alarm the following:
    - (1) Supply fan proof
    - (2) VFD fault
    - (3) Freezestat trip
    - (4) Dirty filter
    - (5) Condensate pan high level
    - (6) Smoke detector
    - (7) Loss of supply airflow
    - (8) Loss of outside airflow
    - (9) BAS communication failure
  - b. Critical alarms shall lock out cooling and/or unit operation and require manual reset.
- 9. TRENDING
  - a. The BAS shall trend the following:
    - (1) Supply airflow (CFM)
    - (2) Outside airflow (CFM)
    - (3) Fan status
    - (4) Fan speed
    - (5) Space temperature, humidity, CO<sub>2</sub>
    - (6) Supply air temperature
    - (7) Return air temperature
    - (8) Return air humidity
    - (9) Return air CO<sub>2</sub>
    - (10) Mixed air temperature
    - (11) Outside air temperature
    - (12) CHW and HW valve positions
    - (13) Filter DP
    - (14) Freezestat and condensate alarm status
- 10. FAILURE MODES
  - a. Upon BAS communication failure, AHU shall revert to last safe operating condition.
  - b. Upon power restoration, AHU shall resume operation only after all safeties are satisfied.
- F. BAS POINT LIST (TYPICAL PER AHU)
  - 1. ANALOG INPUTS (AI)
    - a. Space Temperature (°F)
    - b. Space Relative Humidity (%)

- c. Space CO<sub>2</sub> (ppm)
- d. Discharge Air Temperature (°F)
- e. Mixed Air Temperature (°F)
- f. Outside Air Temperature (°F)
- g. Supply Airflow (CFM)
- h. Outside Airflow (CFM)
- i. Filter Differential Pressure (in.w.c.)
- 2. ANALOG OUTPUTS (AO)
  - a. Supply Fan VFD Speed Command (%)
  - b. Chilled Water Valve Command (%)
  - c. Hot Water Valve Command (%)
  - d. Outside Air Damper Command (%)
  - e. Return Air Damper Command (%)
  - f. Supply Airflow Setpoint (CFM)
  - g. Outside Airflow Setpoint (CFM)
- 3. BINARY INPUTS (BI)
  - a. Supply Fan Proof
  - b. VFD Fault
  - c. Freezestat (Manual Reset)
  - d. Smoke Detector
  - e. Condensate Pan High-Level Alarm
- 4. BINARY OUTPUTS (BO)
  - a. Supply Fan Start
  - b. AHU Enable
  - c. VFD Reset
- 5. STATUS / SOFTWARE POINTS
  - a. AHU Mode (Off / Occupied / Unoccupied / Alarm)
  - b. Filter Status (Normal / Dirty)
  - c. Alarm Summary
  - d. Fan Runtime & Starts
  - e. BAS Communication Status
- 6. ADJUSTABLE SETPOINTS
  - a. Space Temperature Setpoint
  - b. Humidity High Limit
  - c. CO<sub>2</sub> Setpoint
  - d. Supply Airflow Setpoint
  - e. Outside Airflow Setpoint

- f. Minimum OA Airflow
  - g. Filter DP Alarm Setpoint
- G. UNIT VENTILATORS UV-2 to 34

1. GENERAL

- a. Each unit ventilator shall be provided with field-installed BAS controls by the BAS Contractor, including supply fan control, chilled water and hot water coil valves, discharge air temperature sensing, zone temperature/humidity/CO<sub>2</sub> sensing, condensate pan monitoring, freezestat protection, and control of a manufacturer-furnished outside air damper via a field-installed BAS actuator.
- b. Controls shall be provided using Johnson Controls FX controllers integrated into the Niagara Tridium front end. All wiring, programming, graphics, commissioning, and documentation shall be by the BAS Contractor.
- c. Each unit shall be capable of safe standalone operation upon loss of BAS communication.

2. MODES OF OPERATION

- a. Occupied Mode
  - (1) Unit ventilator shall operate per BAS schedule.
  - (2) Supply fan shall operate when the unit is enabled.
  - (3) Outside air damper shall modulate to maintain minimum ventilation and satisfy CO<sub>2</sub>-based demand control ventilation.
  - (4) CHW and HW coils shall modulate to maintain Zone Temperature Setpoint.
  - (5) Zone humidity shall be monitored and used to bias cooling operation as required.
- b. Unoccupied Mode
  - (1) Unit ventilator shall be off unless required for:
    - (a) Night setback/setup
    - (b) Freeze protection
    - (c) Manual override
  - (2) Outside air damper shall be driven fully closed.
- c. Warm-Up / Cool-Down
  - (1) During warm-up, outside air damper shall remain closed or at minimum.
  - (2) During cool-down, outside air damper shall remain at minimum unless purge mode is enabled.

3. SUPPLY FAN CONTROL

- a. Supply fan shall start when the unit is enabled and all safeties are satisfied.
- b. Fan shall stop upon unit disable or critical safety condition.
- c. Fan run status shall be monitored by the BAS.

4. OUTSIDE AIR DAMPER & IAQ CONTROL

- a. Outside air damper shall be modulated by a field-installed BAS actuator.
- b. Minimum OA position shall be adjustable.
- c. Zone CO<sub>2</sub> concentration shall reset the OA damper position.
  - (1) Default CO<sub>2</sub> setpoint: 1000 ppm (adjustable)

- d. OA damper shall:
    - (1) Modulate during occupied mode
    - (2) Close during unoccupied mode
    - (3) Close upon freeze or condensate alarm
  - e. Damper shall fail closed upon loss of power.
5. ZONE TEMPERATURE & HUMIDITY CONTROL
- a. Zone temperature shall be controlled using a wall-mounted temperature/humidity/CO<sub>2</sub> sensor.
  - b. BAS shall modulate:
    - (1) CHW valve for cooling
    - (2) HW valve for heating
  - c. Heating and cooling shall be interlocked with an adjustable deadband.
  - d. Zone humidity shall be monitored; high humidity shall bias cooling operation and generate an alarm.
6. DISCHARGE AIR TEMPERATURE (DAT) MONITORING
- a. DAT shall be continuously monitored.
  - b. BAS shall enforce:
    - (1) Minimum DAT during heating
    - (2) Maximum DAT during cooling
  - c. DAT out of range shall generate an alarm.
7. CONDENSATE PAN MONITORING (CHW COIL)
- a. Each unit ventilator shall include a condensate pan high-level float switch.
  - b. Upon condensate alarm:
    - (1) CHW valve shall close
    - (2) Cooling shall be locked out
    - (3) Outside air damper shall close
    - (4) Critical alarm shall annunciate
  - c. Manual acknowledgement and reset shall be required.
8. FREEZESTAT PROTECTION
- a. Each unit ventilator shall include a manual-reset freezestat located downstream of the cooling coil.
  - b. Upon freezestat trip:
    - (1) Supply fan shall stop immediately
    - (2) Outside air damper shall close
    - (3) Hot water valve shall open 100%
    - (4) Chilled water valve shall close
    - (5) Unit shall be locked out
    - (6) Critical alarm shall annunciate at BAS

- c. Unit shall not restart until:
    - (1) Freezestat is manually reset
    - (2) Alarm is acknowledged at the BAS
- 9. SAFETIES & ALARMS
  - a. The BAS shall monitor and alarm:
    - (1) Supply fan failure
    - (2) High/low zone temperature
    - (3) High zone humidity
    - (4) High zone CO<sub>2</sub>
    - (5) DAT out of range
    - (6) Condensate pan high level
    - (7) Freezestat trip
    - (8) BAS communication failure
  - b. Critical alarms shall disable cooling and/or unit operation and require manual reset.
- 10. TRENDING
  - a. The BAS shall trend:
    - (1) Zone temperature, humidity, CO<sub>2</sub>
    - (2) Discharge air temperature
    - (3) CHW and HW valve positions
    - (4) Outside air damper position
    - (5) Fan status
    - (6) Freeze and condensate alarms
- 11. FAILURE MODES
  - a. Upon BAS communication failure, unit shall revert to last safe operating condition.
  - b. Upon power restoration, unit shall resume operation only after all safeties are satisfied.
- H. BUILDING AUTOMATION SYSTEM POINT LIST
  - 1. ANALOG INPUTS (AI)
    - a. Zone Temperature (°F)
    - b. Zone Relative Humidity (%)
    - c. Zone CO<sub>2</sub> (ppm)
    - d. Discharge Air Temperature (°F)
  - 2. ANALOG OUTPUTS (AO)
    - a. Chilled Water Valve Command (%)
    - b. Hot Water Valve Command (%)
    - c. Outside Air Damper Command (%)
  - 3. BINARY INPUTS (BI)
    - a. Supply Fan Status

- b. Condensate Pan High-Level Alarm
    - c. Freezestat (Manual Reset)
  - 4. BINARY OUTPUTS (BO)
    - a. Supply Fan Start
    - b. Unit Enable
  - 5. STATUS / SOFTWARE POINTS
    - a. Unit Mode (Off / Occupied / Unoccupied / Alarm)
    - b. Alarm Summary
    - c. BAS Communication Status
  - 6. ADJUSTABLE SETPOINTS
    - a. Zone Temperature Setpoint
    - b. Heating/Cooling Deadband
    - c. Zone Humidity High Limit
    - d. CO<sub>2</sub> Setpoint
    - e. Minimum Outside Air Damper Position
    - f. DAT High / Low Limits
- I. FAN COIL UNITS FCU-101 to M201
  - 1. GENERAL
    - a. Each fan coil unit shall be provided with field-installed BAS controls by the BAS Contractor, including supply fan control, chilled water and hot water coil valves, discharge air temperature sensing, zone temperature/humidity/CO<sub>2</sub> sensing, and condensate pan monitoring.
    - b. Controls shall be provided using Johnson Controls FX controllers integrated into the Niagara Tridium front end. All wiring, programming, graphics, commissioning, and documentation shall be by the BAS Contractor.
    - c. Each unit shall be capable of safe standalone operation upon loss of BAS communication.
  - 2. MODES OF OPERATION
    - a. Occupied Mode
      - (1) Fan coil shall operate per BAS schedule.
      - (2) Supply fan shall operate when the unit is enabled.
      - (3) CHW and HW coils shall modulate to maintain Zone Temperature Setpoint.
    - b. Unoccupied Mode
      - (1) Fan coil shall be off unless required for:
        - (a) Night setback/setup
        - (b) Manual override
  - 3. SUPPLY FAN CONTROL
    - a. Supply fan shall start when the unit is enabled and all safeties are satisfied.
    - b. Fan shall stop upon unit disable or critical safety condition.
    - c. Fan run status shall be monitored by the BAS.

4. ZONE TEMPERATURE & HUMIDITY CONTROL
  - a. Zone temperature shall be controlled using a wall-mounted temperature sensor.
  - b. BAS shall modulate:
    - (1) CHW valve for cooling
    - (2) HW valve for heating
  - c. Heating and cooling shall be interlocked with an adjustable deadband.
5. DISCHARGE AIR TEMPERATURE (DAT) MONITORING
  - a. DAT shall be continuously monitored.
  - b. BAS shall enforce:
    - (1) Minimum DAT during heating
    - (2) Maximum DAT during cooling
  - c. DAT out of range shall generate an alarm.
6. CONDENSATE PAN MONITORING (CHW COIL)
  - a. Each unit ventilator shall include a condensate pan high-level float switch.
  - b. Upon condensate alarm:
    - (1) CHW valve shall close
    - (2) Cooling shall be locked out
    - (3) Critical alarm shall annunciate
  - c. Manual acknowledgement and reset shall be required.
7. SAFETIES & ALARMS
  - a. The BAS shall monitor and alarm:
    - (1) Supply fan failure
    - (2) High/low zone temperature
    - (3) DAT out of range
    - (4) Condensate pan high level
    - (5) BAS communication failure
  - b. Critical alarms shall disable cooling and/or unit operation and require manual reset.
8. TRENDING
  - a. The BAS shall trend:
    - (1) Zone temperature
    - (2) Discharge air temperature
    - (3) CHW and HW valve positions
    - (4) Fan status
9. FAILURE MODES
  - a. Upon BAS communication failure, unit shall revert to last safe operating condition.
  - b. Upon power restoration, unit shall resume operation only after all safeties are satisfied.
- J. BUILDING AUTOMATION SYSTEM POINT LIST



1. ANALOG INPUTS (AI)
    - a. Zone Temperature (°F)
    - b. Discharge Air Temperature (°F)
  2. ANALOG OUTPUTS (AO)
    - a. Chilled Water Valve Command (%)
    - b. Hot Water Valve Command (%)
  3. BINARY INPUTS (BI)
    - a. Supply Fan Status
    - b. Condensate Pan High-Level Alarm
  4. BINARY OUTPUTS (BO)
    - a. Supply Fan Start
    - b. Unit Enable
  5. STATUS / SOFTWARE POINTS
    - a. Unit Mode (Off / Occupied / Unoccupied / Alarm)
    - b. Alarm Summary
    - c. BAS Communication Status
  6. ADJUSTABLE SETPOINTS
    - a. Zone Temperature Setpoint
    - b. Heating/Cooling Deadband
    - c. DAT High / Low Limits
- K. EXHAUST FANS EF-1 through EF-59
1. GENERAL
    - a. Exhaust fans EF-1 through EF-59 shall be provided with field-installed DDC controls by the BAS Contractor. Each exhaust fan shall operate based on a time-of-day schedule provided by the BAS and shall be monitored for proper operation.
    - b. Controls shall be provided using Johnson Controls FX controllers integrated into the Niagara Tridium front end. The BAS Contractor shall provide all wiring, control devices, programming, graphics, commissioning, and documentation.
    - c. Each exhaust fan shall be capable of safe standalone operation upon loss of BAS communication.
  2. MODES OF OPERATION
    - a. Scheduled (Occupied) Mode
      - (1) Each exhaust fan shall operate according to its assigned BAS time-of-day schedule.
      - (2) When scheduled ON, the BAS shall issue a fan start command.
      - (3) Fan shall operate continuously during the scheduled period unless a fault occurs.
    - b. Unscheduled (Unoccupied) Mode
      - (1) When outside the scheduled period, the exhaust fan shall be OFF.
      - (2) Fan may be manually overridden by BAS operator if required.
    - c. Manual Override

- (1) BAS operators shall be able to manually start or stop each exhaust fan.
  - (2) Manual overrides shall be logged and time-limited unless locked by operator.
- 3. FAN START / STOP CONTROL
  - a. Fan shall start upon receipt of BAS start command and when all safeties are satisfied.
  - b. Fan shall stop upon BAS stop command or upon critical fault.
  - c. BAS shall monitor fan run status via proof-of-operation input.
- 4. SAFETIES & INTERLOCKS
  - a. BAS shall monitor fan status and alarm upon failure to start or loss of proof.
  - b. If a fan fails to start when commanded ON, a fan failure alarm shall be generated.
  - c. If applicable, fan shall interlock with associated equipment per mechanical drawings.
- 5. ALARMS & NOTIFICATION
  - a. The BAS shall generate alarms for:
    - (1) Fan failure (commanded ON but no proof)
    - (2) Loss of communication
  - b. Alarms shall be displayed at the BAS front end and require acknowledgement.
- 6. TRENDING
  - a. The BAS shall trend the following:
    - (1) Fan command (ON/OFF)
    - (2) Fan run status
    - (3) Alarm status
- 7. FAILURE MODES
  - a. BAS Communication Failure
    - (1) Fan shall revert to last commanded safe state.
    - (2) BAS shall generate a communication failure alarm upon restoration.
  - b. Power Failure
    - (1) Upon power restoration, fan shall resume operation based on current BAS schedule.
- L. BUILDING AUTOMATION SYSTEM POINT LIST
  - 1. BINARY INPUTS (BI)
    - a. Fan Run Status (Proof)
  - 2. BINARY OUTPUTS (BO)
    - a. Fan Start / Stop Command
  - 3. STATUS / SOFTWARE POINTS
    - a. Fan Mode (Off / Scheduled / Manual)
    - b. Fan Schedule Enable
    - c. Alarm Summary
    - d. BAS Communication Status
  - 4. ADJUSTABLE SETPOINTS

- a. Time-of-Day Schedule
- b. Manual Override Duration
- 5. GRAPHICS REQUIREMENTS
  - a. Provide BAS graphics showing:
    - (1) Fan status (ON/OFF)
    - (2) Schedule status
    - (3) Alarm indication
    - (4) Manual override control
- M. HEAT PUMP – DUCTLESS SPLIT SYSTEMS AC/ACC-1 through AC/ACC-5
  - 1. GENERAL DESCRIPTION
    - a. Each ductless split heat pump system shall consist of an indoor unit (AC-x) and a matched outdoor condensing unit (ACC-x). Systems shall be provided with a manufacturer-supplied native BACnet interface allowing monitoring and control by the BAS.
    - b. Primary unit safety, compressor staging, defrost, and inverter control shall remain under manufacturer control. The BAS shall provide supervisory control, scheduling, setpoint adjustment, monitoring, alarming, trending, and operator interface.
    - c. Each system shall be capable of safe standalone operation in the event of BAS communication failure.
  - 2. MODES OF OPERATION
    - a. Occupied Mode
      - (1) System shall operate 24/7.
      - (2) Indoor unit shall maintain Zone Temperature Setpoint.
      - (3) System shall automatically select heating or cooling mode based on zone temperature demand.
  - 3. SYSTEM ENABLE / DISABLE
    - a. The BAS shall enable the system when:
      - (1) BAS schedule is occupied or override is active
      - (2) No active critical unit alarms
    - b. The system shall be disabled when:
      - (1) Critical manufacturer safety alarm occurs
  - 4. ZONE TEMPERATURE CONTROL
    - a. Zone temperature shall be measured by the indoor unit sensor or BAS-provided wall sensor as supported by the manufacturer BACnet interface.
    - b. BAS shall provide adjustable heating and cooling setpoints.
    - c. A deadband shall be enforced to prevent rapid mode switching.
    - d. Capacity modulation shall be handled internally by the heat pump inverter controls.
  - 5. HEATING OPERATION
    - a. When zone temperature falls below heating setpoint:
    - b. System shall operate in heat pump heating mode

- c. Indoor fan shall operate per manufacturer logic
  - d. Heating shall be locked out above adjustable outdoor temperature (if supported).
- 6. COOLING OPERATION
  - a. When zone temperature rises above cooling setpoint:
    - (1) System shall operate in cooling mode
    - (2) Indoor fan shall operate per manufacturer logic
- 7. FAN OPERATION
  - a. Indoor fan shall operate in Auto mode by default.
  - b. BAS may command fan modes (Auto / Low / Medium / High) if supported.
  - c. Fan shall stop when system is disabled.
- 8. DEFROST OPERATION
  - a. Defrost shall be fully controlled by the manufacturer controller.
  - b. BAS shall monitor defrost status and alarm if abnormal duration occurs (if available).
- 9. SAFETIES & ALARMS
  - a. The BAS shall monitor and annunciate alarms including:
    - (1) Unit fault / lockout
    - (2) Compressor fault
    - (3) High or low refrigerant pressure
    - (4) Indoor unit fault
    - (5) Outdoor unit fault
    - (6) Communication failure
  - b. Critical alarms shall:
    - (1) Disable unit operation
    - (2) Require manual acknowledgement
    - (3) Be logged with time and description
- 10. TRENDING
  - a. The BAS shall trend the following:
    - (1) Zone temperature
    - (2) Active mode (heat / cool / off)
    - (3) Unit enable status
    - (4) Indoor fan status
    - (5) Alarm status
- 11. FAILURE MODES
  - a. BAS Communication Failure
    - (1) System shall continue autonomous operation using last valid settings.
    - (2) BAS shall generate communication failure alarm upon loss and restoration.
  - b. Power Failure

- (1) Upon power restoration, system shall resume operation based on BAS schedule and last commanded state.

N. BUILDING AUTOMATION SYSTEM POINT LIST

(Manufacturer Native BACnet Interface)

1. ANALOG INPUTS (AI)

| Point Name       | Description        | Units |
|------------------|--------------------|-------|
| Zone Temp        | Zone Temperature   | °F    |
| Unit Capacity    | Operating Capacity | %     |
| Compressor Speed | Compressor Speed   | %     |

2. ANALOG OUTPUTS (AO)

(Writable only if supported by manufacturer BACnet interface)

| Point Name            | Description      | Units |
|-----------------------|------------------|-------|
| Cooling Setpoint Zone | Cooling Setpoint | °F    |
| Heating Setpoint Zone | Heating Setpoint | °F    |

3. BINARY INPUTS (BI)

| Point Name      | Description    |
|-----------------|----------------|
| Unit Run Status | Unit Operating |
| Alarm Status    | General Fault  |
| Defrost Status  | Defrost Active |

4. BINARY OUTPUTS (BO)

| Point Name  | Description                |
|-------------|----------------------------|
| Unit Enable | System Enable Command      |
| Alarm Reset | Alarm Reset (if supported) |

5. MULTI-STATE / STATUS POINTS

| Point Name     | Description                       |
|----------------|-----------------------------------|
| Operating Mode | Off / Cooling / Heating / Defrost |
| Fan Mode       | Auto / Low / Med / High           |

|             |                         |
|-------------|-------------------------|
| Point Name  | Description             |
| Comm Status | Normal / Failed         |
| Alarm Code  | Manufacturer Alarm Code |

6. CALCULATED / SOFTWARE POINTS

|               |                           |
|---------------|---------------------------|
| Point Name    | Description               |
| Runtime       | Accumulated Runtime Hours |
| Starts        | Compressor Start Count    |
| Alarm Summary | Aggregated Alarm Status   |

7. ADJUSTABLE SETPOINTS

- a. Heating Setpoint
- b. Cooling Setpoint
- c. Heating/Cooling Deadband
- d. Unoccupied Setback / Setup
- e. Alarm Enable / Disable

8. GRAPHICS REQUIREMENTS

- a. Provide BAS graphics including:
  - (1) Unit enable/disable
  - (2) Zone temperature and setpoints
  - (3) Operating mode indication
  - (4) Alarm summary
  - (5) Trend access

O. HOT WATER CABINET UNIT HEATERS & UNIT HEATER CUH-1 through CUH-21, UH-1

1. GENERAL

- a. Each cabinet unit heater and unit heater shall be provided with field-installed DDC controls by the BAS Contractor. Controls shall include supply fan operation, hot water heating coil modulation, space temperature sensing, scheduling, alarming, and integration into the Niagara Tridium front end using Johnson Controls FX controllers.
- b. All wiring, sensors, control valves, actuators, programming, graphics, commissioning, and documentation shall be furnished by the BAS Contractor.
- c. Each unit shall be capable of safe standalone operation upon loss of BAS communication.

2. MODES OF OPERATION

- a. Occupied Mode
  - (1) Unit shall operate per BAS time-of-day schedule.
  - (2) Supply fan shall run when heating is required.

- (3) Hot water valve shall modulate to maintain Space Temperature Setpoint.
    - (4) Fan shall cycle or run continuously as required to maintain comfort.
  - b. Unoccupied Mode
    - (1) Unit shall be off unless required for:
      - (a) Night setback heating
      - (b) Freeze protection
      - (c) Manual override
    - (2) Space temperature setpoint shall reset to unoccupied heating setback.
  - c. Warm-Up Mode
    - (1) BAS may initiate early start to bring space to occupied heating setpoint prior to scheduled occupancy.
3. MODES OF OPERATION
- a. Supply fan shall be enabled when heating demand is present or when unit is commanded ON.
  - b. Fan shall stop when space temperature is satisfied or unit is disabled.
  - c. Fan run status shall be monitored by the BAS.
4. SPACE TEMPERATURE CONTROL
- a. Space temperature shall be measured using a BAS-provided wall-mounted temperature sensor.
  - b. When space temperature falls below heating setpoint:
    - (1) Supply fan shall start
    - (2) Hot water valve shall modulate open
  - c. When space temperature rises above heating setpoint plus deadband:
    - (1) Hot water valve shall close
    - (2) Fan shall stop (or continue to run if configured)
5. HOT WATER COIL CONTROL
- a. Hot water valve shall be modulating (0–100%).
  - b. Valve shall be normally closed and fail closed upon loss of power.
6. FREEZE PROTECTION
- a. Freeze protection shall be provided via minimum space temperature limit
  - b. Upon freeze condition:
    - (1) Hot water valve shall open 100%
    - (2) Fan shall run continuously
    - (3) Alarm shall annunciate at BAS
7. SAFETIES & ALARMS
- a. The BAS shall monitor and alarm the following:
    - (1) Supply fan failure
    - (2) Low space temperature (freeze alarm)

- (3) High space temperature
    - (4) BAS communication failure
  - b. Critical alarms shall require operator acknowledgement.
- 8. TRENDING
  - a. The BAS shall trend:
    - (1) Space temperature
    - (2) Heating valve position
    - (3) Fan status
    - (4) Alarm status
- 9. FAILURE MODES
  - a. BAS Communication Failure
    - (1) Unit shall revert to last safe operating condition.
    - (2) BAS shall generate communication failure alarm upon restoration.
  - b. Power Failure
    - (1) Upon power restoration, unit shall resume operation per BAS schedule after safety checks.
- P. BUILDING AUTOMATION SYSTEM POINT LIST
  - 1. ANALOG INPUTS (AI)
    - a. Space Temperature (°F)
  - 2. ANALOG OUTPUTS (AO)
    - a. Hot Water Valve Command (%)
  - 3. BINARY INPUTS (BI)
    - a. Supply Fan Status (Proof)
  - 4. BINARY OUTPUTS (BO)
    - a. Supply Fan Start / Stop
    - b. Unit Enable
  - 5. STATUS / SOFTWARE POINTS
    - a. Unit Mode (Off / Occupied / Unoccupied / Alarm)
    - b. Alarm Summary
    - c. BAS Communication Status
  - 6. ADJUSTABLE SETPOINTS
    - a. Space Temperature Setpoint
    - b. Heating Deadband
    - c. Unoccupied Heating Setback
    - d. Low Space Temperature Alarm
  - 7. GRAPHICS REQUIREMENTS
    - a. Provide BAS graphics indicating:



- (1) Space temperature and setpoint
- (2) Fan status
- (3) Heating valve position
- (4) Alarm indication

Q. ELECTRIC RADIANT CEILING PANELS & ELECTRIC BASEBOARD HEATERS RCP-1 & and EBB-1 & 2

1. GENERAL

- a. Each electric radiant ceiling panel and electric baseboard heater shall be provided with field-installed DDC controls by the BAS Contractor. Controls shall include space temperature sensing, electric heat enable/staging (or modulation where supported), optional supply fan control (if provided), scheduling, alarming, trending, and integration into the Niagara Tridium front end using Johnson Controls FX controllers.
- b. The BAS Contractor shall furnish and install all required relays/contactors, control wiring, sensors, programming, graphics, commissioning, and documentation. All line-voltage power wiring shall be by Division 26; control interposing relays/contactors shall be provided as required for BAS interface.
- c. Each device shall be capable of safe standalone operation upon loss of BAS communication.

2. MODES OF OPERATION

- a. Occupied Mode
  - (1) Devices shall operate per BAS time-of-day schedule.
  - (2) Electric heating shall operate to maintain Space Temperature Setpoint.
  - (3) If a supply fan is provided, fan shall operate when heating is enabled or as configured for air circulation.
- b. Unoccupied Mode
  - (1) Devices shall be off unless required for:
    - (a) Night setback heating
    - (b) Freeze protection
    - (c) Manual override
  - (2) Space temperature setpoint shall reset to Unoccupied Heating Setback.
- c. Warm-Up (Early Start)
  - (1) BAS may initiate early start to achieve occupied setpoint prior to scheduled occupancy.

3. SPACE TEMPERATURE CONTROL

- a. Space temperature shall be measured by a BAS-provided wall sensor.
- b. When space temperature falls below heating setpoint minus deadband:
  - (1) Electric heat shall energize per staging/modulation logic.
  - (2) Supply fan (if provided) shall start.
- c. When space temperature rises above heating setpoint plus deadband:
  - (1) Electric heat shall de-energize.
  - (2) Supply fan shall stop (unless configured to run continuously).

4. ELECTRIC HEAT CONTROL

a. Control Method

- (1) On/Off or Staged Control: Electric heat shall be enabled via BAS-controlled relays/contactors in one or more stages as provided.
- (2) Modulating Control (if supported): Electric heat output shall modulate to maintain space temperature.

b. Staging Logic (Typical)

- (1) Stage 1 enabled at small deviation from setpoint.
- (2) Additional stages enabled as deviation increases.
- (3) Stages shall shed in reverse order as temperature is satisfied.

c. Safeties

- (1) Electric heat shall be disabled upon:
  - (a) High-temperature safety trip (if provided)
  - (b) Critical fault
  - (c) Manual BAS disable

5. SUPPLY FAN CONTROL (IF PROVIDED)

- a. Supply fan shall start when electric heat is enabled or when unit is commanded ON.
- b. Fan shall stop when heating demand is satisfied or upon unit disable.
- c. Fan run status shall be monitored where proof is available.

6. FREEZE / LOW-TEMPERATURE PROTECTION

- a. BAS shall monitor Low Space Temperature.
- b. Upon low-temperature alarm:
  - (1) Electric heat shall be enabled
  - (2) Alarm shall annunciate at BAS
- c. Alarm shall require acknowledgement.

7. SAFETIES & ALARMS

- a. The BAS shall monitor and alarm:
  - (1) High/low space temperature
  - (2) Supply fan failure (if provided)
  - (3) BAS communication failure
- b. Critical alarms shall disable electric heat and require manual acknowledgement.

8. TRENDING

- a. The BAS shall trend:
  - (1) Space temperature
  - (2) Heating enable/stage status or output %
  - (3) Fan status (if provided)
  - (4) Alarm status

9. FAILURE MODES

- a. BAS Communication Failure
  - (1) Device shall revert to last safe operating state.
  - (2) BAS shall alarm communication failure upon restoration.
- b. Power Failure
  - (1) Upon power restoration, device shall resume operation per BAS schedule and safeties.
- R. BUILDING AUTOMATION SYSTEM POINT LIST
  - 1. ANALOG INPUTS (AI)
    - a. Space Temperature (°F)
  - 2. ANALOG OUTPUTS (AO)
    - a. Electric Heat Output (%) (only if modulating heat is provided)
  - 3. BINARY INPUTS (BI)
    - a. Supply Fan Status (if provided)
  - 4. BINARY OUTPUTS (BO)
    - a. Electric Heat Enable (Stage 1)
    - b. Electric Heat Enable (Stage 2...N, if staged)
    - c. Supply Fan Start / Stop (if provided)
    - d. Unit Enable
  - 5. STATUS / SOFTWARE POINTS
    - a. Unit Mode (Off / Occupied / Unoccupied / Alarm)
    - b. Heating Stage Status (Stage 1...N) or Heat Output %
    - c. Alarm Summary
    - d. BAS Communication Status
  - 6. ADJUSTABLE SETPOINTS
    - a. Space Temperature Setpoint
    - b. Heating Deadband
    - c. Unoccupied Heating Setback
    - d. Low Space Temperature Alarm
    - e. Stage Enable Thresholds (if staged)
  - 7. GRAPHICS REQUIREMENTS
    - a. Provide BAS graphics indicating:
      - (1) Space temperature and setpoint
      - (2) Heating status (stages or %)
      - (3) Fan status (if applicable)
      - (4) Alarm indication and acknowledgement
- S. FINNED TUBE RADIATORS (FTR-1 through FTR-x)
  - 1. GENERAL

- a. Each finned tube radiator shall be provided with field-installed DDC controls by the BAS Contractor. Controls shall include a two-way modulating hot water control valve, wall-mounted zone temperature sensor, scheduling, alarming, trending, and integration into the Niagara Tridium front end using Johnson Controls FX controllers.
- b. The BAS Contractor shall furnish and install all required control valves, valve actuators, temperature sensors, wiring, programming, graphics, commissioning, and documentation.
- c. Each finned tube radiator shall be capable of safe standalone operation upon loss of BAS communication.

## 2. MODES OF OPERATION

- a. Occupied Mode
  - (1) Finned tube radiators shall operate per BAS time-of-day schedule.
  - (2) The hot water control valve shall modulate to maintain the Zone Temperature Setpoint.
  - (3) The zone shall maintain occupied heating setpoint.
- b. Unoccupied Mode
  - (1) During unoccupied periods, the occupied heating setpoint shall be reset to the Unoccupied Heating Setback setpoint.
  - (2) The hot water control valve shall modulate as required to maintain the setback temperature.
  - (3) The valve shall remain closed when no heating demand exists.
- c. Warm-Up (Early Start)
  - (1) The BAS may initiate early start to bring the zone temperature to occupied setpoint prior to scheduled occupancy.
  - (2) During warm-up, the hot water valve shall modulate as required to satisfy the occupied heating setpoint.
- d. Manual Override
  - (1) BAS operators shall be able to manually command the radiator into Occupied mode.
  - (2) Manual overrides shall be logged and time-limited unless locked by the operator.

## 3. ZONE TEMPERATURE CONTROL

- a. Zone temperature shall be measured by a BAS-provided wall-mounted temperature sensor.
- b. The BAS shall compare the measured zone temperature to the active heating setpoint.
- c. When the zone temperature falls below the active heating setpoint, the hot water control valve shall modulate open.
- d. When the zone temperature rises to or above the active heating setpoint, the hot water control valve shall modulate closed.
- e. The control loop shall utilize proportional-integral (PI) control to maintain stable temperature control.
- f. A heating deadband shall be provided to minimize hunting and excessive valve movement.

## 4. HOT WATER VALVE CONTROL

- a. Control Method
  - (1) The hot water valve shall be a two-way modulating valve controlled by a 0–10 VDC or 4–20 mA analog output from the BAS.

- (2) Valve position shall modulate from 0% to 100% based on heating demand.
  - b. Fail Position
    - (1) The valve actuator shall fail to its normally closed position upon loss of power unless otherwise indicated on the mechanical drawings.
  - c. Minimum Position
    - (1) The valve shall remain fully closed when no heating demand exists.
    - (2) A minimum valve position may be configured if required to maintain minimum circulation.
5. FREEZE / LOW-TEMPERATURE PROTECTION
- a. The BAS shall continuously monitor zone temperature.
  - b. If the zone temperature falls below the Low Space Temperature Alarm setpoint (adjustable, default 45°F), a low-temperature alarm shall be generated.
  - c. If the zone temperature falls below the Freeze Protection Setpoint (adjustable, default 40°F):
    - (1) The hot water valve shall drive fully open (100%).
    - (2) Freeze protection mode shall remain active until the zone temperature rises above the Freeze Protection Setpoint plus 3°F.
    - (3) A critical freeze alarm shall be annunciated at the BAS.
6. SYSTEM ENABLE / DISABLE LOGIC
- a. Heating control shall be enabled when any of the following conditions are met:
    - (1) BAS schedule is in Occupied mode.
    - (2) Unoccupied heating setback demand exists.
    - (3) Warm-Up mode is active.
    - (4) Freeze protection mode is active.
    - (5) Manual override is active.
  - b. Heating control shall be disabled when:
    - (1) BAS schedule is Unoccupied and no setback demand exists.
    - (2) BAS operator disables the unit.
    - (3) A critical fault condition exists.
7. SAFETIES & ALARMS
- a. The BAS shall monitor and alarm the following conditions:
    - (1) Low Space Temperature.
    - (2) High Space Temperature.
    - (3) Zone Temperature Sensor Failure.
    - (4) Hot Water Valve Actuator Failure (if feedback is provided).
    - (5) BAS Communication Failure.
  - b. Upon temperature sensor failure:
    - (1) The hot water valve shall drive to a configurable fail-safe position (default 25% open).
    - (2) An alarm shall be generated.

- c. Critical alarms shall require operator acknowledgement.
- 8. TRENDING
  - a. The BAS shall trend the following points:
    - (1) Zone Temperature.
    - (2) Heating Setpoint.
    - (3) Hot Water Valve Command (%).
    - (4) Occupancy Mode.
    - (5) Alarm Status.
- 9. FAILURE MODES
  - a. BAS Communication Failure
    - (1) The local controller shall continue standalone control using the last valid setpoints and schedules.
    - (2) The BAS shall generate a communication failure alarm upon restoration.
  - b. Power Failure
    - (1) Upon restoration of power, the controller shall resume operation using the current schedule and all active safeties.
- T. BUILDING AUTOMATION SYSTEM POINT LIST
  - 1. ANALOG INPUTS (AI)
    - a. Zone Temperature (°F)
  - 2. ANALOG OUTPUTS (AO)
    - a. Hot Water Valve Command (%)
  - 3. BINARY INPUTS (BI)
    - a. None required unless valve end switch or actuator proof is provided.
  - 4. BINARY OUTPUTS (BO)
    - a. Unit Enable (Software Point)
  - 5. STATUS / SOFTWARE POINTS
    - a. Unit Mode (Off / Occupied / Unoccupied / Warm-Up / Freeze Protection / Alarm)
    - b. Alarm Summary
    - c. BAS Communication Status
  - 6. ADJUSTABLE SETPOINTS
    - a. Occupied Heating Setpoint
    - b. Unoccupied Heating Setback
    - c. Heating Deadband
    - d. Low Space Temperature Alarm Setpoint
    - e. Freeze Protection Setpoint
    - f. Sensor Failure Fail-Safe Valve Position
  - 7. GRAPHICS REQUIREMENTS
    - a. Provide BAS graphics indicating:

- (1) Zone Temperature and Active Setpoint
- (2) Hot Water Valve Position
- (3) Occupancy Mode
- (4) Freeze Protection Status
- (5) Alarm Indication and Acknowledgement
- (6) Trend Access

### **PART 3 – EXECUTION**

#### **3.1 INSTALLATION**

- A. All electrical wiring, components and accessories in connection with the Automatic Temperature Control System shall be furnished and installed by the control manufacturer.
  1. Electrical Contractor shall provide all wiring to duct smoke detectors.
  2. Unless stated otherwise in the design documents, the ATC Contractor is responsible for providing control power to all valves, actuators, devices and components within the DDC System.
- B. The ATC Contractor shall be responsible for providing the control interface between terminal unit condensate pumps and their respective units at the required voltage of these devices in order to shut down the terminal unit in the event of high water level in the condensate pump receiver.
- C. Control wiring shall include all wiring necessary to interface with new controls, such as relays and transducers, and shall also include electric and electronic devices such as freezestats, electronic sensors, relays, flow switches and controlled devices such as valve and damper operators, both electric/electronic actuated devices. Pilot devices such as ON/OFF switches and thermostats installed in series with line voltage circuits shall be considered to be control wiring.
- D. Install system and materials in accordance with manufacturer's instructions and roughing-in drawings, and details and drawings. Install electrical work and use electrical products complying with requirements of these specifications. Mount controllers at convenient locations and heights.
- E. All wiring shall be properly supported and run in a neat and workmanlike manner. All wiring exposed and in equipment rooms shall run parallel to or at right angles to the building structure. All wiring within enclosures shall be neatly bundled and anchored to prevent obstruction to devices and terminals. All wiring shall be in accordance with all local and national codes. Low voltage wiring for space temperature sensors, communication bus between terminal units, etc., above accessible ceilings in finished spaces on the floors may be plenum rated cable. Wiring in all other locations shall be installed in EMT conduit. All electronic wiring shall be #18 AWG minimum THHN and shielded if required, except standard network (Ethernet, BACnet MSTP, etc.) cabling shall be as tested and recommended in lieu of #18 gauge twisted, #22 or #24 gauge is acceptable if used as a part of an engineered structured cabling system. The control manufacturer must submit technical and application documentation demonstrating that this cabling system has been tested and approved for use by the manufacturer of both the control system and the engineered structured cabling system.
- F. Provide all sensing, control, and interlock wiring for the following:
  1. System inputs and outputs
  2. System communications
  3. System power
  4. System interlocks Unit controls
- G. The Control Manufacturer shall enter all computer data into the Host computer including all graphics, control programs, initial approved parameters and settings, and English descriptors. The Control Manufacturer shall maintain copies of all data file and application software for reload use

in the event of a system crash or memory failure. One copy shall be delivered to the owner during training sessions, and one copy shall be archived in the Control Manufacturer's local software vault.

- H. All line voltage wiring 120V and above required by the building automation system shall be provided by Division 26.

### **3.2 PROGRAMMING & GRAPHICS**

- A. Provide complete Niagara programming, sequences implementation, graphics, alarms, schedules, and trend logs. All points shall be named using standardized conventions.
- B. All hardware, custom software, application software, graphics, etc., necessary to accomplish the control sequences and display the graphics specified shall be provided as part of this contract. Provide all controllers, inputs, outputs, valves, dampers, actuators and flow meters required to provide the control and graphic data described. Provide software setpoints required for display in logical groups and graphics.
- C. Each digital output shall have a software-associated monitored input. Any time the monitored input does not track it's associated command output within a programmable time interval, a "command failed" alarm shall be reported.
- D. Where calculated points (such as CFM) are shown, they shall appear in their respective logical groups.
- E. Unless otherwise specified or approved prior to bidding, the primary analog input and the analog output of each DDC loop shall be resident in a single remote panel containing the DDC algorithm, and shall function independent of any primary or UC communication links. Secondary (reset type) analog inputs may be received from the primary network, but approved default values and/or procedures shall be substituted in the DDC algorithm for this secondary input if network communications fail or if the secondary input becomes erroneous or invalid.

### **3.3 TESTING & ACCEPTANCE**

- A. Perform complete point-to-point testing. Provide witnessed demonstrations of all control functions, alarms, trends, and graphics. Submit written acceptance documentation.

### **3.4 AS-BUILTS & O&M MANUALS**

- A. Provide complete electronic and hard-copy as-built drawings, final point lists, O&M manuals, and Niagara software backups. All project-specific software shall become property of the Owner.

### **3.5 TRAINING**

- A. Provide a minimum of eight (8) hours of owner training, including system navigation, scheduling, alarm management, trending, and basic troubleshooting.

### **3.6 WARRANTY & SERVICE GUARANTEE**

- A. The control system herein specified shall be free from defects in workmanship and material under normal use and service. After completion of the installation, the control manufacturer shall regulate and adjust all thermostats, control valves, motors and other equipment provided under this contract. If within twelve (12) months from date of acceptance either for beneficial use of final acceptance, whichever is earlier, any of the equipment herein described is proven to be defective in workmanship or materials, it will be replaced or repaired free of charge. The control manufacturer shall, after acceptance, provide any service incidental to the proper performance of the control system under guarantee outlined above for the period of one year. Normal maintenance of the system or adjustments of components is not to be considered part of the guarantee. The control manufacturer will upon completion of the installation, during the warranty period, make available to the Owner, an annual service agreement covering all labor and material required to efficiently maintain the control system.



**3.7 FINAL ADJUSTMENT**

- A. After completion of installation, adjust thermostats, control valves, motors and similar equipment provided as work of this section.
- B. Final adjustment shall be performed by specially trained personnel in direct employ of installer of primary temperature control system.

**END OF SECTION**

## **SECTION 23 0950**

### **TESTING AND BALANCING OF MECHANICAL SYSTEMS - HVAC**

#### **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.
- B. Report Forms:
  - 1. Submit specimen copies of report forms.
  - 2. Forms shall be 8-1/2 x 11 inch paper for loose-leaf binding, with blanks for listing of the required test ratings and for certification of report.

3. Reports shall be on standard forms published by AABC or NEBB.

## **PART 2 – PRODUCTS**

### **2.1 AIR BALANCE INSTRUMENTS**

- A. Alnor Velometer with probes and alnor pitot tube.
- B. Rotating Vane Anemometer: 4 inch size.
- C. ASHRAE Standard Pitot Tubes, stainless steel 5/16 inch outside diameter, lengths 18 inches and 36 inches.
- D. Magnehelic Differential Air Pressure Gauges, 0 to 0.5 inches, 0 to 1.0 inch and 0 to 5.0 inches water pressure ranges, each arranged as a portable unit for use with a standard Pitot tube.
- E. Combination Inclined-Vertical Portable Manometer, range 0 to 5.0 inches water.

### **2.2 WATER BALANCING INSTRUMENTS**

- A. 30 Inch Mercury U-Tube Manometer, 200 psig, with 3 valve bypass assembly and return wells or mercury check valves.
- B. Inspector's gauge testing set.
- C. Water Differential Pressure Gauge, 4-1/2 inch dial, 0 to 100 psi range.
- D. Pressure gauge measurement points, quick connect couplings, 1/4 inch psi.

### **2.3 SYSTEM PERFORMANCE MEASURING INSTRUMENTS**

- A. Insertion Thermometers, with graduation at 0.5 degrees F for air and 0.1 degrees F for water.
- B. Sling Psychrometer.

## **PART 3 – EXECUTION**

### **3.1 GENERAL REQUIREMENTS**

- A. Arrange and pay for all tests.
- B. Notify 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
- 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 DUCTWORK TESTING**

- A. Witness testing conducted by the Mechanical Contractor per Section 230600, PART 3: EXECUTION.

### **3.3 BALANCING PROCEDURE**

- A. Air System Balance:
  - 1. With the fan supply system set to handle normal minimum outdoor air, the balancing firm shall perform the following tests and compile the following information:

Air Handling Equipment

    - a. Design Conditions:
      - (1) CFM Supply Air
      - (2) Static Pressure
      - (3) CFM Fresh Air
      - (4) Fan RPM
    - b. Installed Equipment:
      - (1) Manufacturer
      - (2) Size/Model Number
      - (3) Motor HP, Voltage, Phase, Full Load Amperes
    - c. Field Test:
      - (1) Fan Speed
      - (2) No Load Operating Amperes
      - (3) Fan Motor Operating Amperes
      - (4) Calculated BHP
    - d. Test for Total Air:
      - (1) Size of discharge, return air and outside air ducts.
      - (2) Number and locations of Velocity Readings taken.
      - (3) Duct Average Velocity

- (4) Total CFM
  - (5) Outside Air CFM
  - (6) Return Air CFM
2. After completion of tests, adjustment and balancing under minimum fresh air conditions, set the system for 100% fresh air. Repeat the total CFM tests to check field versus design conditions. The results under 100% fresh air cycle shall agree with conditions found under "minimum fresh air operation" before the system is considered to be in balance. Adjustments of the proper dampers shall be made to achieve balance.
  3. Testing and adjusting of individual outlets shall be performed under procedures recommended by the manufacturers of the outlets. All outlets shall be set for air pattern required and all main supply air and return air dampers to be adjusted and set for design CFM indicated. Any required changes in air patterns, settings, etc., necessary for achieving correct air balance, shall be provided by this Contractor. Total CFM of all outlets shall agree with total CFM of all branches and the grand total shall agree with the air volume for the fan(s).

B. Water Balance:

1. Water balance shall include heating water, chilled water and condenser water systems. The balancing agency shall perform the following tests, compile data and submit reports.
2. Pumps:
  - a. Design Data
    - (1) GPM, head
    - (2) RPM, BHP
  - b. Installed Equipment
    - (1) Manufacturer, Size
    - (2) Type Drive
    - (3) Motor HP, Volts, Cycles and Phase
    - (4) Full Load Amperes
  - c. Field Test
    - (1) Discharge Pressures: Full flow & no flow
    - (2) Suction Pressures: Full flow & no flow
    - (3) Operating Head and GPM
    - (4) No Load Amperes (where possible)
    - (5) Full Flow Amperes, No Flow Amperes
    - (6) Calculated BHP
3. Heating and/or Cooling Elements Including Loop Water to all terminal Units:

a. Design Data:

- (1) MBH Specified, GPM Specified
- (2) Entering Water Temperature (EWT)
- (3) Entering Air Temperature (EAT)
- (4) Water Temperature Drop (DTW)
- (5) Element Type Specified

b. Field Test:

- (1) Identify each element as to location
- (2) Required water temperature drop corrected for item (3) above
- (3) Actual entering air and water conditions (temperature and GPM)
- (4) Adjust element until required temperature drop is obtained

**END OF SECTION**



## **SECTION 26 0000**

### **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.

##### **1.2 DESCRIPTION OF WORK**

- A. Provide all materials, equipment, labor, services and all appurtenances required to completely install and satisfactorily operate the various systems. The items listed below are for general guidance only and do not necessarily include the entire requirements for the project.
  - 1. Coordination with other trades
  - 2. Interior feeders
  - 3. Lighting and power panels
  - 4. Lighting branch wiring
  - 5. Power wiring
  - 6. Lighting fixtures
  - 7. Wiring devices
  - 8. Connections for electrically operated equipment
  - 9. 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 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

Emergency Generator System

C. Testing:

1. After completion of the work, the entire wiring system shall test entirely free from grounds, short circuits, opens, overloads and improper voltage.
2. The grounding system shall be tested for a resistance of 25 ohms or less.
3. Perform testing as follows: Arrange and pay for all tests, provide all equipment, materials and labor to perform test. Notify Engineer and Owner three (3) working days before tests are to be made. Conduct tests in the presence of the Engineer or authorized representative. Repeat tests after defects are corrected.

- D. Special Engineering Services: In the instance of complex specialized electrical power and signaling systems, and other similar systems, the installation and final connections of these systems shall be made by and/or under the supervision of a competent installation and service engineer who shall be a representative of the respective equipment manufacturer. Any and all expenses of these installation and service engineers shall be borne by this Contractor.

## 1.7 COORDINATION

- A. As a requirement of this project, the Electrical Contractor shall furnish coordination for his equipment and layouts with other subcontractors furnishing equipment and services for Divisions 1 thru 23. Any and all contractors who install their equipment or furnish services prior to coordination, any contractor who changes their equipment or services after coordination has occurred, without notifying associated subcontractors, shall be held responsible for making all required changes with no additional cost to the Owner. Or delay in construction time. This coordination will include conduit layout to allow access to equipment for maintenance.
- B. The Mechanical, Plumbing and Electrical Contractors are responsible to coordinate all manufacturer's recommended circuit breakers, starters, disconnects and fuse sizes for all equipment. Submission of a shop drawing will certify that this has been completed.
- C. The drawings and specifications reflect the type, number and size of services required for the equipment the design is based upon. Should the supplying subcontractor elect to furnish an alternate piece of equipment requiring difference services and/or space conditions, he shall inform the subcontractor furnishing those services and be held responsible to pay for all required changes as part of this contract.

## 1.8 SUBMITTALS

A. Shop Drawings:

1. Shop drawings shall be submitted in accordance with Division 1 of these specifications except where herein modified.

**NOTE: Submittals will only be reviewed once and resubmittals will be reviewed once. Any other submittals will be billed to the Contractor at the Engineer's standard rates.**

2. Shop drawings comprising complete catalog cuts, performance test data for electrical equipment as required by other sections of Division 26 shall be submitted for review checking. The Contractor shall review these shop drawings for conformance to contract documents prior to submission and affix contractor's signature to each submittal certifying that this review has been done. By approving and submitting shop drawings, product data, wiring diagrams and similar materials, the Electrical Contractor represents that he and/or his subcontractor has determined and verified materials, field measurements and field construction data that relates to the work, and has checked and coordinated this information with all of the Divisions 1 thru 23 subcontractors.

3. All shop drawing submittals shall have the following identification data, as applicable, contained therein or permanently adhered thereto:
  - a. Project name
  - b. Project number
  - c. Sub-Contractor's, Vendor's and/or manufacturer's name and address.
  - d. Product identification.
  - e. Identification of deviation from the contract documents.
  - f. Applicable contract drawings and specification section number.
  - g. Shop drawing title, drawing number, revision number, and date of drawing and revision.
  - h. Resubmit revised or additional shop drawings as requested.
  - i. Wherever shop drawings or vendor's standard data sheets indicate work to be done "by others", it shall be the responsibility of the Contractor making the submission to identify by name, the Contractor who is to do this work. If the Contractor named is other than the Contractor making the submission, the shop drawing submission must be reviewed by the named Contractor and bear his mark of approval, prior to submission to the Architect/Engineer.
  - j. Where equipment proposed differs from that shown on the drawings or specified, he shall submit for approval drawings showing the manner in which the layout is affected by the substitution.
  - k. The Contractor shall keep a copy of approved shop drawings at the job site.
  - l. No equipment shall be ordered, fabricated, etc., before approval of shop drawings.

## **1.9 SUBSTITUTIONS**

- A. Whenever a material, article, piece of equipment or system is identified in the following specification or indicated on the drawings by reference to manufacturers' or vendors' names, trade names, catalog numbers or the like, it is so identified for the purpose of establishing the basis of the Bid.
- B. Substitution approval must be obtained and included as an addendum item prior to the submission of the bid. An approved substitution shall not be considered as an approval for the contractor or an equipment vendor to deviate from the written portion of the specifications unless so stated in the addendum.
- C. The drawings illustrate the space allocated for equipment and the Contractor shall install the equipment accordingly. If changes are required in the building or arrangement due to substitution of equipment, the Contractor making the substitution must pay for the necessary modifications.
- D. The listed equivalent or substituted manufacturers along with the bidding related contractor shall be completely responsible to comply with all requirements on all contract documents. This shall include, but shall not be limited to space requirements, code clearances, the type, horsepower, capacities, number and size of services required from other trades, including all required ancillary items furnished and installed by other trades. If the manufacturer or related bidding contractor does not comply with these requirements, then they shall be responsible for any and all additional costs associated with the changes required by other trades.

**1.10 LUBRICATION**

- A. Furnish, install and maintain all required lubrication of any equipment operated prior to acceptance by the Owner. Lubrication shall be as recommended by the equipment manufacturer.
- B. Provide one year's supply of lubricants to Owner at date of acceptance.
- C. Verify that required lubrication has taken place prior to any equipment start-up.

**1.11 ADJUSTMENT & CLEANING**

- A. Adjust and clean equipment to be placed in proper operation condition.

**1.12 EQUIPMENT START-UP**

- A. Verify proper installation by manufacturer or his representative.
- B. Advise General Contractor 2 days prior to actual start-up.
- C. Verify proper operation. Obtain signed statement by manufacturer or his representative that equipment is operating within warranty requirements. Submit statement to General Contractor.

**1.13 OPERATION AND MAINTENANCE INSTRUCTIONS**

- A. Properly and fully instruct Owner's personnel in the operation and maintenance of all systems and equipment.
- B. Insure that the Owner's personnel are familiar with all operations to carry on required activities.
- C. Such instruction shall be for each item of equipment and each system as a whole.
- D. Provide report that instruction has taken place. Include in the report the equipment and/or systems instructed, date, contractor, Owner's personnel, vendor, and that a complete operating and maintenance manual has been reviewed.
- E. Manual shall include all instructions on operation, maintenance, repair parts list, lubrication requirements, brochures, catalogue cuts, wiring diagrams, piping diagrams, control sequences, service requirements, names and addresses of vendors, suppliers and emergency contacts. Three manuals shall be provided.
- F. Submit manuals for review prior to operating instruction period. Manuals shall be 8-1/2 x 11" with hard cover, suitably bound.
- 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 (2) 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

#### **1.14 TOOLS**

- A. All equipment furnished by the Contractor which requires special tools or devices other than those normally available to the maintenance or operating staff shall be furnished in duplicate to the Owner, sufficiently marked, packed or boxed for staff usage. The tools provided shall be listed by the Contractor identified as to their use or the equipment applicable in a written transmittal to the Owner.

#### **1.15 CLEANING AND FINISHING**

- A. After equipment start-up and all operating tests have been made and the system pronounced satisfactory, each respective Contractor shall go over the entire project, clean all equipment, etc., installed by him and leave in a clean and working condition. Any surfaces found marred after this final cleaning shall be refinished or replaced by each Contractor at no cost to the Owner.

#### **1.16 OPERATING AND MAINTENANCE MANUALS**

- A. Three complete sets of instructions containing the manufacturer's operating and maintenance instructions for each piece of equipment shall be furnished to the Architect. Each set shall be furnished before the contract is completed. The following identification shall be inscribed on the covers: the words "OPERATING AND MAINTENANCE INSTRUCTIONS", the name and location of the building, the name of the Contractor and the name of the Architect and Engineer. Flysheet shall be placed before instructions covering each subject. The instruction sheets shall be approximately 8-1/2 by 11 inches, with large sheets of drawings folded in. The instructions shall include, but shall not be limited to, the following:

Approved wiring and control diagrams, with data to explain the detailed operation and control of each component.

A control sequence describing start-up, operation and shutdown.

Operating and maintenance instructions for each piece of equipment, including lubrication instructions.

Manufacturer's bulletins, cuts and descriptive data.

Parts lists and recommended spare parts.

#### **1.17 SERVICE INTERRUPTION**

- A. All service interruptions to the electric or related systems, whether during regular working hours or at any other time, must be coordinated with the Owner. All such interruptions shall be so scheduled and planned as to require a minimum of time and shall occur only during a mutually satisfactory period.

#### **1.18 INTERPRETATION OF SYSTEMS**

- A. The interpretation of the Architect will be final in the event there is a lack of understanding of the full scope or requirements of the systems under this contract.

#### **1.19 LAYOUTS**

- A. On small scale drawings, i.e., 1/8" - 1'-0", the approximate location of the electrical branch circuit items such as receptacle, telephone, grounding and equipment outlets are shown to indicate their existence. The exact location of these items and their related raceways are governed by structural conditions, coordination with the work of other trades and the Architect's final decision. By accepting a contract, the Contractor agrees to install the work in accordance with the above statement and within the contract price.

## **PART 2 – PRODUCTS**

### **2.1 MATERIAL**

- A. All material shall be new and of good quality. Material shall conform to all accepted trade standards, codes, ordinances, regulations, or requirements governing same, and shall be approved before being installed.
- B. The Architect reserves the right to require the Contractors to submit samples of any or all articles or materials to be used on the project.
- C. Where any device or equipment is herein referred to in the singular number, such as "the panel", this reference shall be deemed to apply to as many such devices or equipment as are required to complete the installation as shown on the drawings or specified.
- D. All materials and equipment used in the work shall comply with the standards of recognized authorities such as UL, NEMA, IEEE, ETL, IES and EIA in every instance where such standards have been established for the particular type of materials to be installed.
- E. All similar pieces of equipment or materials of the same type or classification used for the same purpose shall be of the same manufacturer.
- F. All manufactured equipment shall have factory applied finishes.

### **2.2 CONCRETE**

- A. Concrete shall be in accordance with or ACI-613.
- B. The 28-day minimum compressive strength shall be 3000 psi, unless noted otherwise.

### **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.

Arrange and design the protection to prevent damage from infiltration or dust, debris, moisture, chemicals and water. Cap or plug electrical raceways.

- B. Protect all surfaces against damage from welding, cutting, burning, or similar construction functions. This protection shall be accomplished by care in operations, covering and shielding. Special care is directed to exposed finished masonry, metal or wood surfaces and painted surfaces. Corrective measures required shall be accomplished by the trade which made the original installation when and as directed by the Architect at the expense of the Contractor.
- C. Cover and protect all lighting fixtures as may be necessary until completion of the work. Replace damaged fixtures or damaged fixture parts as directed by the Architect at no cost to the Owner.
- D. Do not install devices, polished metal fittings or parts until adjoining tile or masonry work is completed.
- E. Maintain and replace protective covering when so directed by the Architect until the work is ready for acceptance.

### **3.6 CUTTING & PATCHING**

- A. Furnish information to the General Contractor as to sizes and locations of recesses required to install panel boxes and other equipment or devices. If the information is late or incorrect, this Contractor shall, at his own expense, have the trade which originally installed the work do the required cutting and patching.
- B. Perform all cutting of concrete or other material for passage of raceways as required to install the work.
- C. Close all such openings around raceways with material as specified under the heading "SEALING".
- D. Install concealed work in place for the mason to wall-in as he carries up the walls; otherwise, this Contractor will be responsible as stated in the first paragraph.

### **3.7 SEALING**

- A. Where raceways pass through fire-rated walls and floors, seal opening with RTV foam.
- B. Seal raceways entering the building to conform to the requirements of the NEC.

### **3.8 OFFSETS AND MODIFICATIONS**

- A. Furnish and install all offsets necessary to install the work and to provide clearance for the work of other trades.
- B. Maintain adequate clearance as directed by the Architect/Engineer.
- C. Incidental modifications necessary to the installation shall be made as necessary and at the direction and/or approval of the Architect.

### **3.9 EQUIPMENT/RACEWAY SUPPORT**

- A. Indicated supports shall be connected to building steel/structure by way of supplemental steel, strut and/or clamps. A built-up roofing system is not structural and shall not be supported from under no circumstances.

### **3.10 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.

### **3.11 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.
- 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.

### **3.12 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.

**3.13 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.

**3.14 PAINTING**

- A. Refinish all factory applied finishes that have been damaged to match the original finish as directed by the Architect.
- B. Prime coat all steel furnished under this Division with material and methods as described in another Section under the heading "PAINTING".

**3.15 EQUIPMENT CONNECTIONS**

- A. Provide required wiring, raceways and final connections for all equipment provided by this Division and Divisions 1 thru 23.
- B. Make final connections in accordance with wiring diagrams obtained from equipment manufacturer.
- C. Rough-in in accordance with approved shop drawings from the manufacturer or supplier of the equipment. Rough-in prior to shop drawing approval will be subject to change without adjustment to contract cost.

**3.16 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.

**3.17 GUARANTEE**

- A. All work shall be guaranteed to be free from defects for a period of two years 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.

**END OF SECTION**

## **SECTION 26 0055**

### **IDENTIFICATION - ELECTRICAL**

#### **PART 1 – GENERAL**

##### **1.1 RELATED DOCUMENTS**

- A. This section is a Division 26 Basic Materials and Methods Section, and is part of each Division 26 Section making reference to electrical identification specified herein.

##### **1.2 DESCRIPTION OF WORK**

- A. Types of electrical identification specified in this section include the following:

Cable conductor identification.

Operational instructions and warnings.

Danger signs.

Equipment/system identification signs.

#### **PART 2 – PRODUCTS**

##### **2.1 MANUFACTURERS**

- A. Subject to compliance with requirements, provide products of one of the following (for each type of marker):

W. H. Brady Co.

Ideal Industries, Inc.

Seton Name Plate Co.

3M Electrical Products

##### **2.2 ELECTRICAL IDENTIFICATION MATERIALS**

- A. Provide manufacturer's standard products of categories and types required for each application. Where more than single type is specified for an application, selection is Installer's option, but provide single selection for each application.

##### **2.3 COLOR-CODED PLASTIC TAPE**

- A. Provide manufacturer's standard vinyl tape not less than 7 mils thick by 3/4" wide.
- B. Colors: Unless otherwise indicated or required by governing regulations, provide tape color as indicated in Paragraph 3.2.B.
- C. Tape shall be of Type 3M Scotch 35 for color coding, Scotch Super 33+ for splices and Tem Flex 1700 for general use.

##### **2.4 CABLE/CONDUCTOR IDENTIFICATION BANDS**

- A. Provide manufacturer's standard vinyl cloth, self-adhesive cable/conductor markers of wrap-around type; either pre-numbered, plastic-coated type, or write-on type with clear plastic, self-adhesive cover

flap; numbered to show circuit identification.

## **2.5 BAKED ENAMEL DANGER SIGNS**

- A. Provide manufacturer's standard "DANGER" signs of baked enamel finish on 20-gage steel; of standard red, black and white graphics; 14" x 10" size except where 10"x 7" is the largest size which can be applied where needed, and except where larger size is needed for adequate vision; with recognized standard explanation wording (as examples: HIGH VOLTAGE, KEEP AWAY, BURIED CABLE, DO NOT TOUCH SWITCH).

## **2.6 ENGRAVED PLASTIC-LAMINATE SIGNS**

- A. Provide engraved stock melamine plastic laminate, in sizes and thicknesses indicated, engraved with engraver's standard letter style of sizes and wording indicated, punched for mechanical fastening except where adhesive mounting is necessary because of substrate.
- B. Thickness: 1/16" for units up to 20 sq. in. or 8" length; 1/8" for larger units.
- C. Fasteners: Self-tapping stainless steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate substrate.

## **2.7 LETTERING AND GRAPHICS**

- A. Coordinate names, abbreviations and other designations used in electrical identification work, with corresponding designations shown, specified or scheduled. Provide numbers, lettering and wording as indicated or, if not otherwise indicated, as recommended by manufacturers or as required for proper identification and operation/maintenance of electrical systems and equipment.

# **PART 3 – EXECUTION**

## **3.1 APPLICATION AND INSTALLATION**

- A. Coordination: Where identification is to be applied to surfaces which require finish, install identification after completion of painting.
- B. Regulations: Comply with governing regulations and requests of governing authorities for identification of electrical work.

## **3.2 CABLE/CONDUCTOR IDENTIFICATION**

- A. Apply cable/conductor identification on each cable and conductor in each box/enclosure/cabinet where wires of more than one circuit or communication/signal system are present. Match identification with marking system used in panelboards, shop drawings, contract documents, and similar previously established identification for project electrical work.
- B. Conductor Color Coding:
  - 1. All conductors used in all systems shall have insulation that is inherently colored. All conductors of a system performing the same function shall be colored alike throughout the project.
  - 2. Equipment Grounding Conductors:
    - a. Standard and/or general feeders or circuits shall be green.
    - b. Isolated feeders or circuits shall be green with yellow stripe.
  - 3. On larger conductors, where colored insulation is not available, colored tape adhesive vinyl bands 3/4" width may be installed 6" maximum from the end of the conductors. Where passing

through pull boxes without splice, each conductor shall be banded.

4. Power system conductor colors shall be as follows:

a. 120/208 Volt System

Phase A - Black

Phase B - Red

Phase C - Blue

Neutral - White or Gray

b. 277/480 Volt System

Phase A - Brown

Phase B - Orange

Phase C - Yellow

Neutral - White or Gray

### 3.3 DANGER SIGNS

- A. In addition to installation of danger signs required by governing regulations and authorities, install appropriate danger signs at locations indicated and at locations subsequently identified by Installer of electrical work as constituting similar dangers for persons in or about project.
- B. High Voltage: Install danger signs wherever it is possible, under any circumstances, for persons to come into contact with electrical power voltages higher than 110-120 volts.

### 3.4 EQUIPMENT/SYSTEM IDENTIFICATION

- A. Install engraved, plastic laminate sign on each major unit of electrical equipment in building, including central or master unit of each electrical system including communication/signal systems, unless unit is specified with its own self-explanatory identification or signal system. Except as otherwise indicated, provide single line of text, 1/2" high lettering on 1-1/2" high sign (2" high where 2 lines are required), white lettering in black field. Provide text matching terminology and numbering of the contract documents and shop drawing. Provide signs for each unit of the following categories of electrical work:
  - 1. Panelboards, electrical cabinets and enclosures.
  - 2. Access panel/doors to electrical facilities.
  - 3. Major electrical switchgear, main and feeder circuit breakers and/or disconnects..
  - 4. Power transfer equipment.
- 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. 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**

## **SECTION 26 0110**

### **RACEWAYS - 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 specified in this Section.
- B. Refer to Section 26 0000 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.

Wireways.

##### **1.3 REFERENCE STANDARDS**

- A. Refer to Section 26 0000 for a general description of requirements applying to this Section.

##### **1.4 QUALITY ASSURANCE**

- A. Refer to Section 26 0000 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.

- B. This coordination shall be carried out prior to actual installation; this shall be done to eliminate the possibility of conflicts between trades on items such as access, clearances and maintenance issues that may arise after completion of construction.
- C. Should the coordination not be carried out prior to installation, and a conflict exists, the installing contractor shall remove and reinstall the equipment as required to clear the conflict at no additional cost to the Owner and no delay in project completion.

## **PART 2 – PRODUCTS**

### **2.1 MATERIALS AND EQUIPMENT**

A. Rigid Metal Conduit:

- 1. Raceway: Full weight, heavy wall rigid steel with zinc coating conforming to ANSI-C80.1.
- 2. Fittings: Cast malleable iron fittings with threaded hubs, insulated throat and zinc protective coating.
- 3. Subject to compliance with requirements, provide products of one of the following:

Allied Tube and Conduit Corporation

LTV Steel Tubular Products Co.

Wheatland Tube

B. Intermediate Metal Conduit:

- 1. Raceway: Light weight, rigid steel, hot dipped galvanized manufactured in accordance with UL1242.
- 2. Fittings: Cast malleable iron fittings with threaded hubs, insulated throat and zinc protective coating.
- 3. Subject to compliance with requirements, provide products of one of the following:

Allied Tube and Conduit Corporation

LTV Steel Tubular Products Co.

Wheatland Tube

C. Electrical Metallic Tubing:

- 1. Raceway: Light weight, thin wall, rigid steel, hot dipped galvanized manufactured in accordance with ANSI C80.3.
- 2. Fittings: Raintight, insulated throat, compression type with zinc protective coating.
- 3. Subject to compliance with requirements, provide products of one of the following:

Allied Tube and Conduit Corp.

LTV Steel Tubular Products Co.

Wheatland Tube Co.

D. 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

Carlson

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 oiltight, insulated throat, with zinc protective coating.
3. Subject to compliance with requirements, provide products of one of the following:

AFC

Alflex Corp.

Electri-Flex Company

G. Wireways:

1. Furnish electrical wireways of the type, size, and style for each service indicated. Wireway shall be a complete assembly including but not necessarily limited to, couplings, offsets, elbows, adapters, hold-down clips, end-caps and other components and accessories as needed for a complete system.



2. System shall fulfill wiring requirements as indicated in contract documents, and shall comply with applicable portions of Article 362 of the National Electrical Code.

3. Subject to compliance with requirements, provide products of one of the following:

Circle AW Products Co.

The EMF Company, Inc.

Hoffman Engineering Company

- 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.

### **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 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.
- E. Complete the installation of electrical raceways before starting the installation of cables/wires within the raceway.
- F. 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.
- G. 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.
- H. 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.
- I. Refer to Section 26 0000 for excavation, shoring and pumping, concrete and backfilling requirements.
  - J. 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.
  - K. In accordance with NEC requirements, install Rigid or Intermediate Metal Conduit where Electrical Metallic Tubing is not permitted.
  - L. 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.
  - M. Refer to Section 26 0190 – Supporting Devices, for supporting conduit runs to building structure
- 3.2 CLEANING**
- A. Upon completion of installation of raceways, inspect interiors of raceways; remove burrs, dirt and construction debris.

**END OF SECTION**



## **SECTION 26 0120**

### **WIRES AND CABLES - ELECTRICAL**

#### **PART 1 – GENERAL**

##### **1.1 RELATED DOCUMENTS**

- A. This section is a Division 26 Basic Materials and Methods section and is part of each Division 26 Section making reference to wires and cables specified herein.

##### **1.2 DESCRIPTION OF WORK**

- A. Electrical wire and electrical cable work is indicated by drawings and specifications.
- B. Types of wire, cable and connectors in this section include, but not limited to the following:
  - Copper conductors.
  - Tap type connectors.
  - Split-bolt connectors.
- C. Refer to other sections of Division 26 for, but not limited to, raceways, connections used in conjunction with wire and cable work.
- D. Applications for wire, cable and connectors required for project are as follows unless otherwise indicated:
  - 1. Power Distribution Circuitry.
  - 2. Appliance and Equipment Circuitry.
  - 3. Motor Branch Circuitry.
  - 4. Control Circuitry.
  - 5. Signal/Communication Circuitry.

#### **PART 2 – PRODUCTS**

##### **2.1 MANUFACTURERS**

- A. Wire and Cable
  - Anaconda Wire and Cable Co.
  - Advance Wire and Cable, Inc.
  - American
  - Cerro Wire and Cable Co.
  - Electrical Conductors, Inc.
  - General Cable Corp.

Rome Cable Corp.

Southwire Company

Triangle PWC., Inc.

General Electric Co.

Connectors

Burndy Corp.

Eagle Electric Mfg. Co., Inc.

Gould, Inc.

Ideal Industries, Inc

Joslyn Mfg. and Supply Co.

O-Z/Gedney Co.

Pyle National Co.

Thomas and Betts Co.

## **2.2 WIRE, CABLE AND CONNECTIONS**

- A. Except as otherwise indicated, provide wire, cable and connectors of manufacturer's standard materials, as indicated by published product information; designed and constructed as recommended by manufacturer, and as required for the installation. Minimum wire and cable size is #12 AWG for power and branch circuits and #14 AWG for control and signal/communication circuits unless otherwise indicated.
- B. Wire: Provide factory fabricated wire of sizes, ratings, materials and types indicated for each service. Where not indicated, provide proper selection as determined by Installer to comply with project's installation requirements and NEC standards. Select from the following types, materials, conductor configurations, insulation and coverings:

UL Type: THHN

UL Type: TW

UL Type: THW

UL Type: THWN

UL Type: TF

UL Type: XHHW

UL Type: MC (Metal Clad)

Material: Copper

Conductors: Solid (AWG 14 to AWG 10 only).

Conductors: Concentric-lay-stranded (standard flexibility)

Outer Covering: Nylon

Outer Covering: Thermoplastic

- C. Connectors: Provide factory fabricated metal connectors of sizes, ratings, materials, types and classes as required for each service. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements and NEC standards. Select from the following types, classes, kinds and styles.

Type: Pressure

Type: Crimp

Type: Threaded

Class: Insulated

Class: Non-insulated

Kind: Copper (for CU to Cu connection).

Style: Butt connection

Style: Elbow connection

Style: Combined "T" and straight connection

Style: "T" connection.

Style: Split-bolt parallel connection

Style: Tap connection

Style: Pigtail connection

### **PART 3 – EXECUTION**

#### **3.1 INSTALLATION**

- A. Install electrical cables, wires and connectors, in compliance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation", and in accordance with recognized industry practices.
- B. Coordinate cable and wire installation work with electrical raceway and equipment installation work, as necessary for proper interface. Pull conductors together where more than one is being installed in a raceway. Use pulling compound or lubricate, where necessary; compound must not deteriorate conductor or insulation. Use pulling means including fish tape, cable or rope which cannot damage raceway. Rope must be used as pulling means when pulling wires or cables into plastic conduit and duct. Keep conductor splices to a minimum and install in junction boxes only. No splices shall be permitted within conduit. Install splices and tapes which have mechanical strength and insulation rating equivalent or better than conductor. Use splice and tape connectors which are compatible with conductor material.

**3.2 FIELD QUALITY CONTROL**

- A. Prior to energization, test cable and wire for continuity of circuitry and also for short circuits. Correct malfunctions when detected.
- B. Subsequent to wire and cable hook-ups, energize circuitry and demonstrate functioning in accordance with requirements.

**END OF SECTION**

## **SECTION 26 0135**

### **BOXES AND FITTINGS - ELECTRICAL**

#### **PART 1 – GENERAL**

##### **1.1 RELATED DOCUMENTS**

- A. This section is a Division 26 Basic Materials and Methods section, and is a part of each Division 26 section making reference to electrical wiring boxes and fittings specified herein.

##### **1.2 DESCRIPTION OF WORK**

- A. Types of electrical boxes and fittings in this section include the following:

Outlet boxes.

Junction boxes.

Pull boxes.

Conduit bodies.

Bushings.

Locknuts.

Knockout closures.

#### **PART 2 – PRODUCTS**

##### **2.1 INTERIOR METALLIC OUTLET BOXES**

- A. Provide galvanized flat rolled sheet steel interior outlet non-gangable wiring boxes, of types, shapes and sizes, including box depths, to suit each respective location and installation; construct with stamped knockouts in back and sides and with threaded screw holes with corrosion-resistant screws for securing box covers and wiring devices.
- B. Provide outlet box accessories as required for each installation, including mounting brackets, wallboard hangers, extension rings, fixture studs, cable clamps and metal straps for supporting outlet boxes, which are compatible with outlet boxes being used and fulfilling requirements of individual wiring situations. Choice of accessories is Installer's option.
- C. Manufacturer: Subject to compliance with requirements, provide interior outlet boxes of one of the following:

Appleton Electric Co.

Bell Electric/Square D Co.

Pass and Seymour, Inc.

RACO, Inc.

Steel City/Midland-Ross Corp.



## **2.2 WEATHERPROOF OUTLET BOXES**

- A. Provide corrosion resistant cast-metal weatherproof outlet wiring boxes, of types, shapes and sizes, including depth of boxes, with threaded conduit ends, cast-metal face plates with spring-hinged waterproof caps suitably configured for each application, including face plate gaskets and corrosion-resistant fasteners.
- B. Manufacturer: Subject to compliance with requirements, provide weatherproof outlet boxes of one of the following:
  - Arrow-Hart Div., Crouse-Hinds Co.
  - Bell Electric/Square D Co.
  - Harvey Hubbell, Inc.
  - O-Z/Gedney Co.
  - Slater Electric Co.
- C. Refer to Section 26 0140 – 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.

## **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**

## **SECTION 26 0140**

### **WIRING DEVICES - ELECTRICAL**

#### **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:
  - Switches.
  - Device plates.
  - Energy Control Devices

##### **1.2 SUBMITTALS**

- A. Product Data: Submit manufacturer's data on electrical wiring devices.

#### **PART 2 – PRODUCTS**

##### **2.1 ACCEPTABLE MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide products of one of the following (for each type of wiring device):
  - Legrand Co.
  - Hubbell, Inc.
  - Leviton Mfg. Co.
  - Lutron Electronics Co., Inc.
  - Cooper Wiring Devices
  - 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 complying with NEC and NEMA Standards for wiring devices. Color selection to be verified by Contractor with Architect/Engineer.

##### **2.3 SWITCHES**

- A. Toggle Switch: Provide extra heavy duty, industrial series flush toggle, 1 pole, 2 pole, 3-way, 4-way AC quiet switch rated 20 amperes @ 120/277 volts with green hexagonal equipment ground screw, metal plaster ears, and side wired screw terminals. Similar to Hubbell Series HBL Series or approved substitute.

## 2.4 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 or block walls, Provide 4" square boxes, surface mounted, with 1/2" 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.

## 2.5 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 20 feet. Device accepts 12 to 24 volt AC or DC. Device shall be similar to Sensor Switch Cat. No. CM-PDT or approved substitute.
  2. Sensor power pack shall be a low voltage power supply with an input of either 120 volts or 277 volts AC and an output of 24 volts DC @ 150 mA. Device shall contain a 20 AMP isolated load control relay. When relay is used, power supply output shall be reduced to 24 volts DC @ 114 mA. Device shall be similar to Sensor Switch PP-20 or approved substitute.

## PART 3 – EXECUTION

### 3.1 INSTALLATION OF WIRING AND CONTROL DEVICES

- A. Install wiring devices as indicated, in compliance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation", and in accordance with recognized industry practices to fulfill project requirements.

- B. Coordinate with other work, including painting, electrical box and wiring work, as necessary to interface installation of wiring devices with other work.
- C. Install wiring devices only in electrical boxes which are clean, free from building materials, dirt and debris.
- D. Provide electrical connections for wiring and control devices.
- E. Delay installation of all wiring and control devices until wiring work is completed.
- F. Isolated Ground Receptacle Devices shall be connected to the system ground by way of an insulated ground conductor color coded green with a yellow stripe.

### **3.2 PROTECTION OF WALL PLATES AND RECEPTACLES**

- A. At time of Substantial Completion, replace those items which have been damaged, including those burned and scorched by faulty plugs.

### **3.3 GROUNDING**

- A. Provide electrically continuous, tight grounding connections for wiring and control devices.

### **3.4 TESTING 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 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**



## **SECTION 26 0155**

### **MOTOR STARTERS - ELECTRICAL**

#### **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.
  - Adjustable Frequency Drive (AFD)

##### **1.2 SUBMITTALS**

- A. Product Data: Submit manufacturer's data on motor starters and accessories.

##### **1.3 COORDINATION**

- A. The drawings and details there upon are scheme and/or diagrammatic in nature, and indicate the need and intent of the design. These are to be used for general guidance only. It shall be the responsibility of the Electrical Contractor to coordinate with other Division subcontractors, the installation of all motor starters, the need for control devices including the wiring and conduit, to and from the device.
- B. This coordination shall be carried out prior to actual installation. This shall be done to eliminate the possibility of conflicts between trades on items such as access, clearances and maintenance issues that may arise after completion of coordination.
- C. During the coordination phase of the project, the Electrical Contractor shall consult with Division 1 thru 23 subcontractors with regard to base design equipment characteristics. Any differences from the electrical plans and specifications shall be considered a change. The trade's contractor making the change at no additional cost to the Owner or delay in project completion shall handle these additional costs.

#### **PART 2 – PRODUCTS**

##### **2.1 ACCEPTABLE MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide products of one of the following (for each type and rating of motor starter):
  - Allen-Bradley Co.
  - Cutler Hammer Products
  - Furnas Electric Co.



Square D Co.

Siemens

## 2.2 MOTOR STARTERS

- A. Provide motor starters and ancillary components; of types, sizes, ratings and electrical characteristics indicated which comply with manufacturer's standard materials, design and construction in accordance with published product information, and as required for complete installations.
- B. Fractional HP Manual Motor Starters: Provide manual, single phase, fractional HP motor starters for each motor rated less than 1/2 HP, of types, ratings and electrical characteristics indicated. Equip unit with thermal overload relay for protection of 120 volt AC motors. Provide starters with quick-make, quick-break, trip free toggle mechanisms, selector switches for hand-off-automatic control; mount starter in NEMA Type 1 or Type 4 enclosure as indicated or required by the NEC.
- C. Magnetic Motor Starter: Provide magnetic full voltage, non-reversing starters for each motor rated 1/2 HP and more of types, ratings and electrical characteristics indicated; equip with solid state overload relays, control transformers with 120V secondary, with one secondary fuse and one grounded secondary lead, two normally open and two normally closed auxiliary contacts, hand-off-automatic selector switch, red and green pilot lights wired and mounted through front of the enclosure. Mount starter in NEMA Type 1 or Type 4 enclosure as required by the NEC.
- D. Combination Disconnect Switch Magnetic Starter: Provide full-voltage, non-reversing, combination non-fused disconnect switch and magnetic starter for each motor rated 1/2 horsepower and more, of types, ratings and electrical characteristics indicated; equip with solid state overload relays, control transformer with 120 volt secondary, one secondary fuse and one grounded secondary lead, two normally open and two normally closed auxiliary contacts, hand-off- automatic switch, red and green pilot lights wired and mounted through the front of the enclosure. Mount starter in NEMA Type 1 or Type 4 enclosure as required by the National Electrical Code (NEC).
- E. Three (3) phase, full voltage, non-reversing magnetic motor starters, horsepower rating with minimum NEMA size #0 shall be as follows:

| NEMA Size | Continuous Rating | Maximum Horsepower |          |
|-----------|-------------------|--------------------|----------|
|           |                   | 208 Volt           | 480 Volt |
| 0         | 18 AMPs           | 3HP                | 5HP      |
| 1         | 27 AMPs           | 7-1/2HP            | 10HP     |
| 2         | 45 AMPs           | 10HP               | 25HP     |
| 3         | 90 AMPs           | 25HP               | 50HP     |
| 4         | 135 AMPs          | 40HP               | 100HP    |
| 5         | 270 AMPs          | 75HP               | 200HP    |

Motor full-load current shall not exceed continuous ampere rating of starter.

- F. Adjustable Frequency Drive (AFD): The AFD shall convert the input AC main power to an adjustable frequency and voltage. The output frequency and voltage of the AFD shall be adjustable to maintain a constant voltage/hertz ratio throughout the operating range. The AFD shall be designed to operate from a 480 volt, three phase, 60 hertz main supply that is within +10% or -10% of nominal line voltage. The AFD control technique shall employ the pulse width modulated (PWM) technology.

1. Ratings:

- a. The AFD shall be capable of supplying 120% of rated full load current for one minute at maximum ambient temperature.
- b. Unit shall be rated for installation in a power system capable of delivering up to 65,000 RMS symmetrical amperes.
- c. Minimum power factor shall be .95 throughout the entire speed range.
- d. The AFD efficiency shall be 98% at full speed.

2. Adjustments:

- a. The acceleration and deceleration ramp rates shall be adjustable from 1 to 60 seconds.
- b. The overload trip shall be adjustable from 0 to 100% of rated output current.
- c. The current limit shall be adjustable from 60 to 120% of rated output current to maximize starting torque.
- d. Voltage boost shall be adjustable from 100 to 400% of nominal voltage/hertz ratio at 1 hertz tapering to 100% at 20 Hertz.
- e. The drive shall provide a control for adjusting the minimum frequency setting up to 45 Hertz and a maximum operating frequency adjustable over a range of 40 to 60 Hertz.

3. Protection:

- a. A non-adjustable instantaneous overcurrent trip shall be set to 250% of rated output current.
- b. AFD protection shall be accomplished with fuseless electronic protective circuits, to protect from the following conditions:
  - Short circuit at AFD output.
  - Ground fault at AFD output.
  - Open circuit at AFD output.
  - Input undervoltage.
  - DC bus overvoltage.
  - Loss of input phase.
  - AC line switching transients.
  - Instantaneous overload.

- Sustained overload exceeding 100% of rated current.
- Overtemperature.

4. Control:

- a. All the following operator controls shall be mounted to the front panel which is integral to the AFD:
  - Manual speed potentiometer.
  - Hand-Off-Auto (HOA) switch. The AFD shall accept an input signal of 4 to 20 Ma. DC. as an automatic speed reference signal when the AFD is in the automatic mode of operation. The manual speed potentiometer shall control the AFD when the switch is in the manual mode.
  - The AFD shall be furnished with an isolated follower with a setpoint control of 4 to 20 Ma. DC with PI control from an isolated ground signal.

5. Operator Interface:

- a. The AFD shall be furnished with an alphanumeric display and keypad to allow the operator access to drive modes, parameters and status conditions.
- b. Operator control and setup functions shall include the following:
  - (1) Frequency setpoint
  - (2) Acceleration/Deceleration time
  - (3) Minimum/Maximum Output Frequencies
  - (4) Proportional Gain
  - (5) Integral Gain
  - (6) Setpoint
  - (7) Drive Reset
  - (8) Elapsed Time
  - (9) Enable PI (Setpoint) Control
  - (10) Auto Reference Source Select

Operating status information will consist of the following:

- (1) Frequency Output
- (2) Output Current
- (3) Output Voltage
- (4) Accel/Decel Ramp Time
- (5) Forward/Reverse Direction
- (6) Hand/Auto Local Indicator

(7) Elapsed Time

The diagnostic and fault conditions available via the operator interface will include the following:

- (1) Output Frequency
- (2) Output Current
- (3) Output Voltage
- (4) Shutdown Reference Status
- (5) Jog Status
- (6) Mode of Operation
- (7) Input Signal Levels
- (8) Faults
- (9) Overload Timer Activated
- (10) Motor Current Limit

6. Enclosure:

- a. The enclosure shall be NEMA Type 1 with a dead front and back construction with all components and load, line and control terminations fully front accessible. The enclosure shall be self-ventilated and have provisions for top and bottom entry of conduit and wire.

**PART 3 – EXECUTION**

**3.1 INSTALLATION OF MOTOR STARTERS**

- A. Install motor starters in accordance with manufacture's written instructions, applicable requirements of NEC, NEMA Standards, and NECA's "Standard of Installation", and in compliance with recognized industry practices to ensure that products fulfill requirements.
- B. The Electrical Contractor shall consult and cooperate with the Control Contractor in assisting him in making control connections to the automatic position of the selector switch and to the auxiliary contacts.
- C. Motor Data: Before installing wiring for motors and starters, the Electrical Contractor shall consult the respective parties furnishing the equipment and obtain from them all data necessary to properly connect the apparatus, and for selection of thermal overload relays in accordance with motor nameplate. Any variance in loads or electrical characteristics from the contract drawings should be reported to the Engineer before proceeding with the work.
- D. When packaged equipment is furnished, all unit starters shall be furnished, mounted and wired by the installing contractor. The Electrical Contractor shall furnish and install a disconnect switch, as specified in Section 260170, and wire between unit's main terminal block and the disconnect switch.
- E. When packaged rooftop equipment is furnished, the unit disconnect switch and all starters shall be furnished, mounted and wired by the installing contractor. The Electrical Contractor shall wire between the line side of the disconnect switch and the building system.
- F. Provide connections for motor starters.

**3.2 ADJUST AND CLEAN**

- A. Inspect operating mechanisms for malfunctioning and where necessary adjust units for free mechanical movement.
- B. Touch-up scratched or marred surfaces to match original finish.

**3.3 FIELD QUALITY CONTROL**

- A. Subsequent to wire/cable hookup, energize motor starters and demonstrate functioning of equipment in accordance with requirements.

**END OF SECTION**

**SECTION 26 0170**  
**MOTOR AND CIRCUIT DISCONNECTS - ELECTRICAL**

**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

**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**

**SECTION 26 0180**  
**OVERCURRENT PROTECTIVE DEVICES - ELECTRICAL**

**PART 1 – GENERAL**

**1.1 DESCRIPTION OF WORK**

- A. Extent of overcurrent protective device work is indicated by drawing schedules and specifications.
- B. Types of overcurrent protective devices in this section include the following:
  - 1. Molded case circuit breaker.

**1.2 SUBMITTALS**

- A. Product Data: Submit manufacturer's data on overcurrent protective devices, including: voltages and current ratings, interrupting ratings, current limitations, internal inductive and non-inductive loads, time-current trip characteristic curves, and mounting requirements.
- B. Shop Drawings: Submit layout drawings of overcurrent protective devices, showing spatial relationships of units to associated electrical equipment, and connections to electrical power supplies.

**PART 2 – PRODUCTS**

**2.1 ACCEPTABLE MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include the following:
  - 1. Circuit-Breakers
    - Cutler-Hammer, Inc. (Eaton)
    - Square D Co.
    - Siemens

**2.2 CIRCUIT BREAKERS**

- A. Except as otherwise indicated, provide circuit breakers and ancillary components, of types, sizes, ratings and electrical characteristics indicated, which comply with manufacturer's standard design, materials, components, and construction in accordance with published product information, as required for a complete installation.
- B. Molded-Case Circuit Breakers: Provide factory assembled, molded-cased circuit breakers of frame size indicated; 120/208 volts, and 277/480 volts 60 Hertz, one, two, or three poles with a short circuit symmetrical ampere interrupting rating as indicated by the panel schedule and/or as shown by the single line riser diagram. Provide circuit breakers with permanent thermal instantaneous magnetic trips in each pole with ampere ratings as indicated. Construct with overcenter, trip-free, toggle type operating mechanisms with quick-make, quick-break action and positive handle trip indication. Construct devices for mounting and operating in any physical position and operating in an ambient temperature of 40 degrees C. Provide circuit breakers with mechanical screw type connector lugs, AL/CU rated.

**PART 3 – EXECUTION**

**3.1 INSTALLATION OF OVERCURRENT PROTECTIVE DEVICES**

- A. Install overcurrent protective devices as indicated in contract documents, in accordance with the manufacturer's written instructions and with recognized industry practices to ensure that protective devices comply with requirements. Comply with NEC Standards for Installation of overcurrent protective devices.
- B. Coordinate with other work, including electrical wiring work, as necessary to interface installation of overcurrent protective devices with other work.



- C. Fasten circuit breakers without causing mechanical stresses, twisting or misalignment being exerted by clamps, supports, or cabling.

**3.2 ADJUST AND CLEAN**

- A. Inspect circuit-breaker operating mechanisms for malfunctioning and, where necessary, adjust units for free mechanical movement.

**3.3 FIELD QUALITY CONTROL**

- A. Prior to energization of overcurrent protective devices, test devices for continuity of circuitry and for short-circuits. Correct malfunctioning units, and then demonstrate compliance with requirements.

**END OF SECTION**

## **SECTION 26 0190**

### **SUPPORTING DEVICES - ELECTRICAL**

#### **PART 1 – GENERAL**

##### **1.1 DESCRIPTION OF WORK**

- A. Types of supports, anchors, sleeves and seals specified in this section include the following:

Hangers.

Riser Clamps.

C-clamps

I-beam clamps.

One-hole conduit straps.

Two-hole conduit straps.

Round steel rods.

Lead expansion anchors.

Toggle bolts.

U-Channel Strut Systems.

#### **PART 2 – PRODUCTS**

##### **2.1 MANUFACTURED SUPPORTING DEVICES**

- A. Provide supporting devices, complying with manufacturer's standard materials, design and construct in accordance with published product information, and as required for a complete installation, and as herein specified.

- B. Supports: Provide supporting devices of types, sizes and materials having the following construction features:

Hangers: For supporting EMT conduit, electro-galvanized steel, with 1/4" minimum diameter hole for round steel rod; approximately MSS types 5, 7, 9 or spring steel conduit clips.

Reducing Couplings: Steel rod reducing coupling, 1/4" minimum black steel.

C-Clamps: Black malleable iron, 1/4" minimum rod size.

I-Beam Clamps: Black steel, 1-1/4" x 3/16" stock; 3/8" cross bolt; flange width 2"; approx. 52 pounds per 100 units.

One-Hole Conduit Straps: For supporting EMT conduit, electro- galvanized steel.

Two-Hole Conduit Straps: For supporting EMT conduit, electro-galvanized steel; 3/4" strap width; and 2-1/8" between center of screw holes.

Hexagon Nuts: For 1/4" rod size; galvanized steel.

Round Steel Rod: Black steel; 1/4" min. dia.

Offset Conduit Clamps: For supporting rigid metal conduit; black steel.

- C. Anchors: Provide anchors of types, sizes and materials indicated; and having the following construction features:

Lead Expansion Anchors: 1/4" - 20 Minimum.

Toggle Bolts: Springhead; 3/16 x 4".

- D. Manufacturer: Subject to compliance with requirements, provide anchors of the following:

Ackerman Johnson Fastening Systems, Inc.

Elcen Metal Products Co.

Ideal Industries, Inc.

Rawlplug Co., Inc.

Star Expansion Co.

U.S. Expansion Bolt Co.

Erico Products, Inc. (Caddy)

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 Huffer 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.
- C. Indicated supports shall be connected to building steel/structure by way of supplemental steel, strut and/or clamps. A built-up roofing system is not structural and shall not be supported from under, no circumstances.

**END OF SECTION**



**SECTION 26 0452**  
**GROUNDING - ELECTRICAL**

**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.
  - Manufactured Cabling Systems

**2.2 ELECTRICAL GROUNDING CONDUCTORS**

- A. Unless otherwise indicated, furnish a green insulated equipment grounding conductor for all feeders and branch circuits, matching power supply wiring materials and sized according to NEC.

**2.3 BONDING PLATES, CONNECTIONS, TERMINALS & CLAMPS**

- A. Provide electrical bonding plates, connectors, terminals and clamps as recommended by bonding plate, connector, terminal and clamp manufacturers for applications.

**2.4 GROUND RODS & PLATES**

- A. Ground Rods: Steel with copper welded exterior, 3/4" dia. x 10'.

### **PART 3 – EXECUTION**

#### **3.1 INSTALLATION OF GROUNDING SYSTEMS**

- A. Install electrical grounding systems in accordance with manufacturer's written instructions and with recognized industry practices to ensure grounding complies with requirements. Comply with requirements of NEC, NESC, NEMA and UL standards for installation of grounding systems.
- B. Coordinate with other electrical work as necessary to interface installation of grounding system with other work.
- C. Clamp cable connections to ground rods.
- D. Install bonding jumpers with ground clamps on water meter piping to electrically bypass water meter.
- E. Install clamp-on connectors only on thoroughly cleaned metal contact surfaces, to ensure electrical conductivity and circuit integrity.

#### **3.2 FIELD QUALITY CONTROL**

- A. Upon completion of installation of electrical grounding system, test ground resistance with ground resistance tester. Where tests show resistance-to-ground is over 25 ohms, take appropriate action to reduce resistance to 25 ohms or less by driving additional ground rods and/or by chemically treating soil encircling ground rods with sodium chloride, calcium chloride, copper sulphate, or magnesium. Then retest to demonstrate compliance.

**END OF SECTION**

**SECTION 26 0470**  
**DISTRIBUTION CIRCUITS - ELECTRICAL**

**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**





## **SECTION 26 0471**

### **FEEDER CIRCUITS - ELECTRICAL**

#### **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**



**SECTION 26 0472**  
**BRANCH CIRCUITS - ELECTRICAL**

**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 26 0110
  - Electrical Metallic Tubing (EMT)
  - MC (Metal Clad) (Concealed Work only)
  - Wires and Cables
  - Junction Boxes
  - Pull Boxes
  - Conduit Bodies
  - Bushings
  - Locknuts
  - Supporting Devices

**PART 2 – PRODUCTS**

**2.1 BRANCH CIRCUITS**

- A. Furnish each branch circuit with an assembly of materials, including but not necessarily limited to, conduit, wire, cable, pull boxes, junction boxes and other items and accessories needed for a complete installation. Where materials or components are not otherwise indicated, comply with NEC, NEMA and established industry standards for applications indicated.

**2.2 CONVENIENCE BRANCH CIRCUITS**

- A. Intent:
  - 1. The intent of this portion of the specifications is to describe the requirements of a convenience circuit as it applies to 120-volt receptacles.
  - 2. All convenience branch circuits may consist of more than one 120-volt receptacle.
- B. Convenience Circuit - General: A circuit consisting of a phase and neutral conductor, which may share its neutral with other phase conductors provided that the neutral conductor does not become overloaded due to circuit phase relationship. This type of circuit shall also include an equipment grounding conductor as described under the grounding section of the specifications.
- C. Convenience Circuit - Dedicated: A circuit consisting of a phase and neutral conductor which DOES NOT share conductors with any other circuits. This type of circuit shall also include an equipment grounding conductor as described under the grounding section of the specifications.

**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**

**SECTION 26 0510**  
**BUILDING LIGHTING - ELECTRICAL**

**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.
  - 4. Support of fixtures shall be as specified in applicable Division 26 Supporting Devices.

**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.

**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.
- D. 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 manufacturer'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 of fixtures amounting to 5% of each type. Deliver the replacement stock, as directed, to the Owner's Storage Area.
- C. Replace defective and burned out fixtures for a period of two (2) years 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**





**SECTION 26 0800  
COMMISSIONING OF ELECTRICAL**

**PART 1 - GENERAL**

**1.1 SECTION INCLUDES**

- A. Description
- B. Responsibilities
- C. Related Work
- D. Test Equipment

**1.2 DESCRIPTION**

- A. The purpose of this section is to specify Division 26 responsibilities in the commissioning process.
- B. The systems to be commissioned are listed in Section 01 91 00.
- C. Commissioning requires the participation of the Division 26 Contractor to ensure that all systems are operating in a manner consistent with the Contract Documents. The general commissioning requirements and coordination are detailed in Section 01 91 00. Division 26 Contractor shall be familiar with all parts of Section 01 91 00 and shall execute all commissioning responsibilities assigned to them in the Contract Documents.

**1.3 RESPONSIBILITIES**

- A. Refer to Section 01 91 00.

**1.4 RELATED WORK**

- A. Specific commissioning requirements are given in the following sections of these specifications. All the following sections apply to the Work of this section.
  - 1. Section 01 91 00 – General Commissioning Requirements
  - 2. Section 22 08 00 - Commissioning of Plumbing
  - 3. Section 23 08 00 - Commissioning of HVAC

**PART 2 - PRODUCTS**

**2.1 TEST EQUIPMENT**

- A. The Contractor shall provide all test equipment necessary to fulfill the testing requirements of this Division. This equipment includes, but is not limited to, the following:
  - 1. Test equipment required for NETA Acceptance Testing.

2. Light meter.
  3. Sound level meter.
  4. Digital multimeter capable of measuring voltage (AC/DC), current, and resistance.
  5. Power quality and energy analyzer capable of capturing waveform (3 phase) and data recording.
  6. Handheld thermal imaging camera.
- B. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the related specifications. All equipment shall be calibrated according to the manufacturer's recommended intervals and when dropped or damaged. Calibration tags shall be affixed or certificates readily available.
- C. Refer to Section 01 91 00 for additional Division 26 requirements.

### PART 3 - EXECUTION

- A. Refer to Section 01 91 00.

END OF SECTION

## **SECTION 31 20 00 EARTH MOVING**

### **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. Preparing subgrades for all aspects of construction shown on the plans.
2. Excavating and backfilling for buildings and structures.
3. Drainage course for concrete slabs-on-grade.
4. Subbase course for concrete walks pavements.
5. Subbase course and base course for asphalt paving.
6. Subsurface drainage backfill for walls and trenches.
7. Excavating and backfilling trenches for utilities and pits for buried utility structures.
8. Excavating well hole to accommodate elevator-cylinder assembly.

- B. Related Sections:

1. Division 01 Section "Construction Progress Documentation" for recording pre-excavation and earth moving progress.
2. Division 01 Section "Temporary Facilities and Controls" for temporary controls, utilities, and support facilities; also for temporary site fencing if not in another Section.
3. Division 03 Section "Cast-in-Place Concrete" for granular course if placed over vapor retarder and beneath the slab-on-grade.
4. Division 14 Section "Hydraulic Elevators" and "Hydraulic Freight Elevators" for excavating well hole to accommodate elevator-cylinder assembly.
5. Divisions 21, 22, 23, 26, 27, 28, and 33 Sections for installing underground mechanical and electrical utilities and buried mechanical and electrical structures.
6. Division 31 Section "Site Clearing" for site stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.
7. Division 31 Section "Dewatering" for lowering and disposing of ground water during construction.

8. Division 31 Section "Excavation Support and Protection" for shoring, bracing, and sheet piling of excavations.
  9. Division 31 Section "Drilled Concrete Piers and Shafts" for excavation of shafts and disposal of surplus excavated material.
  10. Division 32 Section "Turf and Grasses" for finish grading in turf and grass areas, including preparing and placing planting soil for turf areas.
  11. Division 32 Section "Plants" for finish grading in planting areas and tree and shrub pit excavation and planting.
  12. Division 33 Section "Sub-drainage".
- C. Delaware Department of Transportation (DelDOT) Standard Specifications.
- D. Delaware Department of Natural Resources and Environmental Control (DNREC) Sediment and Erosion Control Handbook.

### 1.3 DEFINITIONS

- A. Backfill: Soil material or controlled low-strength material used to fill an excavation.
1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
  2. Final Backfill: Backfill placed over initial backfill to fill a trench.
- B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.
- C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.
- D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.
- E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.
- F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
- G. Fill: Soil materials used to raise existing grades.

### 1.4 SUBMITTALS

- A. Product Data: For each type of the following manufactured products required:
1. Geotextiles.
  2. Controlled low-strength material, including design mixture.
  3. Base Course aggregate
  4. Drainage Course aggregate.

- 5. Soil Amendment.
- 6. Soil Testing.

## 1.5 QUALITY ASSURANCE

- A. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E 329 and ASTM D 3740 for testing indicated.
- B. Pre-excavation Conference: Conduct conference at Project site.

## 1.6 PROJECT CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth moving operations.
  - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
  - 2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
- B. Utility Locator Service: Notify Miss Utility (1-800-282-8555) for area where Project is located before beginning earth moving operations.
- C. Do not commence earth moving operations until temporary erosion- and sedimentation-control measures, specified in Division 31 Section "Site Clearing are in place.

## PART 2 - PRODUCTS

### 2.1 SOIL MATERIALS

- 1. All on-site borrow, subbase material, base course and drainage course shall be as shown on the plans and in accordance with the DelDOT Standard Specifications.

### 2.2 GEOTEXTILES

- A. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters meeting Mirafi 140N or approved equal.
- B. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters meeting Mirafi 600X or approved equal.
- C. Soil Amendment: Per Project Plans

**2.3 ACCESSORIES**

- A. Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility; colored as follows:
1. Red: Electric.
  2. Yellow: Gas, oil, steam, and dangerous materials.
  3. Orange: Telephone and other communications.
  4. Blue: Water systems.
  5. Green: Sewer systems.
  6. Green: Sewer systems.

**PART 3 - EXECUTION**

**3.1 PREPARATION**

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.
- B. Protect and maintain erosion and sedimentation controls during earth moving operations.
- C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

**3.2 DEWATERING**

- A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

**3.3 EXPLOSIVES**

- A. Explosives: Do not use explosives.

### 3.4 EXCAVATION, GENERAL

- A. All excavation shall be as shown on the plans and in accordance with the DelDOT Standard Specifications and the DNREC Sediment and Erosion Control Handbook.

### 3.5 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
  - 1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
- B. Excavations at Edges of Tree- and Plant-Protection Zones:
  - 1. Excavate by hand to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
  - 2. Cut and protect roots according to requirements in Division 01 Section "Temporary Tree and Plant Protection."

### 3.6 EXCAVATION FOR WALKS AND PAVEMENTS

- A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

### 3.7 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
  - 1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.
- B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.
  - 1. Clearance: 12 inches each side of pipe or conduit.
- C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells,



joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

### 3.8 SUBGRADE INSPECTION

- A. Notify Architect/Engineer/Construction Manager when excavations have reached required subgrade.
- B. If Architect/Engineer/Construction Manager determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
- C. Proof-roll subgrade below the building slabs and pavements with a pneumatic-tired and loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
  - 1. Completely proof-roll subgrade in one direction. Limit vehicle speed to 3 mph.
  - 2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.
- D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

### 3.9 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi may be used when approved by Architect.
  - 1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

### 3.10 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
  - 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

### 3.11 BACKFILL

- A. Place and compact backfill in excavations promptly as shown on the plans and in accordance with the DelDOT Specifications.

### 3.12 UTILITY TRENCH BACKFILL

- A. Place backfill on subgrades free of mud, frost, snow, or ice.
- B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- C. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Division 03 Section Cast-in-Place Concrete.
- D. Backfill voids with satisfactory soil while removing shoring and bracing.
- E. Place and compact final backfill of satisfactory soil to final subgrade elevation.

### 3.13 SOIL FILL

- A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- B. Place and compact fill material in layers to required elevations as follows:
  - 1. Under grass and planted areas, use satisfactory soil material.
  - 2. Under walks and pavements, use satisfactory soil material.
  - 3. Under steps and ramps, use engineered fill.
  - 4. Under building slabs, use engineered fill.
  - 5. Under footings and foundations, use engineered fill.
- C. Place soil fill on subgrades free of mud, frost, snow, or ice.

### 3.14 SOIL MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
  - 1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
  - 2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

### 3.15 COMPACTION OF SOIL BACKFILLS AND FILLS

- A. Place and compact fill as shown on the plans and in accordance with the DelDOT Standard Specifications.

### 3.16 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
  - 1. Provide a smooth transition between adjacent existing grades and new grades.
  - 2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

### 3.17 SUBSURFACE DRAINAGE

- A. Sub-drainage Pipe: Specified in Division 33 Section "Sub-drainage."
- B. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within 12 inches of final subgrade.

### 3.18 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

- A. Place as shown on the plans and in accordance with the DelDOT Standard Specifications.

### 3.19 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

- A. Place drainage course on subgrades free of mud, frost, snow, or ice.

### 3.20 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.
- B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.
- C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.

- D. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:
  - 1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft or less of paved area or building slab, but in no case fewer than three tests.
  - 2. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 feet or less of trench length, but no fewer than two tests.
- E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; re-compact and retest until specified compaction is obtained.

### **3.21 PROTECTION**

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
  - 1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and re-compact.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
  - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

### **3.22 DISPOSAL OF SURPLUS AND WASTE MATERIALS**

- A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.
- B. Transport surplus satisfactory soil to designated storage areas on Owner's property. Stockpile or spread soil as directed by Architect.
  - 1. Remove waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION



## **SECTION 32 1216 ASPHALT PAVING**

### **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. Cold milling of existing hot-mix asphalt pavement.
2. Hot-mix asphalt patching.
3. Hot-mix asphalt paving.
4. Hot-mix asphalt paving overlay.
5. Pavement-marking paint.
6. Asphaltic Seal Coat

- B. Related Sections:

1. Division 02 Section "Structure Demolition" for demolition, removal, and recycling of existing asphalt pavements, and for geotextiles that are not embedded within courses of asphalt paving.
2. Division 31 Section "Earth Moving" for aggregate subbase and base courses and for aggregate pavement shoulders.
3. Division 32 Sections for other paving installed as part of crosswalks in asphalt pavement areas.
4. Division 32 Section "Concrete Paving Joint Sealants" for joint sealants and fillers at paving terminations.

- 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 DEFINITION**

- A. Hot-Mix Asphalt Paving Terminology: See DelDOT Standard Specifications.

#### **1.4 SUBMITTALS**

- A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.

1. Job-Mix Designs: For each job mix proposed for the Work.
- B. Shop Drawings: Indicate pavement markings, lane separations, and defined parking spaces. Indicate, with international symbol of accessibility, spaces allocated for people with disabilities.
- C. Material Certificates: For each paving material, from manufacturer.
- D. Material Test Reports: For each paving material.

#### 1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A paving-mix manufacturer registered with and approved by DelDOT.
- B. Testing Agency Qualifications: Qualified according to ASTM D 3666 for testing indicated.
- C. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of DelDOT for asphalt paving work.
  1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.
- D. Preinstallation Conference: Conduct conference at Project site.
  1. Review methods and procedures related to hot-mix asphalt paving including, but not limited to, the following:
    - a. Review proposed sources of paving materials, including capabilities and location of plant that will manufacture hot-mix asphalt.
    - b. Review condition of subgrade and preparatory work.
    - c. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.
    - d. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.
- B. Store pavement-marking materials in a clean, dry, protected location within temperature range required by manufacturer. Protect stored materials from direct sunlight.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: See DelDOT Standard Specifications
- B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F for oil-based materials 55 deg F for water-based materials, and not exceeding 95 deg F.

**PART 2 - PRODUCTS**

2.1 AGGREGATES

- A. General: All aggregates for asphalt paving are in accordance with the DelDOT Standard Specifications.

2.2 ASPHALT MATERIALS

- A. All asphalt materials are in accordance with the DelDOT Standard Specifications. Retain first paragraph below with option for viscosity- or penetration-graded asphalt cement if these materials are available and required. Viscosity testing measures properties more accurately than penetration testing. Insert viscosity or penetration grades below if required.

2.3 AUXILIARY MATERIALS

- A. Paving Geotextile: AASHTO M 288, nonwoven polypropylene; resistant to chemical attack, rot, and mildew; and specifically designed for paving applications.
- B. Joint Sealant: Per the DelDOT Standard Specifications.
- C. Pavement-Marking Paint: As shown on the project plans and in accordance with the DelDOT Standard Specifications.
- D. Asphaltic Seal Coat: ASTM D6690, Type II.

2.4 MIXES

- A. Hot-Mix Asphalt: Dense, hot-laid, hot-mix asphalt plant mixes approved by DelDOT and in accordance with the DelDOT Standard Specifications.

**PART 3 - EXECUTION**

3.1 EXAMINATION

- A. Verify that subgrade is dry and in suitable condition to begin paving.
- B. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
  - 1. Completely proof-roll subgrade in one direction. Limit vehicle speed to 3 mph.



2. Proof roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
  3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.
- C. Proceed with paving only after unsatisfactory conditions have been corrected.
- D. Verify that utilities, traffic loop detectors, and other items requiring a cut and installation beneath the asphalt surface have been completed and that asphalt surface has been repaired flush with adjacent asphalt prior to beginning installation of imprinted asphalt.

### 3.2 COLD MILLING

- A. Clean existing pavement surface of loose and deleterious material immediately before cold milling. Remove existing asphalt pavement by cold milling to grades and cross sections indicated.
1. Mill to a depth of 2 inches.
  2. Mill to a uniform finished surface free of excessive gouges, grooves, and ridges.
  3. Control rate of milling to prevent tearing of existing asphalt course.
  4. Repair or replace curbs, manholes, and other construction damaged during cold milling.
  5. Excavate and trim unbound-aggregate base course, if encountered, and keep material separate from milled hot-mix asphalt.
  6. Transport milled hot-mix asphalt to asphalt recycling facility.
  7. Keep milled pavement surface free of loose material and dust.

### 3.3 PATCHING

- A. Hot-Mix Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.
- B. Tack Coat: Apply uniformly to vertical surfaces abutting or projecting into new, hot-mix asphalt paving in accordance with the DelDOT Standard Specifications.
1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
  2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.
- C. Patching: Fill excavated pavements with hot-mix asphalt base mix for full thickness of patch and, while still hot, compact flush with adjacent surface.

### 3.4 SURFACE PREPARATION

- A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.
- B. Prime Coat: In accordance with the DelDOT Standard Specifications.
- C. Tack Coat: Apply uniformly to surfaces of existing pavement in accordance with the DelDOT Standard Specifications.

### 3.5 PAVING GEOTEXTILE INSTALLATION

- A. Place paving geotextile promptly according to manufacturer's written instructions. Broom or roll geotextile smooth and free of wrinkles and folds. Overlap longitudinal joints 4 inches and transverse joints 6 inches.
  - 1. Protect paving geotextile from traffic and other damage and place hot-mix asphalt paving overlay the same day.

### 3.6 HOT-MIX ASPHALT PLACING

- A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted in accordance with the DelDOT Standard Specifications.
- B. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.
  - 1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete a section of asphalt base course before placing asphalt surface course.
- C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

### 3.7 JOINTS

- A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.
  - 1. Clean contact surfaces and apply tack coat to joints.
  - 2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.
  - 3. Offset transverse joints, in successive courses, a minimum of 24 inches.
  - 4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time.

5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
6. Compact asphalt at joints to a density within 2 percent of specified course density.

### 3.8 COMPACTION

- A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers in accordance with the DelDOT Standard Specifications.
- B. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.
- C. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
- D. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

### 3.9 INSTALLATION TOLERANCES

- A. Pavement Thickness: Compact each course to produce the thickness indicated within the tolerances found in the DelDOT Standard Specifications.
- B. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the tolerances found in the DelDOT Standard Specifications.

3.10 Asphaltic Seal Coat: Application in accordance with manufacturer's recommendations.

### 3.11 PAVEMENT MARKING

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.
- B. Allow paving to age for 14 days before starting pavement marking.
- C. Sweep and clean surface to eliminate loose material and dust.
  1. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges.

### 3.12 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

- B. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.
- C. In-Place Density: In accordance with the DelDOT Standard Specifications.

### 3.13 DISPOSAL

- A. Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose of them in an DNREC approved landfill.

END OF SECTION

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## **SECTION 32 1313 CONCRETE PAVING**

### **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. Walks.
  - 2. Concrete Pavement
  - 3. Concrete Pads
  - 4. Concrete Curb
- B. Related Sections:
  - 1. Division 03 Section "Cast-in-Place Concrete" for general building applications of concrete.
  - 2. Division 32 Section "Concrete Paving Joint Sealants" for joint sealants in expansion and contraction joints within concrete paving and in joints between concrete paving and asphalt paving or adjacent construction.
- C. Delaware Department of Transportation (DelDOT) Standard Specifications.
- D. Delaware Department of Natural Resources and Environmental Control (DNREC) Sediment and Erosion Control Handbook.

#### **1.3 DEFINITIONS**

- A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, and ground granulated blast-furnace slag.

#### **1.4 SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Indicate pavement markings, lane separations, and defined parking spaces. Indicate, with international symbol of accessibility, spaces allocated for people with disabilities.

C. Other Action Submittals:

1. Design Mixtures: For each concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

D. Material Certificates: For the following, from manufacturer:

1. Cementitious materials.
2. Steel reinforcement and reinforcement accessories.
3. Admixtures.
4. Curing compounds.
5. Applied finish materials.
6. Bonding agent or epoxy adhesive.
7. Joint fillers.
8. Aggregates and sand materials.

E. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with the DelDOT Standard Specifications.

B. Testing Agency Qualifications: 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.

C. Pre-installation Conference: Conduct conference at Project site.

1. Review methods and procedures related to concrete paving, including but not limited to, the following:
  - a. Quality control of concrete materials and concrete paving construction practices.
2. Require representatives of each entity directly concerned with concrete paving to attend, including the following:
  - a. Contractor's superintendent.
  - b. Concrete paving subcontractor.

## 1.6 PROJECT CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

## PART 2 - PRODUCTS

### 2.1 FORMS

- A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces in accordance with the DelDOT Standard Specifications.
- B. Form-Release Agent: In accordance with the DelDOT Standard Specifications

### 2.2 STEEL REINFORCEMENT

- A. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, fabricated from steel wire into flat sheets as shown on the plans and in accordance with the DelDOT Specifications.

### 2.3 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of same type, brand, and source throughout Project:
  - a. Portland Cement: Per the DelDOT Standard Specifications.
- B. Normal-Weight Aggregates: Per the DelDOT Standard Specifications.
- C. Water: Per the DelDOT Standard Specifications.
- D. Air-Entraining Admixture: Per the DelDOT Standard Specifications.

### 2.4 CURING MATERIALS: All curing shall be in accordance with the DelDOT Standard Specifications.

### 2.5 RELATED MATERIALS

- A. Joint Fillers: In accordance with the DelDOT Standard Specifications.



- A. All concrete shall be Type "B" (3,000 PSI) in accordance with the DelDOT Standard Specifications.

## 2.7 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete in accordance with the DelDOT Standard Specifications.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.
- B. Proof-roll prepared subbase surface below concrete paving to identify soft pockets and areas of excess yielding.
  - 1. Completely proof-roll subbase in one direction. Limit vehicle speed to 3 mph.
  - 2. Proof-roll with a pneumatic-tired and loaded, 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
  - 3. Correct subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch according to requirements in Division 31 Section "Earth Moving."
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Remove loose material from compacted subbase surface immediately before placing concrete.

### 3.3 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.
- B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

### 3.4 STEEL REINFORCEMENT

- A. General: In accordance with the DelDOT Standard Specifications.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.
- C. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

### 3.5 JOINTS

- A. General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.
  - 1. When joining existing paving, place transverse joints to align with previously placed joints unless otherwise indicated.
- B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.
  - 1. Continue steel reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of paving strips unless otherwise indicated.
  - 2. Provide tie bars at sides of paving strips where indicated.
  - 3. Butt Joints: Use bonding agent at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated.
  - 1. Locate expansion joints at intervals of 50 feet for paving and 20 feet for sidewalks and curbing unless otherwise indicated.
  - 2. Extend joint fillers full width and depth of joint.
  - 3. Terminate joint filler not less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.
  - 4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
  - 5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
  - 6. During concrete placement, protect top edge of joint filler with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

- D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness at 25-foot intervals for paving and 5-feet for sidewalks.
  - 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/4-inch radius. Repeat grooving of contraction joints after applying surface finishes.
- E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes.

### 3.6 CONCRETE PLACEMENT

- A. Placement of concrete shall be as shown on the plans and in accordance with the DelDOT Standard Specifications.

### 3.7 FLOAT FINISHING

- A. Float finishing shall be in accordance with the DelDOT Standard Specifications.

### 3.8 CONCRETE PROTECTION AND CURING

- A. Concrete protection and curing shall be in accordance with the DelDOT Standard Specifications.

### 3.9 PAVING TOLERANCES

- A. Paving tolerances shall be in accordance with the DelDOT Standard Specifications.

### 3.10 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
  - 1. Testing Frequency: In accordance with the DelDOT Standard Specifications.
  - 2. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
  - 3. Compressive-Strength Tests: ASTM C 39/C 39M; test one specimen at seven days and two specimens at 28 days.

- a. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at 28 days.
- C. Strength of each concrete mixture will be satisfactory if average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
- D. Test results shall be reported in writing to 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.
- E. Concrete paving will be considered defective if it does not pass tests and inspections.
- F. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

### 3.11 REPAIRS AND PROTECTION

- A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Architect.
- B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory paving areas with portland cement concrete bonded to paving with epoxy adhesive.
- C. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.
- D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION



## **SECTION 32 3113 CHAIN LINK FENCES AND GATES**

### **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. Chain-link fences and gates.
  - 2. Swing Gates

- B. Related Sections:

- 1. Division 03 Section "Cast-in-Place Concrete" for cast-in-place concrete for equipment bases/pads for gate operators and controls and post footings.
  - 2. Division 26 Sections for electrical service and connections for motor operators, controls, limit and disconnect switches, and safety features and for system disconnect switches.

#### **1.3 PERFORMANCE REQUIREMENTS**

- a. Structural Performance: Chain-link fence and gate framework shall withstand the effects of gravity loads.

#### **1.4 SUBMITTALS**

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for chain-link fences and gates.

- 1. Fence and gate posts, rails, and fittings.
  - 2. Chain-link fabric, reinforcements, and attachments.
  - 3. Gates and hardware.

- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work. Show accessories, hardware, gate operation, and operational clearances.

## 1.5 QUALITY ASSURANCE

- A. Pre-installation Conference: Conduct conference at Project site.
  - 1. Review required testing, inspecting, and certifying procedures.
  - 2. Coordination of new fencing installation and removal of existing fencing.

## 1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify layout information for chain-link fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

## 1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer/Installer agrees to repair or replace components of chain-link fences and gates that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: Five years from date of Substantial Completion.

# PART 2 - PRODUCTS

## 2.1 CHAIN-LINK FENCE FABRIC

- A. General: Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle or twist. Comply with CLFMI Product Manual and with requirements indicated below:
  - 1. Fabric Height: As indicated on Drawings.
  - 2. Steel Wire Fabric: Wire with a diameter of 0.192 inch (6 gauge).
    - a. Mesh Size: 2 inches.
    - b. Zinc-Coated Fabric: ASTM A 392, Type II, Class 1, 1.2 oz./sq. ft. with zinc coating applied after weaving.
    - c. Coat selvage ends of fabric that is metallic coated before the weaving process with manufacturer's standard clear protective coating.
  - 3. Selvage: Twisted top and knuckled bottom.

## 2.2 FENCE FRAMING

- A. Posts and Rails: Comply with ASTM F 1043 for framing, including rails, braces, and line; terminal; and corner posts. Provide members with minimum dimensions and wall thickness according to ASTM F 1043 based on the following:
  - 1. Fence Height: As indicated on Drawings.
  - 2. Heavy Industrial Strength: Material Group IA, round steel pipe, Schedule 40.
    - a. Line Post: 4.0 inches.
    - b. End, Corner and Pull Post: 4.0 inches.
  - 3. Horizontal Framework Members: Top and bottom rails complying with ASTM F 1043, 1 5/8 inch diameter.
  - 4. Brace Rails: Comply with ASTM F 1043, 1 5/8 inch diameter.
  - 5. Metallic Coating for Steel Framing:
    - a. Type A, consisting of not less than minimum 2.0-oz./sq. ft. average zinc coating per ASTM A 123/A 123M.

## 2.3 SWING GATES

- A. General: Comply with ASTM F 900 for gate posts and single swing gate types.
  - 1. Gate Leaf Width: As indicated.
  - 2. Gate Fabric Height: As indicated.
- B. Pipe and Tubing:
  - 1. Zinc-Coated Steel: Comply with ASTM F 1043 and ASTM F 1083; protective coating and finish to match fence framing.
  - 2. Gate Posts: Round tubular steel.
  - 3. Gate Frames and Bracing: Round tubular steel.
- C. Frame Corner Construction: Welded.
- D. Hardware:
  - 1. Hinges: 180-degree inward swing.
  - 2. Latches permitting operation from both sides of gate with provision for padlocking accessible from both sides of gate.
  - 3. Padlock and Chain: Owner will provide locks.
  - 4. Lock: Closer: Manufacturer's standard.



5. See Architectural drawings for gate size and panic bars.

## 2.4 FITTINGS

- A. General: Comply with ASTM F 626.
- B. Rail and Brace Ends: For each gate, corner, pull, and end post.
- C. Rail Fittings: Provide the following:
  1. Top Rail Sleeves: Round-steel tubing not less than 6 inches long.
  2. Rail Clamps: Line and corner boulevard clamps for connecting bottom rails in the fence line-to-line posts.
- D. Tension and Brace Bands: Pressed steel.
- E. Tension Bars: Steel length not less than 2 inches shorter than full height of chain-link fabric. Provide one bar for each gate and end post, and two for each corner and pull post, unless fabric is integrally woven into post.
- F. Truss Rod Assemblies: Steel, hot-dip galvanized after threading rod and turnbuckle or other means of adjustment.
- G. Tie Wires, Clips, and Fasteners: According to ASTM F 626.
  1. Standard Round Wire Ties: For attaching chain-link fabric to posts, rails, and frames, complying with the following:
    - a. Hot-Dip Galvanized Steel: 0.106-inch; galvanized coating thickness matching coating thickness of chain-link fence fabric.
- H. Finish:
  1. Metallic Coating for Pressed Steel or Cast Iron: Not less than 1.2 oz. /sq. ft. zinc.

## 2.5 GROUT AND ANCHORING CEMENT

- A. Non-shrink, Nonmetallic Grout: Premixed, factory-packaged, non-staining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout, recommended in writing by manufacturer, for exterior applications.
- B. Erosion-Resistant Anchoring Cement: Factory-packaged, non-shrink, non-staining, hydraulic-controlled expansion cement formulation for mixing with potable water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended in writing by manufacturer, for exterior applications.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, and other conditions affecting performance of the Work.
  - 1. Do not begin installation before final grading is completed unless otherwise permitted by Architect/Engineer/Construction Manager.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### **3.2 PREPARATION**

- A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

#### **3.3 INSTALLATION, GENERAL**

- A. Install chain-link fencing to comply with ASTM F 567 and more stringent requirements indicated.

#### **3.4 CHAIN-LINK FENCE INSTALLATION**

- A. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings indicated, in firm, undisturbed soil.
- B. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil.
  - 1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
  - 2. Concrete Fill: Place concrete around posts to dimensions indicated and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.
- C. Terminal Posts: Locate terminal end, corner, and gate posts per ASTM F 567 and terminal pull posts at changes in horizontal or vertical alignment of 15 degrees or more.
- D. Line Posts: Space line posts uniformly at 10 feet o.c.
- E. Top Rail: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Run rail continuously through line post caps, bending to radius for curved runs and terminating into rail end attached to posts or post caps fabricated to receive rail

at terminal posts. Provide expansion couplings as recommended in writing by fencing manufacturer.

- F. Bottom Rails: Install and secure to posts with fittings.
- G. Chain-Link Fabric: Prior to placing fabric, excavate trench for placement of fence anchoring concrete. Apply fabric to outside of enclosing framework. Pull fabric taut and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released. Pour anchoring concrete as shown on the plans embedding 3-inches of the fabric in the concrete.
- H. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull, and gate posts with tension bands spaced not more than 15 inches o.c.
- I. Tie Wires: Use wire of proper length to firmly secure fabric to line posts and rails. Attach wire at one end to chain-link fabric, wrap wire around post a minimum of 180 degrees, and attach other end to chain-link fabric per ASTM F 626. Bend ends of wire to minimize hazard to individuals and clothing.
  - 1. Maximum Spacing: Tie fabric to line posts at 12 inches o.c. and to braces at 24 inches o.c.
- J. Fasteners: Install nuts for tension bands and carriage bolts on the side of the fence opposite the fabric side. Peen ends of bolts or score threads to prevent removal of nuts.

### 3.5 GATE INSTALLATION

- A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach fabric as for fencing. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

### 3.6 FIELD QUALITY CONTROL

### 3.7 ADJUSTING

- A. Gates: Adjust gates to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.
- B. Lubricate hardware, gate operator, and other moving parts.

END OF SECTION

## **SECTION 33 4100 STORM UTILITY DRAINAGE PIPING**

### **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. Pipe and fittings.
2. Nonpressure transition couplings.
3. Pressure pipe couplings.
4. Expansion joints and deflection fittings.
5. Drains.
6. Encasement for piping.
7. Manholes.
8. Channel drainage systems.
9. Catch basins.
10. Stormwater inlets.
11. Stormwater detention structures.
12. Pipe outlets.
13. Stormwater disposal systems.
14. Stormwater Management Facilities
15. Sectional Track Perimeter Drain
16. Infield Edge Drains
17. Turf Field Underdrains

- B. Delaware Department of Transportation (DelDOT) Standard Specifications.
- C. Delaware Department of Natural Resources and Environmental Control (DNREC) Sediment and Erosion Control Handbook.

#### **1.3 SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Shop Drawings:

1. Manholes: Include plans, elevations, sections, details, frames, and covers.
2. Catch basins: Include plans, elevations, sections, details, frames, covers, and grates.
3. Piping: Include manufacturer's certification for each pipe type.
4. Stormwater Management Facility Outlet Structures.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Do not store plastic manholes, pipe, and fittings in direct sunlight.
- B. Protect pipe, pipe fittings, and seals from dirt and damage.
- C. Handle manholes according to manufacturer's written rigging instructions.
- D. Handle catch basins according to manufacturer's written rigging instructions.

#### 1.5 PROJECT CONDITIONS

- A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
  1. Notify Architect/Engineer, Construction Manager and Owner no fewer than two days in advance of proposed interruption of service.

### **PART 2 - PRODUCTS**

#### 2.1 PIPING

- A. All storm drainage piping shall be as shown on the plans and in accordance with the DelDOT Standard Specifications.

#### 2.2 MANHOLES

- A. All storm water manholes shall be as shown on the plans and in accordance with the DelDOT Standard Specifications.

#### 2.3 CATCH BASINS

- A. All catch basins shall be as shown on the plans and in accordance with the DelDOT Standard specifications.

#### 2.4 STORMWATER MANAGEMENT STRUCTURES

- A. All structures shall be as shown on the plans and in accordance with either the DelDOT Standard Specifications or the DNREC Erosion and Sediment Control Handbook.

## 2.5 SECTIONAL TRACK PERIMETER DRAIN

- A. Utilize ACO Sport System #4020 at track perimeter and Sport System #2000 at 'D' Areas, as manufactured by Sports Field Specialties, Delhi, N.Y. 13753, (607) 746-8911; Pro Channel Drain #SE426 at track perimeter and 'XT' slot drain at 'D' Areas as manufactured by Sports Edge, ABT, Inc., Troutman, N.C. (800) 334-6057; or approved equivalent. Drain shall be furnished with eight (8) catch basins with removable trash buckets.
- B. Drain shall be connected at the 8 catch basin locations to the field's collector drainage system, as shown on plans and detailed.
- C. Provide manufacturer's descriptive information for these products for approval as well installation instructions and procedures.

## 2.6 "HYDROBLOX" INFIELD EDGE DRAINS

- A. Hydroblox is a prefabricated thermoplastic non-clogging drainage plank approximately 2"x 9"x 40" long, installed in a single line a 4-5" wide trench that is cut with hand trenching equipment.
- B. Provide the hydroblox where shown and detailed at the circular edge of skinned infields starting at the center of the skinned area, and sloping at no less than 0.50% toward either side of the infield to discharge points a shown on plans. The initial high point of the trench should be cut to a level that the top of the hydroblox plank is positioned at or slightly below the level of the subgrade at the circular edge of the infield.
- C. Upon completion of trenching and installation of the Hydroblox, backfill and clean excess soil from trenches, ready for seeding.

## PART 3 - EXECUTION

### 3.1 EARTHWORK

- A. Excavation, trenching, and backfilling are specified in Division 31 Section "Earth Moving."

### 3.2 PIPING INSTALLATION

- A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take into account design considerations. Install piping as

indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

- B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
- C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.

### 3.3 PIPE JOINT CONSTRUCTION

- A. Join gravity-flow, non-pressure drainage piping according to DelDOT Standard Specifications.

### 3.4 MANHOLE INSTALLATION

- A. General: Install manholes, complete with appurtenances and accessories indicated in accordance with the DelDOT Standard Specifications.

### 3.5 CATCH BASIN INSTALLATION

- A. Construct catch basins to sizes and shapes indicated in accordance with the DelDOT Standard Specifications.

### 3.6 CLOSING ABANDONED STORM DRAINAGE SYSTEMS

- A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:
  - 1. Close open ends of piping with at least 8-inch thick, brick masonry bulkheads.
- B. Abandoned Manholes and Structures: Excavate around manholes and structures as required and use one procedure below:
  - 1. Remove manhole or structure and close open ends of remaining piping.
- C. Backfill to grade according to Division 31 Section "Earth Moving."

3.7 FIELD QUALITY CONTROL

- A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.

3.8 CLEANING

- A. Clean interior of piping of dirt and superfluous materials.

END OF SECTION



