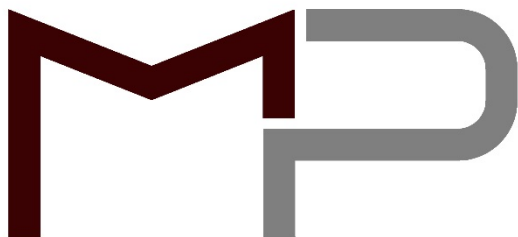
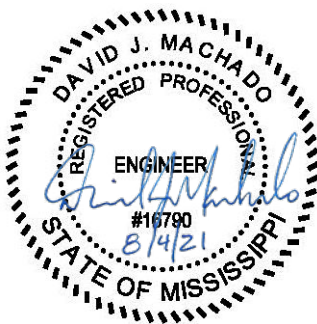


PROJECT MANUAL

# GULFPORT SCHOOL DISTRICT – HVAC REPLACEMENT

Anniston Elementary School  
Bayou View Elementary School  
Bayou View Middle School  
Central Elementary School  
Gaston Elementary School  
Middle/West Elementary School  
Pass Road Elementary School

Gulfport School District  
2001 Pass Road | Gulfport, Mississippi 39501



**MACHADO | PATANO**  
ENGINEERING + ARCHITECTURE  
**M | P DESIGN GROUP**  
BRADFORD A. JONES, ARCHITECT  
918 HOWARD AVE STE F • BILOXI • MS 39530  
P: 228.388.1950 • F: 228.388.1971 • WWW.MPENG.US

M|P Project # 0247.21.001  
REV 0: ISSUED FOR CONSTRUCTION 08.04.2021

ENGINEERING • ARCHITECTURE • PLANNING • SURVEYING

**SECTION 000102**  
**PROJECT INFORMATION**

**PART 1 GENERAL**

**1.01 PROJECT IDENTIFICATION**

- A. Project Name: Gulfport School District - HVAC Replacement, located at the following addresses:
  - Anniston Elementary School - 2314 Jones Street, Gulfport, MS 39507
  - Bayou View Elementary School - 4898 Washington Avenue, Gulfport, MS 39507
  - Bayou View Middle - 212 43rd Street, Gulfport, MS 39507
  - Central Elementary - 1043 Pass Road, Gulfport, MS 39501
  - Gaston Point Elementary School - 1526 Mill Road, Gulfport, MS 39507
  - Middle/West Elementary - 4051 15th Street, Gulfport, MS 39507
  - Pass Road Elementary School - 37 Pass Road, Gulfport, MS 39507
- B. The Owner, hereinafter referred to as Owner: Gulfport School District
- C. Owner's Project Manager: Engineer/Architect.

**1.02 NOTICE TO PROSPECTIVE BIDDERS**

- A. These documents constitute an Invitation to Bid to General Contractors for the construction of the project described below.

**1.03 PROJECT DESCRIPTION**

- A. Summary Project Description: This project will consist of the following general scope of work. This description is provided for convenience purposes only and shall not be considered all inclusive. It is the general contractor's responsibility to become fully familiar with the existing conditions, review all of the construction document drawings, specifications, and any additional information documents in their entirety and bring forth any and all questions regarding scope confusion, misinterpretations, and/or possible errors and omissions to the Architect and/or Engineer prior to bid submission and/or start of construction.
  - 1. This project consists of HVAC equipment replacement across multiple schools within the School District. Its will also include associated electrical improvements as described in the Construction Documents and Specifications.
- B. Contract Terms: Lump sum (fixed price, stipulated sum).
- C. All bid amounts must be based on the most stringent requirement called for in the complete construction document package. In addition, the most stringent requirement shown shall govern and take precedence in the event of any and all conflicts between different drawings (plans, elevations, details, sections, schedules, etc...), between different specification sections, within specification sections, and between the drawings and the specifications. It will be the General Contractor's responsibility to bring any and all discrepancies to the architect's attention for further clarity prior to submitting a formal bid.
- D. The currently occupied premises at the project site are open for examination by bidders only during the following hours:
  - 1. Monday through Friday: 8:00 AM to 5:00 PM.

**1.04 PROJECT CONSULTANTS**

- A. The Architect, hereinafter referred to as Engineer/Architect: M|P Design Group, PLLC/Machado Patano, PLLC.
  - 1. Address: 918 Howard Avenue, Suite F.
  - 2. City, State, Zip: Biloxi, MS 39530.
  - 3. Phone: 228-388-1950.

4. Fax: 228-388-1971
5. Website: [www.mpeng.us](http://www.mpeng.us)
6. Plan Room: [www.mpengplans.us](http://www.mpengplans.us)
7. E-mail: [dmachado@mpeng.us](mailto:dmachado@mpeng.us), [fsilva@mpeng.us](mailto:fsilva@mpeng.us).

#### **1.05 PROCUREMENT TIMETABLE**

- A. A non-mandatory Pre-Bid Meeting and site walk: Wednesday, August 18, 2021 at 09:00AM local time at the front entry lobby of Gaston Point Elementary at 1526 Mill Road, Gulfport, MS 39507. Following the meeting, a site walkthrough in all schools included in this project will be conducted.
- B. Last Request for Substitution Due: 7 days prior to due date of bids.
- C. Last Request for Information Due: 7 days prior to due date of bids.
- D. Bid Due Date: Thursday, September 2, 2021, before 11AM local time.
- E. Bid Opening: Same day, after the bids are due at the discretion of the Owner and a time that is best determined by the Owner.
- F. Notice to Proceed: Will be issued after contract award with anticipated start dates as shown below.
- G. Bids May Not Be Withdrawn Until: 60 days after due date.
- H. Contract Time: 240 Calendar Days.
- I. Anticipated Construction Start: Not later than Monday, October 4, 2021.
- J. Completion date is critical due to requirements of Owner's operations.
- K. The Owner reserves the right to change the schedule or terminate the entire procurement process at any time.

#### **1.06 PROCUREMENT DOCUMENTS**

- A. Availability of Documents: Complete sets of procurement documents may be obtained:
  1. Bid Documents for a Stipulated Sum contract may be obtained from the website of the Architect at [www.mpengplans.us](http://www.mpengplans.us) upon receipt of a nonrefundable deposit, by cash or check, in the amount indicated on the plan room site for one set delivered in PDF format.
  2. Bid Documents can be obtained from PlanHouse printing in Gulfport, MS. Contact PlanHouse Printing at (228) 248-0181 for more detailed information on pricing and available construction document delivery formats.
- B. Documents may be viewed at Office of the Architect.

#### **1.07 BID SECURITY**

- A. Bids shall be accompanied by a security deposit as follows:
  1. Bid Bond of a sum not less than 5 percent of the Bid Amount on AIA A310 Bid Bond Form.

#### **PART 2 PRODUCTS (NOT USED)**

#### **PART 3 EXECUTION (NOT USED)**

**END OF SECTION**

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- C. 000820 - Federal Requirements
- D. 001113 - Advertisement for Bids
- E. 002113 - Instructions to Bidders
- F. 004000 - Procurement Forms and Supplements
- G. 004100 - Bid Form
- H. 004105 - Form of Non Collusive Affidavit
  - 1. Architect's Non Collusive Affidavit Form
- I. 004325 - Substitution Request Form - During Procurement
  - 1. Architect's Substitution Request Form
- J. 005000 - Contracting Forms and Supplements
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- D. 012300 - Alternates
- E. 013000 - Administrative Requirements
- F. 014000 - Quality Requirements
- G. 014100 - Regulatory Requirements
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**END OF SECTION**

## **SECTION 000820 FEDERAL REQUIREMENTS**

### **PART 1 GENERAL**

#### **1.01 GENERAL REQUIREMENTS**

- A. This project is a federally funded project and must comply with federal construction and related laws, including, but not limited to, the Davis Bacon Act, Buy American Act, Clean Air Act, Occupational Safety and Health Act (OSHA), as well as Preservation of Historical Sites and Buildings. All energy conservation must be considered using American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) standards.
- B. In addition, the contractor will be required to comply with the requirements below, but not limited to Sections 34 CFR Section 76.600 (Where to Find Construction Regulations), 34 CFR Sections 75.600-75.617, 2 Section 200.321 Contracting with Small and Minority Businesses, Women's Business Enterprises, and Labor Surplus Area Firms, 2 Section 200.322 Domestic Preference for Procurements, 2 Section 200.324 Contract Cost and Price, 2 Section 200.325 Federal Awarding Agency or Pass-Through Entity Review, 2 Section 200.326 Bonding Requirements, 2 Section 200.327 Contract Provisions, 2 Section 200.329(d) Construction Performance Reports, as well as Appendix II to Part 200- Contract Provision for Non-Federal Entity Contract under Federal awards, including Equal Employment Opportunity, Davis Bacon Act, as amended (40 U.S.C. 3141-3148), Contract Work Hours and Safety Standards Act (40 U.S.C. 3701-3708), Rights to Inventions Made Under Contract or Agreement, Clean Air Act (42 U.S.C. 7401-7671q) and the Federal Water Pollution Control Act (33 U.S.C. 1251-1387) as amended, Debarment and Suspension (Executive Orders 12549 and 12689) and the Byrd Anti-Lobbying Amendment (31 U.S.C. 1352)

### **PART 2 EQUAL OPPORTUNITY**

#### **2.01 REQUIREMENTS**

- A. The contractor will maintain policies of employment as follows:
  - 1. The Contractor and all Subcontractors will not discriminate against any employee or applicant for employment because of race, religion, color, sex, national origin, or age. The Contractor will take affirmative action to ensure that applicants are employed and that employees are treated during employment without regard to their race, religion, color, sex, national origin, or age. Such action will include, but not limited to the following employment, upgrading, demotion or transfer, recruitment, or recruitment advertisement, layoff or termination, rates of pay or other forms of compensation, selection for training including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the policies of non-discrimination.
  - 2. The Contractor and all Subcontractors will, in all solicitations or advertisements for employees' places by them or their behalf, state that all qualified applicants receive consideration for employment without regard to race, religion, color, sex, national origin or age.

### **PART 3 DAVIS-BACON ACT REGULATIONS**

#### **3.01 CONTRACT PROVISIONS AND RELATED MATTERS**

- A. Every employer performing work covered by the labor standards of The Davis-Bacon and related Acts shall post the notice *WH-1321 attached in Appendix A* (including any applicable wage determination) at the site of the work in a prominent and accessible place where it may be easily seen by employees.
- B. Under the Davis-Bacon and related Acts, covered contractors must maintain payroll and basic records for all covered laborers and mechanics during the course of the work and for a period of the three years thereafter. Records to be maintained include:
  - 1. Name, address, and social security number of each worker

2. Each worker's work classifications
  3. Hourly rates of pay, including rates of contributions or costs anticipated for fringe benefits or their cash equivalents
  4. Daily and weekly numbers of hours worked
  5. Deductions made
  6. Actual wages paid
  7. Detailed information regarding bona fide fringe benefit plans and programs, including records that show that the plan or program has been communicated in writing to the laborers and mechanics affected
  8. If applicable, detailed information regarding approved apprenticeship or trainee programs
  9. See *Fact sheet #21: Recordkeeping requirements under the Fair Labor Standards Act* attached in Appendix A.
- C. Each covered contractor and subcontractor must, on a weekly basis, provide the contracting agency a copy of all payrolls providing the information listed above under "Recordkeeping" for the preceding weekly payroll period, except that that full social security numbers and home addresses shall not be included on weekly transmittals, and instead the payrolls only need to include an individually identifying number for each worker (e.g., the last four digits of the worker's social security number). Each payroll submitted must be accompanied by a "Statement of Compliance" using page 2 of *Form WH-347 Payroll attached in Appendix A (For Contractors Optional Use)*, or any form with identical wording, certifying compliance with applicable requirements. The statement is to be signed by the contractor or subcontractor, or by an authorized officer or employee of the contractor or subcontractor who supervises the payment of wages, and delivered to a representative of the federal or state agency in charge. This must be submitted within seven days after the regular pay date for the pay period
- D. Minimum Wages:
1. (i) All mechanics and laborers employed or working upon the site of the work, will be paid unconditionally and not less often than once a week and without subsequent deduction or rebate on any account (except such payroll deductions as permitted by regulations, issued by the Secretary of Labor under the Copeland Act, 29 CFR Part 3), the full amounts due at time of payment computed at wages rates not less than those contained in the wage determination decision of the Secretary of Labor which is attached hereto and made part of hereof, regardless of any contractual relationship which may be alleged to exist between the Contractor and such laborers and mechanics, and the wage determination decision will be posted by the Contractor at the site of the work in a prominent place where can be easily seen by workers. For the purpose of this clause, contributions made costs reasonably anticipated under Section 1 (b) (2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of 28 CFR 5.5 (a) (1) (iv). Also, for the purpose of this clause, regular contributions made or costs incurred for more than a weekly period under plans, funds or programs, but covering the particular weekly period are deemed to be constructively made or incurred during such weekly periods.
  2. (ii) The contracting officer will require that any class of laborers or mechanics, including apprentices and trainees, which is not listed in the wage determination and which is to be employed under the contract, will be classified or reclassified conformably to wage determination and a report of the action taken will be sent by the State Agency to the Secretary of Labor in the event the interested parties cannot agree on the proper classification or reclassification of a particular class of laborers and mechanics, including apprentices and trainees to be used, the question, accompanied by the recommendation of the contracting officer, will be referred to the Secretary for final determination.
  3. (iii) The contracting officer will require, whenever the minimum wage rate prescribed in the Contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly wage rate and the contractor is obligated to pay a cash equivalent of such a fringe benefit, an hourly cash equivalent thereof to be established. In the event



- the interested parties cannot agree upon a cash equivalent of the fringe benefit the question, accompanied by the recommendation of the contracting officer, shall be referred to the Secretary of Labor for determination.
4. (iv) If the Contractor does not make payments to a trustee or other third person, he may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing benefits under a plan or program of a type expressly listed in the wage determination decision of the Secretary of Labor is a part of this Contract. Provide, however, the Secretary of Labor has found, upon the written request of the Contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the Contractor to set aside in a separate account assets for the meeting of obligations under the plan, or program.
- E. Withholding: The State may withhold or cause to be withheld from the contractor so much of the accrued payments or advances as may be considered necessary to laborers and mechanics, including apprentices and trainees, employed by the Contractor or any Subcontractor on the work the full amount of wages required by the Contract. In the event of failure to pay any laborer or mechanic, including any apprentice of the Project, all or part of the wages required by the Contract, the State may, after written notice to the Contractor, sponsor, applicant of Owner, take such action as may be necessary to cause the suspension of any further payment, advance or guarantee of funds until such violations have ceased.
- F. Payroll and Basic Records:
1. (i) Payrolls and basic record relating thereto will be maintained during the course of the work and preserved for a period of three (3) years thereafter for all laborers and mechanics working at the site of the work in the construction or development of the Project. Such record will contain the name and address of each employee, his correct classification, rates of pay (including rates of contributions or costs anticipated of the types described in Section 1 (b) (2) of the Davis-Bacon Act, daily and weekly number of hours worked, deductions made, and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5 (a) (1) (iv) the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in Section 1 (b) (2) (b) of the Davis-Bacon Act, the Contractor will maintain record which show that the commitment to provide such benefits is enforceable that the plan or program is financially responsible and that the plan or program has been communicated in writing to the laborers or mechanics affected and records which show the costs anticipated or the actual cost incurred in providing such benefits.
  2. (ii) The Contractor will submit weekly a copy of all payrolls to the Project Architect/Engineer or will submit payrolls to the applicant, sponsor or Using Agency as the case may be, for transmission to the State. The copy will be accompanied by a statement signed by the employer or his agent indicating that the payrolls are correct and complete, that the wage rates contained therein are not less than those determined by the Secretary of Labor and that the classifications set forth for each laborer or mechanic conform with the work he performed. A submission of a "Weekly Statement of Compliance" which is required under this Contract and the Copeland regulations of the Secretary of Labor (29 DFR, Part 3) and the filing with the initial payroll or any subsequent payroll of a copy of any findings by the Secretary of Labor under 29 CFR 5.5 (a) (1) (iv) will satisfy this requirement. The Prime Contractor will be responsible for submission of copies of payrolls of all Subcontractors. The Contractor will make the records required under the labor standards clauses of the Contract available for inspection by authorized representatives to interview employees during working hours on the job.
- G. Apprentices and Trainees:
1. (i) Apprentices: Apprentices will be permitted to work as such only when they are registered individually under a bona fide apprenticeship program registered with a State apprenticeship agency which is recognized by the Bureau of Apprenticeship and Training, U. S. Department of Labor or, if no such recognized agency exists in a State, under a

- program registered with the Bureau of Apprenticeship and Training, U.S., Department of Labor. The allowable ratio of apprentices to journeymen in any craft classification will not be greater than the ratio of permitted to the Contractor as to his entire work force under the registered program. Any employee listed on a payroll at an apprentice wage rate, who is not a trained as defined in subdivision (kk) of this subparagraph or is not registered as above, will be paid the wage rate determined by the Secretary of Labor for the classification of work he actually performed. The Contractor or Subcontractor will be required to furnish to the contracting officer written evidence of the registration of his program and apprentices, as well as of the appropriate ratios and wage rates, for the area of construction prior to using any apprentices on the contract work.
2. (ii) Trainees: Trainees will be permitted to work as such when they are bona fide trainees employed pursuant to a program approved by the U. S. Department of Labor, Manpower Administration, Bureau of Apprenticeship and training, and where subdivision (iii) of this subparagraph is applicable, in accordance with the provisions of Part 5a of this subtitle.
  3. (iii) Application of 29 CFR part 5a: On Contracts in excess of \$10,000, the employment of all laborers and mechanics, including apprentices and trainees, as defined in 5.2 ©, will also be subject to the provisions of Part 5a of this subtitle. Apprentices and trainees will be hire in accordance with the requirements of Part 5a of this subtitle.
- H. Compliance with Copeland Regulations 29CFR Part 3: The Contractor will comply with the Copeland Regulations (29 CFR Part 3) of the Secretary of Labor which are herein incorporated by reference.
- I. Subcontractors: The contractor will insert in any subcontracts the clauses contained in 29 DFR 5.5 (a) (1) through (5) and (7) and such other clauses as the State may, by appropriate instructions, require and also a clause requiring the Subcontractors to include these clauses in any lower tier subcontracts which they may enter into, together with a clause requiring this insertion in any further subcontracts that they may in turn be made.
- J. Contract Termination, Debarment: A breach of clauses (1) through (6) may be grounds for termination of the Contract for debarment as provided in 29 CFR 5.6.
- K. PART 5A – LABOR STANDARDS FOR RATIOS OF APPRENTICES AND TRAINEES TO JOURNEYMEN ON FEDERAL AND FEDERALLY ASSISTED CONSTRUCTION.
- L. 5a.3 APPRENTICE AND TRAINEE EMPLOYMENT REQUIREMENTS:
1. The following Contract clauses will be conditions of each Federal or Federally assisted construction Contract in excess of \$10,000 and each Federal agency concerned will include the clauses or provide for their inclusion in each such Contract.
  2. The contractors agree:
    - a. (i) That he will make a diligent effort to hire for the performance of the Contract a number of apprentices or trainees, or both, in each occupation, which bears to the average number of the journeymen in that occupation to be employed in the performance of the Contract the applicable ratio as determined by the Secretary of Labor.
    - b. (ii) That he will assure that twenty-five percent (25%) of such apprentices or trained in each occupation are in their first year of training, where feasible. Feasibility here involves a consideration of: (a) the availability of training opportunities for first year apprentices; (b) the hazardous nature of the work for beginning workers; and (c) excessive unemployment of apprentices in their second and subsequent years of training.
    - c. (iii) That during the performance of the Contract, he will, to the greatest extent possible, employ the number of apprentices or trainees necessary to meet currently the requirements of subdivisions (i) and (ii) of this subparagraph.
    - d. The contractor agrees to maintain records of employment by trade of the number of apprentices and trainees, apprentices and trainees by first year of training, and of journeymen and the wages paid and hours of work of such apprentices, trainees and

- journeymen. The contractor agrees to make these records available for inspection upon request of the Department of Labor and the Federal agency concerned.
- e. The Contractor who claims compliance based on the criterion stated in 5a.4(a) agrees to maintain records of employment, as described in 5a3(a) (2), on non-Federal and Non-federally assisted construction work done during the performance of this Contract in the same labor area. The contractor agrees to make these record available for inspection upon request of the Department of Labor and the Federal agency concerned.
3. CRITERIA FOR MEASURING DILIGENT EFFORT
- a. (A) The Contractor employs, on all his public and private construction work combined in the labor market area of his Project, an average number of apprentices and trainees by craft as required by the contract clauses, at least equal to the ratios established in accordance with 5a.5.
4. DETERMINATION OF RATIOS OF APPRENTICES OR TRAINEES TO JOURNEYMEN
- a. The Secretary of Labor has determined that the applicable ratios of apprentices and trainees to journeymen in an occupation will be as follow:
    - 1) (a) In any occupation the applicable ratio of apprentices and trainees to journeymen will be equal to the predominant ratio for the occupation in the area where the construction is to be undertaken, set forth in collective bargaining agreements or other employment agreements and available through the regional Manager for the Bureau of Apprenticeship and Training for the applicable area.
    - 2) (b) For any occupation for which no such ratio is found, the ratio of apprentices and trainees to journeymen will be determined by the Contractor in accordance with the recommendations set forth in the standards of the National Joint Apprentice Committee for the occupation, which are field with the U. S. Department of Labor's Bureau of Apprenticeship and Training.
    - 3) (c) For any occupation for which no such recommendations are found, the ratio of apprentices and trainees to journeymen will be at least (1) apprentice or trainee for every five (5) journeymen.

### **PART 3 – FEDERAL AQUISITION REGULATIONS**

#### **4.01 25.1102(A) BUY AMERICAN-CONSTRUCTION MATERIALS (FEB 2021)**

- (a) Definitions. As used in this clause - Commercially available off-the-shelf (COTS) item
  - (1) Means any item of supply (including construction material) that is
    - (i) A commercial item (as defined in paragraph (1) of the definition at Federal Acquisition Regulation (FAR) 2.101);
    - (ii) Sold in substantial quantities in the commercial marketplace; and
    - (iii) Offered to the Government, under a contract or subcontract at any tier, without modification, in the same form in which it is sold in the commercial marketplace; and
  - (2) Does not include bulk cargo, as defined in 46 U.S.C. 40102(4), such as agricultural products and petroleum products.

"Construction material" means an article, material, or supply brought to the construction site by the Contractor or a subcontractor for incorporation into the building or work. The term also includes an item brought to the site preassembled from articles, materials, or supplies. However, emergency life safety systems, such as emergency lighting, fire alarm, and audio evacuation systems, that are discrete systems incorporated into a public building or work and that are produced as complete systems, are evaluated as a single and distinct construction material regardless of when or how the individual parts or components of those systems are delivered to the construction site. Materials purchased directly by the Government are supplies, not construction material.

Cost of components means—

- (1) For components purchased by the Contractor, the acquisition cost, including transportation costs to the place of incorporation into the construction material (whether or

not such costs are paid to a domestic firm), and any applicable duty (whether or not a duty-free entry certificate is issued); or

(2) For components manufactured by the Contractor, all costs associated with the manufacture of the component, including transportation costs as described in paragraph (1) of this definition, plus allocable overhead costs, but excluding profit. Cost of components does not include any costs associated with the manufacture of the construction material.

Domestic construction material means—

(1) For construction material that does not consist wholly or predominantly of iron or steel or a combination of both-

(i) An unmanufactured construction material mined or produced in the United States; or

(ii) A construction material manufactured in the United States, if-

(A) The cost of its components mined, produced, or manufactured in the United States exceeds 55 percent of the cost of all its components. Components of foreign origin of the same class or kind for which nonavailability determinations have been made are treated as domestic. Components of unknown origin are treated as foreign; or

(B) The construction material is a COTS item; or

(2) For construction material that consists wholly or predominantly of iron or steel or a combination of both, a construction material manufactured in the United States if the cost of foreign iron and steel constitutes less than 5 percent of the cost of all components used in such construction material. The cost of foreign iron and steel includes but is not limited to the cost of foreign iron or steel mill products (such as bar, billet, slab, wire, plate, or sheet), castings, or forgings utilized in the manufacture of the construction material and a good faith estimate of the cost of all foreign iron or steel components excluding COTS fasteners. Iron or steel components of unknown origin are treated as foreign. If the construction material contains multiple components, the cost of all the materials used in such construction material is calculated in accordance with the definition of "cost of components".

Fastener means a hardware device that mechanically joins or affixes two or more objects together. Examples of fasteners are nuts, bolts, pins, rivets, nails, clips, and screws.

Foreign construction material means a construction material other than a domestic construction material.

Foreign iron and steel means iron or steel products not produced in the United States.

Produced in the United States means that all manufacturing processes of the iron or steel must take place in the United States, from the initial melting stage through the application of coatings, except metallurgical processes involving refinement of steel additives. The origin of the elements of the iron or steel is not relevant to the determination of whether it is domestic or foreign.

Predominantly of iron or steel or a combination of both means that the cost of the iron and steel content exceeds 50 percent of the total cost of all its components. The cost of iron and steel is the cost of the iron or steel mill products (such as bar, billet, slab, wire, plate, or sheet), castings, or forgings utilized in the manufacture of the product and a good faith estimate of the cost of iron or steel components excluding COTS fasteners.

Steel means an alloy that includes at least 50 percent iron, between 0.02 and 2 percent carbon, and may include other elements.

"United States" means the 50 States, the District of Columbia, and outlying areas.

(b) Domestic preference.

(1) This clause implements 41 U.S.C. chapter 83, Buy American, by providing a preference for domestic construction material. In accordance with 41 U.S.C. 1907, the domestic content test of the Buy American statute is waived for construction material that is a COTS item, except that for construction material that consists wholly or predominantly of iron or

steel or a combination of both, the domestic content test is applied only to the iron and steel content of the construction materials, excluding COTS fasteners. (See FAR 12.505(a)(2)). The Contractor shall use only domestic construction material in performing this contract, except as provided in paragraphs (b)(2) and (b)(3) of this clause.

(2) This requirement does not apply to information technology that is a commercial item or to the construction materials or components listed by the Government as follows:

\_\_\_\_\_[Contracting Officer to list applicable excepted materials or indicate "none"]

(3) The Contracting Officer may add other foreign construction material to the list in paragraph (b)(2) of this clause if the Government determines that-

- (i) The cost of domestic construction material would be unreasonable. The cost of a particular domestic construction material subject to the requirements of the Buy American statute is unreasonable when the cost of such material exceeds the cost of foreign material by more than 20 percent;
- (ii) The application of the restriction of the Buy American statute to a particular construction material would be impracticable or inconsistent with the public interest; or
- (iii) The construction material is not mined, produced, or manufactured in the United States in sufficient and reasonably available commercial quantities of a satisfactory quality.

(c) Request for determination of inapplicability of the Buy American statute.

(1) (i) Any Contractor request to use foreign construction material in accordance with paragraph (b)(3) of this clause shall include adequate information for Government evaluation of the request, including-

- (A) A description of the foreign and domestic construction materials;
- (B) Unit of measure;
- (C) Quantity;
- (D) Price;
- (E) Time of delivery or availability;
- (F) Location of the construction project;
- (G) Name and address of the proposed supplier; and
- (H) A detailed justification of the reason for use of foreign construction materials cited in accordance with paragraph (b)(3) of this clause.

(ii) A request based on unreasonable cost shall include a reasonable survey of the market and a completed price comparison table in the format in paragraph (d) of this clause.

(iii) The price of construction material shall include all delivery costs to the construction site and any applicable duty (whether or not a duty-free certificate may be issued).

(iv) Any Contractor request for a determination submitted after contract award shall explain why the Contractor could not reasonably foresee the need for such determination and could not have requested the determination before contract award. If the Contractor does not submit a satisfactory explanation, the Contracting Officer need not make a determination.

(2) If the Government determines after contract award that an exception to the Buy American statute applies and the Contracting Officer and the Contractor negotiate adequate consideration, the Contracting Officer will modify the contract to allow use of the foreign construction material. However, when the basis for the exception is the unreasonable price of a domestic construction material, adequate consideration is not less than the differential established in paragraph (b)(3)(i) of this clause.

(3) Unless the Government determines that an exception to the Buy American statute applies, use of foreign construction material is noncompliant with the Buy American statute.

(d) Data. To permit evaluation of requests under paragraph (c) of this clause based on unreasonable cost, the Contractor shall include the following information and any applicable

supporting data based on the survey of suppliers:

#### **4.02 52.225-10 NOTICE OF BUY AMERICAN REQUIREMENT-CONSTRUCTION MATERIALS**

(a) Definitions. "Commercially available off-the-shelf (COTS) item," "construction material," "domestic construction material," and "foreign construction material," as used in this provision, are defined in the clause of this solicitation entitled "Buy American-Construction Materials" (Federal Acquisition Regulation (FAR) clause 52.225-9).

(b) Requests for determinations of inapplicability. An offeror requesting a determination regarding the inapplicability of the Buy American statute should submit the request to the Contracting Officer in time to allow a determination before submission of offers. The offeror shall include the information and applicable supporting data required by paragraphs (c) and (d) of the clause at FAR 52.225-9 in the request. If an offeror has not requested a determination regarding the inapplicability of the Buy American statute before submitting its offer, or has not received a response to a previous request, the offeror shall include the information and supporting data in the offer.

(c) Evaluation of offers.

(1) The Government will evaluate an offer requesting exception to the requirements of the Buy American statute, based on claimed unreasonable cost of domestic construction material, by adding to the offered price the appropriate percentage of the cost of such foreign construction material, as specified in paragraph (b)(3)(i) of the clause at FAR 52.225-9.

(2) If evaluation results in a tie between an offeror that requested the substitution of foreign construction material based on unreasonable cost and an offeror that did not request an exception, the Contracting Officer will award to the offeror that did not request an exception based on unreasonable cost.

(d) Alternate offers.

(1) When an offer includes foreign construction material not listed by the Government in this solicitation in paragraph (b)(2) of the clause at FAR 52.225-9, the offeror also may submit an alternate offer based on use of equivalent domestic construction material.

(2) If an alternate offer is submitted, the offeror shall submit a separate Standard Form 1442 for the alternate offer, and a separate price comparison table prepared in accordance with paragraphs (c) and (d) of the clause at FAR 52.225-9 for the offer that is based on the use of any foreign construction material for which the Government has not yet determined an exception applies.

(3) If the Government determines that a particular exception requested in accordance with paragraph (c) of the clause at FAR 52.225-9 does not apply, the Government will evaluate only those offers based on use of the equivalent domestic construction material, and the offeror shall be required to furnish such domestic construction material. An offer based on use of the foreign construction material for which an exception was requested-

(i) Will be rejected as nonresponsive if this acquisition is conducted by sealed bidding; or

(ii) May be accepted if revised during negotiations.

### **PART 5 - COMPLIANCE DOCUMENTS**

#### **5.01 ATTACHEMENTS**

- A. Refer to attachment General Decision Number: MS20210050 04/02/2021.
- B. Refer to Appendix A - Required Davis-Bacon and Related Acts Compliance Documents

**END OF SECTION**

"General Decision Number: MS20210050 04/02/2021

Superseded General Decision Number: MS20200050

State: Mississippi

Construction Type: Building

BUILDING CONSTRUCTION PROJECTS (does not include single family homes or apartments up to and including 4 stories).

County: Harrison County in Mississippi.

Note: Under Executive Order (EO) 13658, an hourly minimum wage of \$10.95 for calendar year 2021 applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least \$10.95 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in calendar year 2021. If this contract is covered by the EO and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must pay workers in that classification at least the wage rate determined through the conformance process set forth in 29 CFR 5.5(a)(1)(ii) (or the EO minimum wage rate, if it is higher than the conformed wage rate). The EO minimum wage rate will be adjusted annually. Please note that this EO applies to the above-mentioned types of contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but it does not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60). Additional information on contractor requirements and worker protections under the EO is available at [www.dol.gov/whd/govcontracts](http://www.dol.gov/whd/govcontracts).

Modification Number	Publication Date
0	01/01/2021
1	02/12/2021
2	04/02/2021

ELEC0903-012 12/01/2019

	Rates	Fringes
ELECTRICIAN (Includes Low Voltage Wiring).....	\$ 27.45	9.5%+5.52

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ENGI0624-008 01/01/2017

	Rates	Fringes
POWER EQUIPMENT OPERATOR Forklift.....	\$ 26.20	12.30

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IRON0798-009 10/01/2020

	Rates	Fringes
IRONWORKER, REINFORCING.....	\$ 27.30	15.87

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\* PLUM0568-007 11/01/2020

	Rates	Fringes
PIPEFITTER (Includes HVAC Unit Installation (Excludes HVAC Pipe Installation)).....	\$ 27.11	10.57
PLUMBER (Includes HVAC Pipe Installation (Excludes HVAC Unit Installation)).....	\$ 27.11	10.02

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SHEE0441-006 07/01/2014

	Rates	Fringes
SHEET METAL WORKER (Includes HVAC Duct Installation).....	\$ 20.00	11.72

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SUMS2015-011 04/03/2017

	Rates	Fringes
BRICKLAYER.....	\$ 22.00	0.02
CARPENTER, Includes Drywall Hanging, Finishing/Taping and Form Work.....	\$ 15.90	0.00
CEMENT MASON/CONCRETE FINISHER...	\$ 18.37	0.00
IRONWORKER, STRUCTURAL.....	\$ 18.51	0.00
LABORER: Common or General.....	\$ 10.91	0.00
LABORER: Mason Tender - Cement/Concrete.....	\$ 12.50	0.00
OPERATOR: Backhoe/Excavator/Trackhoe.....	\$ 17.93	1.62
OPERATOR: Bulldozer.....	\$ 15.14	1.03
OPERATOR: Crane.....	\$ 21.40	3.58
PAINTER (Brush and Roller).....	\$ 17.00	0.00
ROOFER.....	\$ 14.50	0.00
SPRINKLER FITTER (Fire Sprinklers).....	\$ 21.21	0.00
TILE SETTER.....	\$ 18.00	0.00
TRUCK DRIVER: Dump Truck.....	\$ 14.11	0.27

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WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this



contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at [www.dol.gov/whd/govcontracts](http://www.dol.gov/whd/govcontracts).

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

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The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of ""identifiers"" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

#### Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

#### Survey Rate Identifiers

Classifications listed under the ""SU"" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007

in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

#### Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

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#### WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- \* an existing published wage determination
- \* a survey underlying a wage determination
- \* a Wage and Hour Division letter setting forth a position on a wage determination matter
- \* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations  
Wage and Hour Division  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator  
U.S. Department of Labor  
200 Constitution Avenue, N.W.

Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION"



## INDEPENDENT CONTRACTOR DEBARMENT VERIFICATION FORM

(Please print clearly or type)

Subgrantee's/Contractor's Name	
Authorized Official's Name	
Complete Address	
Contact Number	
Are you currently registered with <a href="http://www.sam.gov">www.sam.gov</a> (Yes or No) If yes, attach supporting documentation and DUNS number must be Active with open access. <b>(Federal fund requirement)</b>	
Are you currently registered to do business in the State of Mississippi? (Yes or No) If yes, attach supporting documentation of registration status. If not, please register and provide documentation of registration status. <b>(Federal and State/Other fund requirement)</b>	

*\*\*Appropriate signatures shall certify statements below.*

### FEDERAL DEBARMENT CERTIFICATION:

CONTRACTOR hereby certify that at the execution of a contract with the Mississippi Department of Education, CONTRACTOR is not on the list for federal debarment on [www.sam.gov](http://www.sam.gov) – System for Award Management.

### STATE OF MISSISSIPPI REGISTRATION:

CONTRACTOR hereby certify that at the execution of a contract with the Mississippi Department of Education, CONTRACTOR is not on the list for debarment on [www.sos.ms.gov](http://www.sos.ms.gov) for doing business with the State of Mississippi or with any Mississippi State Agency.

### PARTNERSHIP DEBARMENT CERTIFICATION:

CONTRACTOR hereby certify that all entities who are in partnership through this contract or grant with the Mississippi Department of Education (MDE) (subcontractors, subrecipients, et al.) are not on the federal debarment list on [www.sam.gov](http://www.sam.gov) – System for Award Management or the State of Mississippi debarment list. Proof of documentation of partnership verification with SAM shall be kept on file and the debarment status shall be checked prior to submission of every contract/subgrant and modification to MDE.

\_\_\_\_\_  
*Original Signature of Contractor or Authorized Official*

\_\_\_\_\_  
*Date*

**SECTION 001113  
ADVERTISEMENT FOR BIDS**

**FROM:**

**1.01 THE OWNER (HEREINAFTER REFERRED TO AS OWNER ):**

- A. Gulfport School District
- B. Address:  
2001 Pass Road  
Gulfport, MS, 39501

**1.02 AND THE ENGINEER/ARCHITECT (HEREINAFTER REFERRED TO AS  
ENGINEER/ARCHITECT ):**

- A. Machado|Patano, PLLC & M|P Design Group, PLLC
- B. Address:  
918 Howard Avenue, Suite F  
Biloxi, MS 39530  
Phone: 228-388-1950
  - 1. Fax: 228-388-1971
  - 2. Web Site: [www.mpeng.us](http://www.mpeng.us)
  - 3. Plan Room: [www.mpengplans.us](http://www.mpengplans.us)

**1.03 TO: POTENTIAL BIDDERS**

- A. Your firm is invited to submit an offer under seal to Owner for renovations to existing buildings located at Gulfport School District Schools and indicated below:
  - Anniston Elementary School
  - Bayou View Elementary School
  - Bayou View Middle School
  - Central Elementary School
  - Gaston Point Elementary School
  - Learning Center
  - Pass Road Elementary School

Before 11:00 am local standard time on the 2nd day of September, 2021, for:
- B. Project Name: Gulfport School District - HVAC Replacement
- C. Project Number: 0247.21.001
- D. Project Description: This project consists of HVAC equipment replacement across multiple schools within the School District. Its will also include associated electrical improvements as described in the Construction Documents and Specifications.
- E. Bid Documents for a Stipulated Sum contract may be obtained from the website of the Architect at [www.mpengplans.us](http://www.mpengplans.us) upon receipt of a non-refundable deposit, by cash or check, in the amount indicated on the plan room site for one set delivered in electronic PDF format.
- F. Bidders will be required to provide Bid security in the form of a Bid Bond of a sum no less than 5 percent of the Bid Amount or a certified check for a sum no less than 5 percent of the Bid Amount.
- G. Refer to other bidding requirements described in Document 002113 - Instructions to Bidders and Document 003100 - Available Project Information.
- H. Submit your offer on the Bid Form provided. Bidders may supplement this form as appropriate.
- I. If Bids are mailed or hand delivered, then they must be contained in a sealed envelope marked on the outside with the project name. They must be on file as received or delivered by the time stated above to the address of the Owner stated above. Do not deliver Bids to the project

address or the Architect's address.

- J. Electronic Bid Submission will be accepted on this project. Online bids can be placed on the website of the Architect at [www.mpengplans.us](http://www.mpengplans.us). If Bids are electronically submitted, then a title page containing the same information as would occur on the front of a sealed envelope must be included and must be clearly indicated as such in the file name.
- K. Bids in excess of \$50,000.00 must be marked on the outside of the envelope with the contractor's Mississippi certificate of responsibility number as issued by the Mississippi Board of Contractors.
- L. Your offer will be required to be submitted under a condition of irrevocability for a period of 60 days after submission.
- M. This is a federally funded project and shall comply with all State and Federal requirements, including but not limited to compliance with any applicable Davis-Bacon Act requirements and other laws and regulations as referenced in the Construction Documents and Specifications.
- N. The Owner reserves the right to accept or reject any or all offers.

**END OF SECTION**

**SECTION 002113  
INSTRUCTIONS TO BIDDERS**

**INVITATION**

**1.01 BID SUBMISSION**

- A. Bids signed and under seal, executed, and dated will be received at the office of the Owner at 2001 Pass Road, Gulfport, MS 39501 before 11 a.m. local standard time on the 2nd day of September, 2021.
- B. Electronic Bid Submission will be accepted on this project. Online MUST be placed on the website of the Architect at [www.mpengplans.us](http://www.mpengplans.us). For any questions relating to the electronic bidding process, please call Central Bidding at 225-810-4814.
- C. Offers submitted after the above time shall be returned to the bidder unopened.
- D. Offers will be opened publicly after the time for receipt of bids.

**1.02 INTENT**

- A. The intent of this Bid request is to obtain an offer to perform work to complete HVAC replacement located at Anniston Elementary School - 2314 Jones Street, Gulfport, MS 39507; Bayou View Elementary School - 4898 Washington Avenue, Gulfport, MS 39507; Bayou View Middle - 212 43rd Street, Gulfport, MS 39507; Central Elementary - 1043 Pass Road, Gulfport, MS 39501; Gaston Point Elementary School - 1526 Mill Road, Gulfport, MS 39507; Middle/West Elementary - 4051 15th Street, Gulfport, MS 39507 and Pass Road Elementary School - 37 Pass Road, Gulfport, MS 39507 for a Stipulated Sum contract, in accordance with the Contract Documents.

**1.03 WORK IDENTIFIED IN THE CONTRACT DOCUMENTS**

- A. Work of this proposed Contract comprises renovation, including structural, mechanical, and electrical Work.
- B. All bid amounts must be based on the most stringent requirement called for in the complete construction document package. In addition, the most stringent requirement shown shall govern and take precedence in the event of any and all conflicts between different drawings (plans, elevations, details, sections, schedules, etc...), between different specification sections, within specification sections, and between the drawings and the specifications. It will be the General Contractor's responsibility to bring any and all discrepancies to the architect's attention for further clarity prior to submitting a formal bid.

**1.04 BUILDING PERMITS AND PLAN REVIEW**

- A. Refer to 011000 Summary

**1.05 CONTRACT TIME**

- A. Inclement Weather: The Contract Time for the project has incorporated all days for inclement weather. No additional request inclement weather days will be allowed during the project duration. The only inclement weather delays that will be considered to be above and beyond standard adverse conditions and will be considered appropriate for the Contractor's request for additional time will be Acts of God that have directly effected the project site as follows:
  - 1. Named Storms
  - 2. Earthquakes
  - 3. Tornadoes
  - 4. Floods
  - 5. Hail Storms

## **BID DOCUMENTS AND CONTRACT DOCUMENTS**

### **2.01 DEFINITIONS**

- A. Bid Documents include the Advertisement for Bids, Instructions to Bidders, Bid Form, Information Available to Bidders, Supplements To Bid Forms and Appendices, other sample bidding and contract forms, and the proposed Contract Documents including any Addenda issued prior to receipt of bid. The Contract Documents proposed for the Work consist of the Owner-Contractor Agreement, the Conditions of the Contract (General, Supplementary, and other Conditions), the Drawings, the Specifications, and all Addenda issued prior to and all Modifications issued after execution of the Contract.
- B. All definitions set forth in the General Conditions of the Contract for Construction, AIA Document A201, or in other Contract Documents are applicable to the Bidding Documents.
- C. Addenda are written or graphic instructions issued by the Architect prior to the execution of the Contract which modify or interpret the Bidding Documents by additions, deletions, clarifications, or corrections.
- D. A Bid is a complete and properly signed proposal to do the Work or designated portion thereof for the sums stipulated therein, submitted in accordance with the Bidding Documents.
- E. The Base Bid is 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.
- F. An Alternate Bid (or Alternate) is an amount stated in the Bid 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.
- G. A Unit Price is an amount stated in the Bid as a price per unit of measurement for materials or services as described in the Bidding Documents or in the proposed Contract Document.
- H. A bidder is a person or entity who submits a Bid.
- I. A Sub-Bidder is a person or entity who submits a bid to a Bidder for materials or labor for a portion of the work.

### **2.02 CONTRACT DOCUMENTS IDENTIFICATION**

- A. The Contract Documents are identified as Gulfport School District - HVAC Replacement Number 0247.21.001, as prepared by Engineer/Architect, and with contents as identified in the Project Manual.

### **2.03 AVAILABILITY**

- A. Bid Documents can also be obtained from the Plan Room website of the Architect at [www.mpengplans.us](http://www.mpengplans.us) upon receipt of a nonrefundable deposit, by cash or check, in the amount indicated on the plan room site for one set delivered in PDF format.
- B. Bid Documents can be obtained from PlanHouse printing in Gulfport, MS. Contact PlanHouse Printing at (228) 248-0181 for more detailed information on pricing and available construction document delivery formats.
- C. Bid Documents are made available only for the purpose of obtaining offers for this project. Their use does not grant a license for other purposes.

### **2.04 EXAMINATION**

- A. Bid Documents may be viewed at the office of Engineer/Architect.
- B. Upon receipt of Bid Documents verify that documents are complete. Notify Engineer/Architect should the documents be incomplete.
- C. Immediately notify Engineer/Architect upon finding discrepancies or omissions in the Bid Documents.



## **2.05 INQUIRIES/ADDENDA AND INTERPRETATIONS**

- A. Direct questions to David Machado or Fernanda Silva, at email: dmachado@mpeng.us and fsilva@mpeng.us respectively.
- B. Addenda may be issued during the bidding period. All Addenda become part of Contract Documents. Include resultant costs in the Bid Amount.
- C. Verbal answers are not binding on any party.
- D. Clarifications requested by bidders must be in writing not less than 7 days before date set for receipt of bids. The reply will be in the form of an Addendum, a copy of which will be forwarded to known recipients .
- E. Any interpretation, correction or change of the Bidding Documents will be made by Addendum issued during the bidding period. All Addenda become part of the Contract Documents. Interpretations, corrections or changes of the Bidding Documents made in any other manner will not be binding.
- F. Failure of any bidder to receive addendum issued, or to acknowledge receipt on the bid form, shall not relieve such bidder from any obligation under this bid as submitted.
- G. All bid amounts must be based on the most stringent requirement called for in the complete construction document package. In addition, the most stringent requirement shown shall govern and take precedence in the event of any and all conflicts between different drawings (plans, elevations, details, sections, schedules, etc...), between different specification sections, within specification sections, and between the drawings and the specifications. It will be the General Contractor's responsibility to bring any and all discrepancies to the architect's attention for further clarity prior to submitting a formal bid. No other method of estimating shall be used in preparing the bid proposal, unless contrary instructions are issued in the form of an Addendum before bid proposal due date.
- H. Any claim by the Contractor or Subcontractors that they, in submitting their respective bid proposals, did not include all items as shown in the Contract Documents will be given no consideration for an adjustment of any kind. If any item is specified in a Section which would not normally furnish this item, it shall be the responsibility of the Contractor to provide the work in question, without any additional cost to the Owner.

## **2.06 PRODUCT/ASSEMBLY/SYSTEM SUBSTITUTIONS**

- A. Where the Bid Documents stipulate a particular product, substitutions will be considered up to 10 days before receipt of bids.
- B. Submit substitution requests by completing the form in Section 004325 - Substitution Request Form - During Procurement; see this section for additional information and instructions. Use only this form; other forms of submission are unacceptable. If this form is not completed in its entirety, then it will be rejected and will have to be resubmitted.
- C. When a request to substitute a product is made, Engineer/Architect may approve the substitution and will issue an Addendum to known bidders.
- D. The submission shall provide sufficient information to determine acceptability of such products.
- E. Provide complete information on required revisions to other work to accommodate each proposed substitution.
- F. Provide products as specified unless substitutions are submitted in this manner and accepted.
- G. See Section 016000 - Product Requirements for additional requirements.

## **SITE ASSESSMENT**

### **3.01 SITE EXAMINATION**

- A. Examine the project site before submitting a bid.

- B. A visit to the project site has been arranged for bidders as follows: Immediately following the Pre-Bid Conference
- C. The currently occupied premises at the project site are open for examination by bidders only during the following hours:
  - 1. Monday through Friday: 8 AM to 5 PM.
  - 2. Contractor will be required to contact the School Front Office prior to arriving to schedule a time for examination.

### **3.02 PREBID CONFERENCE**

- A. A bidders conference has been scheduled for 09:00 a.m. on the 18th day of August at the location of 1526 Mill Road, Gulfport, MS 39507. Meet in the main lobby of the Gaston Point Elementary School. We will then relocate to a designated area as directed by the staff for the formal meeting. After the Pre-Bid Meeting we will tour the site of Schools included in this project.
- B. All general contract bidders and suppliers are invited.
- C. Representatives of Engineer/Architect will be in attendance.
- D. Summarized minutes of this meeting may be circulated to all known bidders. These minutes will not form part of the Contract Documents.
- E. No verbal answers during this meeting are binding nor do they become a part of the Bid Documents. Information relevant to the Bid Documents will be recorded in an Addendum, issued to Bid Document recipients.

## **QUALIFICATIONS**

### **4.01 SUBCONTRACTORS/SUPPLIERS/OTHERS**

- A. Owner reserves the right to reject a proposed subcontractor for reasonable cause.
- B. Refer to General Conditions.

## **BID SUBMISSION**

### **5.01 SUBMISSION PROCEDURE**

- A. Bidders shall be solely responsible for the delivery of their bids in the manner and time prescribed.
- B. Submit one copy of the executed offer on the Bid Forms provided, signed and sealed with the required security in a closed opaque envelope, clearly identified with bidder's name, project name and Owner's name on the outside. If Bids are electronically submitted, then a title page containing the same information as would occur on the front of a sealed envelope must be included and must be clearly indicated as such in the file name (i.e. "open first," or "Envelope Information," etc...), so that it will be the first item opened.
- C. Bids in excess of \$50,000.00 must be marked on the outside of the envelope with the contractor's Mississippi Certificate of Responsibility Number as issued by the Mississippi Board of Contractors.
- D. Electronic Bid Submission will be accepted on this project. Online bids can be placed on the website of the Architect at [www.mpengplans.us](http://www.mpengplans.us).

### **5.02 BID INELIGIBILITY**

- A. Bids that are unsigned, improperly signed or sealed, conditional, illegible, obscure, contain arithmetical errors, erasures, alterations, or irregularities of any kind, may at the discretion of the Owner, be declared unacceptable.
- B. Bid Forms, Appendices, and enclosures that are improperly prepared may, at the discretion of Owner, be declared unacceptable.

- C. Failure to provide security deposit, bonding or insurance requirements may, at the discretion of Owner, invalidate the bid.

## **BID ENCLOSURES/REQUIREMENTS**

### **6.01 SECURITY DEPOSIT**

- A. Bids shall be accompanied by a security deposit as follows:
  - 1. Bid Bond of a sum no less than 5 percent of the Bid Amount on AIA A310 Bid Bond Form.  
-OR-
  - 2. Certified check in the amount of a sum no less than 5 percent of the Bid Amount.
- B. Endorse the certified check in the name of the Owner.
- C. The security deposit will be returned after delivery to the Owner of the required Performance and Payment Bond(s) by the accepted bidder.
- D. Include the cost of bid security in the Bid Amount.
- E. If no contract is awarded, all security deposits will be returned.

### **6.02 PERFORMANCE ASSURANCE**

- A. Accepted Bidder:
  - 1. Provide a Performance Bond
  - 2. Provide a Payment Bond
  - 3. Provide a Schedule of Values
  - 4. Provide a Construction Schedule
- B. Include the cost of Performance and Payment Bonds in the Bid Amount.

### **6.03 INSURANCE**

- A. Provide an executed "Undertaking of Insurance" letter on official letterhead provided by the insurance company stating their intention to provide insurance to the bidder in accordance with the insurance requirements of the Contract Documents. This is nothing more than a letter. There is no special form required. The intent is to assure the Owner that the Bidder is capable of obtaining insurance coverage requirements set forth herein for this specific project.

### **6.04 NON COLLUSIVE AFFIDAVIT**

- A. Bids shall be accompanied with 004105 Form of Non Collusive Affidavit.

### **6.05 BID FORM REQUIREMENTS**

- A. Complete all requested information in the Bid Form and Appendices.

### **6.06 BID FORM SIGNATURE**

- A. The Bid Form shall be signed by the bidder, as follows:
  - 1. Sole Proprietorship: Signature of sole proprietor in the presence of a witness who will also sign. Insert the words "Sole Proprietor" under the signature.
  - 2. Partnership: Signature of all partners in the presence of a witness who will also sign. Insert the word "Partner" under each signature.
  - 3. Corporation: Signature of a duly authorized signing officer(s) in their normal signatures. Insert the officer's capacity in which the signing officer acts, under each signature. Affix the corporate seal. If the bid is signed by officials other than the president and secretary of the company, or the president/secretary/treasurer of the company, a copy of the by-law resolution of their board of directors authorizing them to do so, must also be submitted with the Bid Form in the bid envelope.

### **6.07 ADDITIONAL BID INFORMATION**

- A. Upon request by the Architect, the selected Bidder shall within seven days thereafter submit the following:
  - 1. A schedule of values for each major item of work included in the bid.

2. A list of the work to be performed by the Bidder with his own work forces.
3. A list of Subcontractors or other persons or organizations proposed for use on this project. The Bidder will be required to establish to the Architect, Owner and the Owner's Representative the reliability and responsibility of the proposed Subcontractors to furnish and perform the work. Subcontractors and other persons and organizations proposed by the Bidder and accepted by the Owner, Architect, and the Owner's Representative must be used on the work for which they were proposed and accepted and shall not be changed except with the written approval of the Owner, Architect and Owner's Representative.

#### **6.08 SELECTION AND AWARD OF ALTERNATES**

- A. Bids will be evaluated on the total of the base bid price and any combination of the Alternates. After determination of the successful bidder, consideration will be given to which Alternates will be included in the Work.

#### **6.09 QUALIFICATION OF BIDDERS**

- A. If required, a Bidder shall submit to the Architect a properly executed Contractor's Qualification Statement AIA Document A305, within five (5) days from request.
- B. The successful low bidder(s) will have to meet the following criteria to the Owners' satisfaction, prior to award of bid. Failure to do so may result in the rejection of the defaulting Contractors' Bid.
  1. The Contracting Company's ability to perform the designated scope of work.
  2. Qualified personnel and adequate work force capable of completing the specified project Work.
  3. Satisfactory construction plan.
  4. Satisfactory safety plan and work history related to safety and reportable OSHA related incidences.
  5. Successful completion of a similar project and no documented letters of dissatisfaction from similar owners.
- C. Independent Contractor Status: It is understood and agreed that the contractor is an independent Contractor and not an employee of the Owner and that the Contractor shall be responsible for all necessary licenses, federal and state taxes, liability insurance, worker's compensation coverage and other obligations imposed upon him and his employees as an independent Contractor under applicable laws, rules and regulations.
- D. Indemnity to the Owner: It is understood and agreed that the Contractor shall hold the Owner harmless and indemnify the Owner against any losses, damages, or liabilities resulting from the performance of the aforesaid services by said Contractor. Contractor shall be responsible for all employee withholding, payroll and FICA taxes, and shall maintain any and all Worker's Compensation Insurance on its laborers as required by law and shall hold the Owner harmless from all claims, if any, concerning Contractor's employees or subcontractors.
- E. The Owner reserves the right to reject any Bid if the evidence submitted by, or investigation of, such bidder fails to satisfy the Owner that such bidder is properly qualified to carry out the obligations of the Contract and to complete the scope of Work. Conditional bids will not be accepted. The Owner may consider either of the following reasons as being sufficient for the disqualification of a bidder and the rejection of the bidder's proposal:
  1. Submission of more than one proposal for the same work from an individual, partnership, firm or corporation under the same or different name(s),
  2. Evidence of collusion among bidders. Participants of such collusion may be disqualified for future Work of the Owner, and
  3. If the Bidder has been placed in default on another project with the Owner.

#### **6.10 DURATION OF OFFER**

- A. Bids shall remain open to acceptance and shall be irrevocable for a period of sixty (60) days after the bid closing date.

#### **6.11 ACCEPTANCE/ REJECTION OF OFFER**

- A. Owner reserves the right to accept or reject any or all offers.
- B. The Bidder acknowledges the right of the Owner to reject any or all bids and to waive any informality or irregularity in any bid received. In addition, the Bidder recognizes the right of the Owner to reject a bid if the Bidder failed to furnish required bid security or to submit the data required by the bidding documents, or if the bid is in any way incomplete or irregular. Each actual or prospective bidder agrees to waive any claim it has or may have against the Owner, or against the Architect, or against the Owner's Representative, and their respective employees and agents, arising out of or in connection with the bidding process specifically including the receipt, evaluation, recommendation, and administration of any bid.
- C. The Owner intends to award a Contract to the lowest and best Bidder within available funds, based on the sum of the base bid plus accepted alternates, if any. A bidder may be disqualified for any legally permissible reason. In making award, the Owner reserves the right to consider a bidder's experience, quality of previous work, availability of appropriate financial, material, facility, managerial or personal resources, warranties, life cycle cost and any other legal factors related to evaluating the bidder's capability to perform contract requirements in a timely and proper manner.
- D. The Owner reserves the right to cancel the award of a contract any time prior to the execution by all parties without liability against the Owner.
- E. Any protest from any bidder must be delivered to the Owner in writing within seventy-two (72) hours of bid opening.
- F. Any claim of error and request to be released from the bid by any bidder must be delivered to the Owner within twenty-four (24) hours of bid opening. Sufficient documentation and proof must accompany this written request clearly showing an error was made by the bidder.
- G. The Contract will provide for Liquidated Damages in the amounts indicated on the Bid Form. Amounts indicated are to be paid per day by the Contractor for this Project to the Owner for each calendar day after the date of substantial completion.
- H. After acceptance by Owner, Engineer/Architect on behalf of Owner, will issue to the successful bidder, a written Notice To Proceed.

#### **6.12 LIQUIDATED DAMAGES FOR FAILURE TO ENTER INTO CONTRACT**

- A. The successful Bidder, upon his failure or refusal to execute and deliver the Contract and bonds required within seven (7) days after he has received notice of the acceptance of his bid, shall forfeit to the Owner, as liquidated damages for such failure or refusal, the difference between his bid and the next acceptable bid, up to the maximum amount of the Bid Security.
- B. Refer to the Bid Form for the Amount and Time Frame for the Liquidated Damages.

#### **6.13 TIME OF COMPLETION**

- A. Bidder must agree to commence work on a date to be specified in a written "Notice to Proceed" and to substantially complete the Work within the number of calendar days indicated on the bid form.
- B. Bidders shall substantially complete all the work involved in its contract within the calendar days stated and shall be subject to damages for each calendar day of delay thereafter in accordance with the General Conditions of the Contract for Construction.

#### **END OF SECTION**

**SECTION 004000  
PROCUREMENT FORMS AND SUPPLEMENTS**

**PART 1 GENERAL**

**1.01 FORMS**

- A. Use the following forms for the specified purposes unless otherwise indicated elsewhere in the procurement requirements.
- B. Bid Form: Section 004100 - Bid Form.
- C. Procurement Form Supplements:
  - 1. Certificate of Responsibility Number: Required on the Outside of the Envelope
  - 2. Bid Bond Form: AIA A310. Required to be submitted with the Bid.
  - 3. Proposed Schedule of Values Form: AIA G703. This does not have to be submitted with the bid, but must be provided to the Architect within seven (7) if so requested.
  - 4. Form of Non Collusive Affidavit: 004105 Form of Non Collusive Affidavit. Required to be submitted with the Bid.

**1.02 REFERENCE STANDARDS**

- A. AIA A310 - Bid Bond 2010.
- B. AIA G703 - Continuation Sheet 1992.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION - NOT USED**

**END OF SECTION**

**SECTION 004100  
BID FORM**

**THE PROJECT AND THE PARTIES**

**1.01 TO:**

- A. Gulfport School District (Owner)  
2001 Pass Road  
Gulfport, MS 39507

**1.02 FOR:**

- A. Project Name: Gulfport School District - HVAC Replacement  
B. Architect's Project Number: 0247.21.001  
C. Project Addresses:  
Anniston Elementary School - 2314 Jones Street, Gulfport, MS 39507  
Bayou View Middle - 212 43rd Street, Gulfport, MS 39507  
Central Elementary - 1043 Pass Road, Gulfport, MS 39501  
Gaston Point Elementary School - 1526 Mill Road, Gulfport, MS 39507  
Middle/West Elementary - 4051 15th Street, Gulfport, MS 39507  
Pass Road Elementary School - 37 Pass Road, Gulfport, MS 39507  
Project Location City, Project Location StateProject Location ZIP

**1.03 DATE:** \_\_\_\_\_

**1.04 CERTIFICATE OF RESPONSIBILITY NUMBER:** \_\_\_\_\_

**1.05 SUBMITTED BY:**

- A. Bidder's Full Name \_\_\_\_\_  
1. Address \_\_\_\_\_  
2. City, State, Zip \_\_\_\_\_

**1.06 OFFER**

- A. Having examined the Place of The Work and all matters referred to in the Instructions to Bidders and the Contract Documents prepared by MP Design Group/Machado Patano for the above mentioned project, we, the undersigned, hereby offer to enter into a Contract to perform the Work, within the time set forth herein for the Sum of:

**B. BASE BID LUMP SUM PRICE:**

\_\_\_\_\_ dollars  
(\$ \_\_\_\_\_), in lawful money of the United States of America.

**C. ADDITIVE BID ALTERNATE NO. 01:**

\_\_\_\_\_ dollars  
(\$ \_\_\_\_\_), in lawful money of the United States of America.

**D. ADDITIVE BID ALTERNATE NO. 02:**

\_\_\_\_\_ dollars  
(\$ \_\_\_\_\_), in lawful money of the United States of America.

**E. ADDITIVE BID ALTERNATE NO. 03:**

\_\_\_\_\_ dollars  
(\$ \_\_\_\_\_), in lawful money of the United States of America.

- F. We have included the required security Bid Bond as required by the Instruction to Bidders.
- G. We have included the required Non Collusive Affidavit Form as required by the Instructions to Bidders.
- H. We have included the cost of the required performance assurance bonds in the Bid Amount as required by the Instructions to Bidders.
- I. We have included the cost of all local jurisdiction building permits required to complete the construction of this project in our Base Bid amount unless specifically called for otherwise in Section 012100 Allowances.
- J. All applicable federal taxes are included and State of Mississippi taxes are included in the Bid Sum.
- K. All Cash and Contingency Allowances described in Section 012100 - Allowances are included in the Bid Sum.

#### 1.07 ACCEPTANCE

- A. This offer shall be open to acceptance and is irrevocable for sixty days from the bid closing date.
- B. If this bid is accepted by Owner within the time period stated above, we will:
  - 1. Furnish the required bonds within seven days of receipt of Notice of Award.
  - 2. Commence work within seven days after written Notice to Proceed of this bid.
- C. If this bid is accepted within the time stated, and we fail to commence the Work or we fail to provide the required Bond(s), the security deposit shall be forfeited as damages to Owner by reason of our failure, limited in amount to the lesser of the face value of the security deposit or the difference between this bid and the bid upon which a Contract is signed.
- D. In the event our bid is not accepted within the time stated above, the required security deposit shall be returned to the undersigned, in accordance with the provisions of the Instructions to Bidders; unless a mutually satisfactory arrangement is made for its retention and validity for an extended period of time.

#### 1.08 CONTRACT TIME

- A. Complete the Work in 240 calendar days from Notice to Proceed.
- B. If the Substantial Completion date falls beyond the above date based on days, we will pay to the Owner the following amount as liquidated damages, not as a penalty, for each calendar day of delay for the Project until the actual date of Substantial Completion of the Project:

\*\*\* UP \$500.00 PER CALENDAR DAY \*\*\*

#### 1.09 CHANGES TO THE WORK

- A. When Architect establishes that the method of valuation for Changes in the Work will be net cost plus a percentage fee in accordance with General Conditions, our percentage fee will be:
  - 1. Ten percent overhead and profit on the net cost of our own Work;
  - 2. Ten percent on the cost of work done by any Subcontractor.

#### 1.10 ADDENDA

- A. The following Addenda have been received. The modifications to the Bid Documents noted below have been considered and all costs are included in the Bid Sum.
  - 1. Addendum # \_\_\_\_\_ Dated \_\_\_\_\_.
  - 2. Addendum # \_\_\_\_\_ Dated \_\_\_\_\_.



3. Addendum # \_\_\_\_\_ Dated \_\_\_\_\_.
4. Addendum # \_\_\_\_\_ Dated \_\_\_\_\_.
5. Addendum # \_\_\_\_\_ Dated \_\_\_\_\_.

**1.11 BID FORM SUPPLEMENTS**

- A. The following information is to be included with Bid submission:
  1. Non Collusive Affidavit
  2. Bid Bond: Form AIA Document A310
  3. Letter from Insurance Company
- B. If so requested by the Architect, we agree to submit the following Supplements to Bid Forms within 7 days after submission of this bid for additional bid information:
  1. Proposed Schedule of Values Form

**1.12 BID FORM SIGNATURE(S)**

- A. The Corporate Seal of
- B. \_\_\_\_\_
- C. (Bidder - print the full name of your firm)
- D. was hereunto affixed in the presence of:
- E. \_\_\_\_\_
- F. (Authorized signing officer, Title)
- G. (Seal)
- H. \_\_\_\_\_
- I. (Authorized signing officer, Title)

**1.13 IF THE BID IS A JOINT VENTURE OR PARTNERSHIP, ADD ADDITIONAL FORMS OF EXECUTION FOR EACH MEMBER OF THE JOINT VENTURE IN THE APPROPRIATE FORM OR FORMS AS ABOVE.**

**END OF SECTION**

**SECTION 004105**  
**FORM OF NON COLLUSIVE AFFIDAVIT**

**PART 1 GENERAL**

**1.01 FORM OF NON-COLLUSION AFFIDAVIT IS AS FOLLOWS:**

- A. A copy of the Non-Collusion Affidavit is attached to the end of this Section. It will be the General Contractor's (Bidders) responsibility to complete this form in its entirety and submit it with and in his bid package.

**PART 2 PRODUCTS (NOT USED)**

**PART 3 EXECUTION (NOT USED)**

**END OF SECTION**

## NON-COLLUSION AFFIDAVIT

The undersigned bidder or agent, being duly sworn on oath, says that he/she has not, nor has any other member, representative, or agent of the firm, company, corporation or partnership represented by him, entered into any combination, collusion or agreement with any person relative to the price to be bid by anyone at such letting nor to prevent any person from bidding nor to include anyone to refrain from bidding, and that this bid is made without reference to any other bid and without any agreement, understanding or combination with any other person in reference to such bidding.

He/She further says that no person or persons, firms, or corporation has, have or will receive directly or indirectly, any rebate, fee gift, commission or thing of value on account of such sale.

## OATH AND AFFIRMATION

I HEREBY AFFIRM UNDER THE PENALTIES FOR PERJURY THAT THE FACTS AND INFORMATION CONTAINED IN THE FOREGOING BID FOR PUBLIC WORKS ARE TRUE AND CORRECT.

Dated this \_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_

\_\_\_\_\_  
General Contractor (GC) Company Name

\_\_\_\_\_  
Printed Name and Title of GC's Representative

\_\_\_\_\_  
Signature of GC's Representative

## NOTARY PUBLIC ACKNOWLEDGEMENT

STATE OF \_\_\_\_\_

COUNTY OF \_\_\_\_\_

Before me, a Notary Public, personally appeared the above named and swore that the statements contained in the foregoing document are true and correct.

Subscribed and sworn to me this \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_.

\_\_\_\_\_  
Signature

My Commission Expires: \_\_\_\_\_

SEAL

**SECTION 004325  
SUBSTITUTION REQUEST FORM - DURING PROCUREMENT**

**PART 1 GENERAL**

**1.01 SUBSTITUTION REQUEST FORM IS AS FOLLOWS:**

- A. A copy of the Substitution Request Form that must be used is attached at the end of this section.
  - 1. No other forms will be allowed.
  - 2. Any additional information that can be provided to substantiate the substitution request will be gladly accepted.
  - 3. An incomplete Substitution Request Form will be immediately rejected.

**1.02 RELATED REQUIREMENTS**

- A. Section 002113 - Instructions to Bidders

**PART 2 PRODUCTS (NOT USED)**

**PART 3 EXECUTION (NOT USED)**

**END OF SECTION**

**Project:** \_\_\_\_\_

**Specification Section Number and Paragraph:** \_\_\_\_\_

**Contract Drawings Affected:** \_\_\_\_\_

**Proposed Manufacturer:** \_\_\_\_\_

**Proposed Product Substitution:** \_\_\_\_\_

**Proposed Product Description:** \_\_\_\_\_

#### **EFFECTS OF PROPOSED PRODUCT SUBSTITUTION**

##### **PROVIDE THE FOLLOWING:**

1. Attach list of at least 3 projects where proposed substitution has been used within past 6 to 12 months include name, address, and telephone number of Owner and Architect.
2. Does substitution affect dimensions indicated on Drawings? (Y/N) \_\_\_\_\_
3. Does substitution affect Work of other Specification Sections? (Y/N) \_\_\_\_\_
4. Does substitution require modifications to design, changes to Drawings, or revisions to specifications? (Y/N) \_\_\_\_\_

#### **CONTRACTOR'S / BIDDER'S RESPONSIBILITY**

Undersigned accepts responsibility for coordination of proposed substitution and accepts all additional costs resulting from the incorporation of proposed substitution into the Project per Section 01600. The only response to this Request for Substitution will be by Addendum.

##### **SUBMITTED BY**

(Include name, address, telephone, and contract person of manufacturer/supplier of proposed substitution)

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

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

Contact Telephone: \_\_\_\_\_

**Signature and date:** \_\_\_\_\_

#### **ARCHITECT / ENGINEER REVIEW**

Reviewed by: \_\_\_\_\_ Date: \_\_\_\_\_

Comments: \_\_\_\_\_

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

**SECTION 005000  
CONTRACTING FORMS AND SUPPLEMENTS**

**PART 1 GENERAL**

**1.01 AGREEMENT AND CONDITIONS OF THE CONTRACT**

- A. See Section 005200 - Agreement Form for the Agreement form to be executed.
- B. See Section 007200 - General Conditions for the General Conditions.
- C. The Agreement is based on AIA A101.
- D. The General Conditions are based on AIA A201.

**1.02 FORMS**

- A. Use the following forms for the specified purposes unless otherwise indicated elsewhere in Contract Documents.
- B. Bond Forms:
  - 1. Bid Bond Form: AIA A310.
    - a. Must be submitted with the Bid Form.
  - 2. Performance and Payment Bond Form: AIA A312.
    - a. A Performance Bond and a Payment (Labor and Material) Bond are required as a condition of this Contract.
    - b. Simultaneous with delivery of the executed contract, the Contractor shall furnish a surety bond or bonds as security for the faithful performance of this Contract and for the payment of all persons performing labor on the project under this Contract and furnishing materials in connection with this Contract in the amount of 100% of the contract sum for payment, executed on AIA Document A312.
    - c. The surety on such bond or bonds will be a duly authorized surety company who is licensed by the State of Mississippi's Commissioner of Insurance and who has a B++ or higher rating in accordance with the most recent edition of the A.M. Best Company, Inc., Key Rating Guide.
    - d. All bonds shall be countersigned by a Mississippi resident agent with the name and address typed or lettered legibly.
    - e. All bonds must be accompanied by an appropriate Power of Attorney.
- C. Post-Award Certificates and Other Forms:
  - 1. Architect's Submittal Transmittal Letter Form: Attached at the end of this section.
  - 2. Schedule of Values Form: AIA G703.
  - 3. Application for Payment Forms: AIA G702 with AIA G703 (for Contractors).
- D. Clarification and Modification Forms:
  - 1. Architect's Request for Interpretation Form: Attached to the end of this section.
  - 2. Architect's Substitution Request Form (During the Bidding/Negotiating Stage): Attached at the end of this section.
  - 3. Architect's Supplemental Instructions Form: AIA G710.
  - 4. Construction Change Directive Form: AIA G714.
  - 5. Change Order Form: AIA G701.
- E. Closeout Forms:
  - 1. Certificate of Substantial Completion Form: AIA G704.
  - 2. Affidavit of Release of Liens Form: AIA 706A.

**1.03 REFERENCE STANDARDS**

- A. AIA A101 - Standard Form of Agreement Between Owner and Contractor where the basis of Payment is a Stipulated Sum 2017.
- B. AIA A201 - General Conditions of the Contract for Construction 2017.

- C. AIA A310 - Bid Bond 2010.
- D. AIA A312 - Performance Bond and Payment Bond 2010.
- E. AIA G701 - Change Order 2017.
- F. AIA G702 - Application and Certificate for Payment 1992.
- G. AIA G703 - Continuation Sheet 1992.
- H. AIA G704 - Certificate of Substantial Completion 2017.
- I. AIA G710 - Architect's Supplemental Instructions 2017.
- J. AIA G714 - Construction Change Directive 2017.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION - NOT USED**

**END OF SECTION**

Project Name: Project

Number:

RFI Number	Submitted To	Submitted By	Copies To
Date			
Subject		Discipline	Co-Author
Specification Section		Drawing Reference	
Information Requested (suggest solution, if possible):			Date Requested:
Response			

By responding to the RFI, we do not agree to any additional costs and/or time. Any additional costs and/or time shall be submitted in accordance with the Contract Documents.

Date Answered:

Answered By:



## SUBMITTAL IDENTIFICATION

Submittal No. \_\_\_\_\_

### Contractor to Complete

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

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

General Contractor: \_\_\_\_\_

Submittal Subcontractor: \_\_\_\_\_

Date Submitted to MP: \_\_\_\_\_

Specification Number: \_\_\_\_\_

Specification Description: \_\_\_\_\_

### Architect/Engineer to Complete

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

Method Returned: \_\_\_\_\_

Returned To: \_\_\_\_\_

**SECTION 005200  
AGREEMENT FORM**

**PART 1 GENERAL**

**1.01 FORM OF AGREEMENTS ARE AS FOLLOWS:**

- A. Standard Form of Agreement Between Owner and Contractor, American Institute of Architects Document A101, 2017 Edition will be used for the Contract.
- B. Standard Form Insurance and Bonds, American Institute of Architects Document A101, 2017 Exhibit A will be used for the Contract.
- C. Prospective bidders should read and understand the Agreement forms before submitting bids or executing the Agreement.
- D. Draft copies of these Agreements are available at the Architect's office for the Contractor's examination M-F from 8-5. The Agreements are incorporated by reference as though fully written herein.

**1.02 RELATED REQUIREMENTS**

- A. Section 007200 - General Conditions.

**PART 2 PRODUCTS (NOT USED)**

**PART 3 EXECUTION (NOT USED)**

**END OF SECTION**

**SECTION 006200  
INSURANCE AND BONDS**

**PART 1 GENERAL**

**1.01 INSURANCE**

- A. The Contractor is responsible for maintaining the following insurance coverages described herein.
- B. **PROPERTY INSURANCE (BUILDER'S RISK)**
  - 1. The Contractor shall purchase and maintain, from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located, property insurance written on a Builder's Risk "all-risks" completed value or equivalent policy form and sufficient to cover the total value of the entire Project on a replacement cost basis. The Owner's property insurance coverage shall be no less than the amount of the initial Contract Sum, plus the value of subsequent Modifications and labor performed and materials or equipment supplied by others. The property insurance shall be maintained until Substantial Completion. This insurance shall include the interests of the Owner, Contractor, Subcontractors, and Sub-subcontractors in the Project as insureds. This insurance shall include the interests of mortgagees as loss payees.
- C. **COMMERCIAL GENERAL LIABILITY INSURANCE**
  - 1. Commercial General Liability Insurance for the Project shall be written on an occurrence form with policy limits of not less than One Million Dollars (\$1,000,000) each occurrence, Two Million Dollars (\$2,000,000) general aggregate, and One Million Dollars (\$1,000,000) aggregate for products-completed operations hazard, providing coverage for claims including:
    - a. damages because of bodily injury, sickness or disease, including occupational sickness or disease, and death of any person;
    - b. personal injury and advertising injury;
    - c. damages because of physical damage to or destruction of tangible property, including the loss of use of such property;
    - d. bodily injury or property damage arising out of completed operations; and
    - e. the Contractor's indemnity obligations under the General Conditions.
  - 2. The Contractor's Commercial General Liability policy shall not contain an exclusion or restriction of coverage for the following:
    - a. Claims by one insured against another insured, if the exclusion or restriction is based solely on the fact that the claimant is an insured, and there would otherwise be coverage for the claim.
    - b. Claims for property damage to the Contractor's Work arising out of the products-completed operations hazard where the damaged Work or the Work out of which the damage arises was performed by a Subcontractor.
    - c. Claims for bodily injury other than to employees of the insured.
    - d. Claims for indemnity of the General Conditions arising out of injury to employees of the insured.
    - e. Claims or loss excluded under a prior work endorsement or other similar exclusionary language.
    - f. Claims or loss due to physical damage under a prior injury endorsement or similar exclusionary language.
    - g. Claims related to residential, multi-family, or other habitational projects, if the Work is to be performed on such a project.
    - h. Claims related to roofing, if the Work involves roofing.
    - i. Claims related to exterior insulation finish systems (EIFS), synthetic stucco or similar exterior coatings or surfaces, if the Work involves such coatings or surfaces.

- j. Claims related to earth subsidence or movement, where the Work involves such hazards.
- k. Claims related to explosion, collapse and underground hazards, where the Work involves such hazards.

**D. AUTOMOBILE LIABILITY INSURANCE**

- 1. Automobile Liability Insurance covering vehicles owned, and non-owned vehicles used, by the Contractor, with policy limits of not less than One Million Dollars (\$1,000,000) per accident, for bodily injury, death of any person, and property damage arising out of the ownership, maintenance and use of those motor vehicles along with any other statutorily required automobile coverage.

**E. EMPLOYERS' LIABILITY INSURANCE (WORKER'S COMP)**

- 1. Employers' Liability Insurance with policy limits not less than Two Million Dollars (\$2,000,000) each accident, One Million Dollars (\$1,000,000) each employee, and Two Million Dollar (\$2,000,000) policy limit.

**1.02 SECURITY BONDS FOR FAITHFUL PERFORMANCE**

- A. A Performance Bond and a Payment (Labor and Material) Bond are required as a condition of this Contract.
- B. Simultaneous with delivery of the executed contract, the Contractor shall furnish a surety bond or bonds as security for the faithful performance of this Contract and for the payment of all persons performing labor on the project under this Contract and furnishing materials in connection with this Contract in the amount of 100% of the contract sum for payment, executed on AIA Document A312.
- C. The surety on such bond or bonds will be a duly authorized surety company who is licensed by the State of Mississippi's Commissioner of Insurance and who has a B++ or higher rating in accordance with the most recent edition of the A.M. Best Company, Inc., Key Rating Guide.
- D. All bonds shall be countersigned by a Mississippi resident agent with the name and address typed or lettered legibly.
- E. All bonds must be accompanied by an appropriate Power of Attorney.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION - NOT USED**

**END OF SECTION**

**SECTION 007200  
GENERAL CONDITIONS**

**PART 1 GENERAL**

**1.01 GENERAL CONDITIONS ARE AS FOLLOWS:**

- A. Standard Form of General Conditions of the Contract for Construction, American Institute of Architects Document A201, 2017 Edition will be used for the Contract.
- B. If a conflict exists between the General Conditions and the Specifications, the Specifications shall rule. Any party discovering a conflict between the Specifications and the General Conditions shall immediately notify the Architect in writing.
- C. Prospective bidders should read and understand the General Conditions before submitting bids or executing the Agreement.
- D. A copy of the Agreement is available at the Architect's office for the Contractor's examination on M-F from 8-5. The Agreement is incorporated by reference as though fully written herein.

**END OF SECTION**

**SECTION 009000  
ADDENDA**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Any addenda to the drawings or specifications issued before or during the time of bidding shall be included in the proposal and become a part of the Contract.
- B. Indicate receipt of addenda on the proposal form.

**1.02 PART 2 PRODUCTS (NOT USED)**

**1.03 PART 3 EXECUTION (NOT USED)**

**END OF SECTION**

## **SECTION 011000 SUMMARY**

### **PART 1 GENERAL**

#### **1.01 PROJECT**

- A. Project Name: Gulfport School District - HVAC Replacement
- B. Owner's Name: Gulfport School District.

#### **1.02 PROJECT DESCRIPTION**

- A. This description is provided for convenience purposes only and shall not be considered all inclusive. It is the General Contractor's responsibility to become fully familiar with the existing conditions, review all of the construction document drawings, specifications, and any additional information documents in their entirety and bring forth any and all questions regarding scope confusion, misinterpretations, and/or possible errors and omissions to the Architect, Engineer prior to bid submission.
  - 1. This project consists of HVAC equipment replacement across multiple schools within the School District. Its will also include associated electrical improvements as described in the Construction Documents and Specifications.
- B. Alternates: refer to Division 1 Section "Alternates" for information.
- C. All accessories or incidental items not specifically shown and detailed in the specifications herein, which are necessary and/or required to complete the work within the intent of the specifications, shall be included by the Contractor without additional cost to the Owner.
- D. All bid amounts must be based on the most stringent requirement called for in the complete construction document package. In addition, the most stringent requirement shown shall govern and take precedence in the event of any and all conflicts between different drawings (plans, elevations, details, sections, schedules, etc...), between different specification sections, within specification sections, and between the drawings and the specifications. It will be the General Contractor's responsibility to bring any and all discrepancies to the architect's attention for further clarity prior to submitting a formal bid.

#### **1.03 BUILDING PERMITS AND PLAN REVIEW**

- A. Building Permits:
  - 1. All Building Permits including all special subcontractor permits will be required for this project.
  - 2. The General Contractor will be required to apply for and pull all permits in their name.
  - 3. The General Contractor will be required to pay for all permits. Refer to Allowances section for any specified amount that may be allocated for the paying of said permits. If there is no set allowance provided, then it will be the General Contactor's responsibility to coordinate with the AHJ and provide for the costs of all permits in his base bid amount.
- B. Plan Review:
  - 1. The project will be required to go through the plans review process with the Authority Having Jurisdiction (AHJ).
  - 2. The General Contractor will be required to pay for all plans review fees. Refer to Allowances section for any specified amount that may be allocated for the paying of said plan review. If there is no set allowance provided, then it will be the General Contactor's responsibility to coordinate with the AHJ and provide for the costs of the plan review in his base bid amount.
  - 3. The General Contractor will be responsible for providing and paying for all hard copy sets of plans and specifications required by the AHJ for their completion of the plan review process.

#### **1.04 DESCRIPTION OF ALTERATIONS WORK**

- A. Scope of demolition and removal work is indicated on drawings.
- B. Scope of alterations work is indicated on drawings.

#### **1.05 WORK BY OWNER (EXCLUDED FROM BID WORK)**

- A. Some items will be furnished and installed by Owner under separate contracts. Contractors shall coordinate and cooperate with these separate contractors including scheduling, delivery and installation dates, storage of materials, and use of utilities.
  - 1. Loose Furniture
  - 2. Promethean Boards
  - 3. Copy Machines
  - 4. Refrigerators
  - 5. Microwaves
  - 6. Paper Towel Dispensers

#### **1.06 GENERAL INFORMATION**

- A. All work shall be performed in a professional manner and workmanlike manner.
- B. Submittals: Submittals shall be submitted in accordance with Division 1 Section "Submittals".
- C. Scheduling: The contractor shall prepare a construction schedule showing each construction activity, based on the project specification divisions, prior to starting work.
- D. The Contractor will be expected to cooperate with the Owner and his representative in pursuing work continuously and with the highest degree of efficiency possible.
- E. The Contractor will be required to finish the job and leave the site in a condition similar to starting project.
- F. Inclement Weather: The Contract Time for the project has incorporated all days for inclement weather. No additional request inclement weather days will be allowed during the project duration. The only inclement weather delays that will be considered to be above and beyond standard adverse conditions and will be considered appropriate for the Contractor's request for additional time will be Acts of God that have directly effected the project site as follows:
  - 1. Named Storms
  - 2. Earthquakes
  - 3. Tornadoes
  - 4. Floods
  - 5. Hail Storms
- G. Storm Damage: Should warnings of winds of gale force or stronger be issued, the Contractor shall take every practical precaution to minimize danger to persons and damage to property. These precautions shall be coordinated through the Owner's Representative and shall include closing all openings; removing all loose materials, tools, and equipment from exposed locations; as well as removing or securing scaffolding and other temporary work.
- H. Interruption of Utility Service: Interruptions to utility services shall be minimized. Necessary outages shall be coordinated with the Owner a minimum of 10 days in advance of the planned outage.

#### **1.07 OWNER OCCUPANCY/WORKING CONDITIONS**

- A. Owner intends to continue to occupy adjacent portions of the existing building during the entire construction period.
- B. Workmen shall be limited to the use of only those areas necessary to perform the work.
- C. Owner intends to occupy the Project upon Substantial Completion.
- D. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.



- E. The Contractor shall take all necessary and prudent safety precautions to ensure the safety of the workforce and other exposed personnel.

#### **1.08 CONTRACTOR USE OF SITE AND PREMISES**

- A. Construction Operations: Limited to areas permitted by Law, Ordinances, Permits, and Contract Documents..
- B. Provide access to and from site as required by law and by Owner:
  - 1. Do not obstruct roadways, sidewalks, or other public ways without permit and/or permission by Owner.
  - 2. Deliveries and access/exit to project site is not available during the student drop off/unloading and student pick up/unloading times in the morning hours of 7:15 a.m. to 8:00 a.m. and during the afternoon hours of 3:15 to 4:00 p.m. General Contractor shall coordinate with Owner and not schedule or maneuver equipment during this time to obstruct traffic flow of buses and parents entering/exiting the school grounds during these time frames.
- C. Existing building spaces and portions of site occupied by Owner for daily use may not be used for storage.
- D. Contractor shall not unreasonably encumber site with materials or equipment.
- E. Contractor shall assume full responsibility for protection and safe-keeping of products sorted on premises.
  - 1. Move any stored materials/products which interfere with operations of other Contractors.
  - 2. Obtain and pay for, use of additional storage or work areas needed for operations.
  - 3. Refer to Division 1 Section "Temporary Facilities and Controls" for additional information.
- F. No Smoking (Tobacco) Policy:
  - 1. Smoking and other tobacco products including vaping are prohibited within and outside of all buildings. This applies to **ALL** buildings including the project site during all times of construction.
- G. No Weapons Policy:
  - 1. No deadly weapons of any kind are permitted on the property.
- H. No Alcohol Policy:
  - 1. No alcoholic beverages of any kind are permitted on the property.
- I. Utility Outages and Shutdown:
  - 1. Limit disruption of utility services to hours the existing surrounding building is unoccupied.
  - 2. Do not disrupt or shut down life safety systems, including but not limited to fire sprinklers and fire alarm system, without 7 days notice to Owner and authorities having jurisdiction.
  - 3. Prevent accidental disruption of utility services to other facilities.

#### **PART 2 PRODUCTS - NOT USED**

#### **PART 3 EXECUTION - NOT USED**

**END OF SECTION**

**SECTION 012000  
PRICE AND PAYMENT PROCEDURES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Procedures for preparation and submittal of applications for progress payments.
- B. Documentation of changes in Contract Sum and Contract Time.
- C. Change procedures.
- D. Procedures for preparation and submittal of application for final payment.

**1.02 RELATED REQUIREMENTS**

- A. Section 005000 - Contracting Forms and Supplements: Forms to be used.
- B. Section 007200 - General Conditions.
- C. Section 012100 - Allowances.

**1.03 SCHEDULE OF VALUES**

- A. Use Schedule of Values Form: AIA G703, edition stipulated in the Agreement.
- B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit draft to Engineer/Architect for approval.
- C. Forms filled out by hand will not be accepted.
- D. Submit Schedule of Values in duplicate within 15 days after date established in Notice to Proceed.
- E. Revise schedule to list approved Change Orders, with each Application For Payment.

**1.04 APPLICATIONS FOR PROGRESS PAYMENTS**

- A. Payment Period: Submit at intervals stipulated in the Agreement.
- B. Forms filled out by hand will not be accepted.
- C. For each item, provide a column for listing each of the following:
  - 1. Item Number.
  - 2. Description of work.
  - 3. Scheduled Values.
  - 4. Previous Applications.
  - 5. Work in Place and Stored Materials under this Application.
  - 6. Authorized Change Orders.
  - 7. Total Completed and Stored to Date of Application.
  - 8. Percentage of Completion.
  - 9. Balance to Finish.
  - 10. Retainage.
- D. Notarize certification by signature of authorized officer.
- E. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored products.
- F. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of work.
- G. Submit one electronic and three hard-copies of each Application for Payment.
- H. Include the following with the application:
  - 1. Transmittal letter as specified for submittals in Section 013000.
  - 2. Construction progress schedule, revised and current as specified in Section 013000.
  - 3. Current construction photographs specified in Section 013000.

4. Partial release of liens from major subcontractors and vendors.
5. Back up information will be required for stored materials.
- I. When Engineer/Architect requires substantiating information, submit data justifying dollar amounts in question. Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.

#### **1.05 MODIFICATION PROCEDURES**

- A. For minor changes not involving an adjustment to the Contract Sum or Contract Time, Engineer/Architect will issue instructions directly to Contractor.
- B. For other required changes, Engineer/Architect will issue a document signed by Owner instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.
  1. The document will describe the required changes and will designate method of determining any change in Contract Sum or Contract Time.
  2. Promptly execute the change.
- C. For changes for which advance pricing is desired, Engineer/Architect will issue a document that includes a detailed description of a proposed change with supplementary or revised drawings and specifications, a change in Contract Time for executing the change. Contractor shall prepare and submit a fixed price quotation within 7 days.
- D. Contractor may propose a change by submitting a request for change to Engineer/Architect, 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. Document any requested substitutions in accordance with Section 01 6000.
- E. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.
  1. For change requested by Engineer/Architect for work falling under a fixed price contract, the amount will be based on Contractor's price quotation.
  2. For change requested by Contractor, the amount will be based on the Contractor's request for a Change Order as approved by Engineer/Architect.
- F. Substantiation of Costs: Provide full information required for evaluation.
  1. On request, provide the following data:
    - a. Quantities of products, labor, and equipment.
    - b. Taxes, insurance, and bonds.
    - c. Overhead and profit.
    - d. Justification for any change in Contract Time.
    - e. Credit for deletions from Contract, similarly documented.
  2. Support each claim for additional costs with additional information:
    - a. Origin and date of claim.
    - b. Dates and times work was performed, and by whom.
    - c. Time records and wage rates paid.
    - d. Invoices and receipts for products, equipment, and subcontracts, similarly documented.
- G. Execution of Change Orders: Engineer/Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.
- H. After execution of Change Order, 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.
- I. 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.
- J. Promptly enter changes in Project Record Documents.

**1.06 APPLICATION FOR FINAL PAYMENT**

- A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.
- B. Application for Final Payment will not be considered until the following have been accomplished:
  - 1. All closeout procedures specified in Section 017000.

**END OF SECTION**

**SECTION 012100  
ALLOWANCES**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. This Section sets forth the following allowances to be included in the Contract:
  - 1. Contingency Allowance
  - 2. AHJ Plan Review Fee
  - 3. Electrical Service Entrance Allowance
  - 4. Underground Utility Relocation Allowance
- B. Conditions:
  - 1. The Contractor shall include in his base bid the cash and/or material allowances as described hereinafter for the purchase of materials as described or as to be determined herein. All costs for overhead, profit, bond, insurance and taxes shall not be included as part of the specified allowances and these overhead amounts shall be carried as an additional cost, where applicable, in a separate line item on the contractor's bid and subsequent schedule of values.
  - 2. All specified allowances shall appear as a line item amount, matching the amount specified herein, on the contractor's AIA Document G703, schedule of values.

**1.02 CASH ALLOWANCES**

- A. Purchase products under allowance as directed by Architect/Engineer or as specified herein.
- B. Use of any allowance shall be specifically authorized in writing upon approval by authorized Owner Representative. A final accounting of all contingency funds used will be made by issuance of a change order at the end of the project.
- C. At close-out of Contract, funds remaining in Allowances will be credited to owner by Change Order. In addition to the balance of the allowance all applicable costs for overhead, profit, bond, insurance and taxes will be added to the allowance change order credit. Overhead amounts that can be clearly documented as being expended over the course of the project will be excluded from this added amount to the allowance credit. Refer to AIA A201 General Conditions for further information.
- D. Contractor shall solicit a minimum of three (3) quotes for material and labor to be performed under all allowances.
  - 1. General Contractor's Overhead and Profit cannot be included in these proposals. The General Contractor's Overhead and Profit in relation to all allowances shall be included in the General Contractor's Base Bid.
- E. Costs Included in Cash Allowances: Cost of product to Contractor or subcontractor, less applicable trade discounts.
  - 1. Net cost of product
  - 2. Delivery to site
  - 3. Installation
  - 4. Labor
  - 5. Insurance
  - 6. Payroll
  - 7. Taxes
  - 8. Bonding
  - 9. Overhead and Profit (O&P).
  - 10. Equipment Rental
- F. Engineer/Architect Responsibilities:
  - 1. Consult with Contractor for consideration and selection of products, suppliers , and installers.

2. Select products in consultation with Owner and transmit decision to Contractor.
3. Prepare Change Order.
- G. Contractor Responsibilities:
  1. Assist Engineer/Architect in selection of products, suppliers, and installers.
  2. Obtain proposals from suppliers and installers and offer recommendations.
  3. On notification of which products have been selected, execute purchase agreement with designated supplier and installer.
  4. Arrange for and process shop drawings, product data, and samples. Arrange for delivery.
  5. Promptly inspect products upon delivery for completeness, damage, and defects. Submit claims for transportation damage.
- H. Differences in costs will be adjusted by Change Order.

#### **1.03 ALLOWANCE SCHEDULE:**

##### **A. General Contingency Allowance:**

1. In addition to the work shown on the contract documents, the contractor shall include in the base bid contract amount the following lump sum cash allowance amount:
  - a. Seventy Five Thousand Dollars (\$75,000).
2. Contractor shall solicit a minimum of three (3) quotes for additional material or work to be performed under the Contingency Allowance.
  - a. General Contractor's Overhead and Profit cannot be added to these proposals. The General Contractor's Overhead and Profit in relation to the

#### **1.04 SELECTION/DELIVERY/INSTALLATION PROCESS**

- A. Architect shall consult with Contractor in coordination of products and suppliers and shall make selection of products to be used.
- B. Contractor shall assist Architect in determining qualified suppliers, obtain proposals from suppliers for Architect's review, and enter into purchase agreement with designated supplier chosen.
- C. Contractor is responsible for arranging delivery, unloading and inspecting products for damage and defects.
- D. Contractor shall comply with requirements of referenced specification section for installation and/or install per Manufacturer's recommendations.

#### **PART 2 PRODUCTS - NOT USED**

#### **PART 3 EXECUTION - NOT USED**

**END OF SECTION**

**SECTION 012300  
ALTERNATES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Description of administrative and procedural requirements for Alternates.
- B. Description of Alternates.

**1.02 RELATED REQUIREMENTS**

- A. Document 002113 - Instructions to Bidders: Instructions for preparation of pricing for Alternates.

**1.03 ACCEPTANCE OF ALTERNATES**

- A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in the Owner-Contractor Agreement.
- B. Coordinate related work and modify surrounding work to integrate the Work of each Alternate designated in the Contract.
  - 1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
  - 2. Execute accepted alternates under the same conditions as other work of the Contract.

**1.04 SCHEDULE OF ALTERNATES**

- A. Additive Alternate No. 01 - Additive alternate shall include cooling towers stainless steel upper and stainless steel basin parts in lieu of galvanized material as indicated on attached drawings and specifications.
- B. Additive Alternate No. 02 - Additive alternate shall include cooling towers sweeper piping and filter pump as indicated on attached drawings and specifications
- C. Additive Alternate No. 03 - Additive alternate shall include coil coating on cooling tower coils as indicated on attached drawings and specifications.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION - NOT USED**

**END OF SECTION**

**SECTION 013000  
ADMINISTRATIVE REQUIREMENTS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. General administrative requirements.
- B. Preconstruction meeting.
- C. Progress meetings.
- D. Construction progress schedule.
- E. Progress photographs.
- F. Coordination drawings.
- G. Submittals for review, information, and project closeout.
- H. Number of copies of submittals.
- I. Requests for Interpretation (RFI) procedures.
- J. Submittal procedures.

**1.02 RELATED REQUIREMENTS**

- A. Section 016000 - Product Requirements: General product requirements.

**1.03 GENERAL ADMINISTRATIVE REQUIREMENTS**

- A. Comply with requirements of Section 017000 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION**

**3.01 COLLABORATION SOFTWARE**

- A. SUMMARY
  - 1. The Contractor will be required to utilize a web based construction project management collaboration software to submit, track, distribute and collaborate on project documentation and action items.
  - 2. The intent of utilizing a web based construction management application is to reduce cost and schedule risk, improve quality and safety, and maintain a healthy team dynamic by improving information flow, reducing non-productive activities, reducing rework and decreasing turnaround times.
- B. SOFTWARE
  - 1. Procore ([www.procore.com](http://www.procore.com))
- C. SOFTWARE CAPABILITIES (including but not limited to)
  - 1. Daily Log
    - a. Provide daily log entry from web and mobile with automatic capture of daily weather conditions.
    - b. Provide ability to attach photographs to entries directly from mobile.
    - c. Provide reporting capabilities to easily report on man-hours and activities for a certain time frame and contractor.
  - 2. Dashboards
    - a. Provide a dashboard that shows the status of all currently assigned items with drill down capability to see the subject, assignee and due date of each item.
  - 3. Deficiency Tracking
    - a. Provide a means for recording, assigning and confirming completion of any deficiency or observation noted during the course of construction. Must be accessible from web



- and mobile.
- 4. Directory
  - a. Provide a directory of all team member's contact information that is accessible from web and mobile.
- 5. Documents
  - a. Provide a storage location for miscellaneous project documents with the ability to have a folder hierarchy and privacy settings on folders.
  - b. There should not be a storage limit.
  - c. Provide download tracking.
  - d. Provide the ability to revision and check out files, with access to all previous revisions.
- 6. Drawings
  - a. Provide access to a system maintained current set of drawings on web and mobile, with access to all previous revisions as well.
  - b. Provide automatic hyperlinking capability for detail callouts.
  - c. Provide drawing markup capabilities on web and mobile.
  - d. Provide ability to link RFIs, Submittals, Punchlist Items, Photos and Project Documents to the drawings.
  - e. Drawing Markups should be carried forward when new revisions are uploaded.
  - f. Markups and linked documentation should be able to be public or private.
- 7. Financial Management
  - a. Provide ability to manage contracts, payment applications and change orders through the software.
  - b. Provide ability to view contracts and change orders from web and mobile.
- 8. Inspections
  - a. Provide ability to create inspections from web and mobile.
  - b. Provide ability to create a deficiency item from an inspection that can be assigned and tracked to completion.
- 9. Meetings
  - a. Provide ability to create, edit and view meeting minutes from web and mobile.
  - b. Provide ability to create action items with assignees and due dates from a meeting item.
- 10. Mobile Accessibility
  - a. Provide native mobile applications for iOS and Android phones at a minimum that provide access to relevant project documentation, including as-built versions of Drawings and Specifications, even when there is no internet access.
- 11. Photos
  - a. Provide ability to upload and view photos from web and mobile.
  - b. Provide ability to markup photos from mobile to clarify anything important in the photo.
  - c. Provide ability to link photos to specific locations on drawings.
- 12. Punchlist
  - a. Provide ability to create punchlist items from web and mobile and link them to specific locations on the drawings.
  - b. Provide ability to distribute punchlist items to all contractors, for contractors to mark them as resolved with photographic proof of resolution via mobile, and for the items to be marked as complete via mobile or web. .
- 13. Requests for Information (RFIs)
  - a. Provide ability to create RFIs with assignees, due dates and attachments.
  - b. Provide ability for assignees to respond to RFIs both via the software and by responding to the system generated email.
  - c. Provide an auto-generated log of all RFIs.

14. Schedule
    - a. Provide ability to display schedules from typical scheduling software such as Microsoft Project, Primavera P3, Primavera P6 or Asta Powerproject.
  15. Specifications
    - a. Provide ability to upload project specifications and manage them at the individual specification level.
    - b. Provide ability to view and search specifications on web and mobile.
    - c. Provide ability to upload revisions to individual specifications and maintain all revision history.
    - d. Provide an auto-generated current specification log that provides access to the current version of each specification.
    - e. Provide ability to link specifications to submittals and view the specification from the submittal.
  16. Submittals
    - a. Provide ability to upload a submittal register of all expected submittals.
    - b. Provide ability to create multi-step approval workflows for submittals, with reminder notifications for the current assignee.
    - c. Provide the ability to upload any file type without size restrictions.
    - d. Provide an auto-generated submittal log.
- D. TECHNOLOGY
1. Fully web based with mobile apps for Windows, iOS and Android phones.
  2. Accessible without logging in through a virtual private network (VPN).
  3. Works on the current version of Internet Explorer, Google Chrome, Mozilla firefox and Apple Safari browsers.
  4. Can generate emails automatically, and all attachments are included in the emails via download links to avoid emails not being delivered due to size.
  5. PDF output of forms such as RFIs, Submittals, Meetings, Change Orders, etc. should be available and customizable.
- E. TRAINING AND SUPPORT
1. The software selected must provide support to all parties via email, phone and live chat at no additional charge.
  2. The software selected must provide training in the form of self-paced learning videos as well as interactive webinars.
  3. The contractor shall hold a kickoff meeting with the Owner and applicable consultants at the beginning of the project to discuss how the software will be used, routing & naming protocols, etc.
- F. PROCEDURES
1. RFIs and Submittals
    - a. The Contractor will be responsible for submitting all RFIs and Submittals through the software and assigning them to the appropriate parties.
    - b. Architects / Engineers / Consultants etc. are responsible for posting all responses to these items via the software, including all relevant attachments.
    - c. The Contractor will distribute responses to all affected subcontractors and confirm agreement with the response by closing the item.
  2. Construction Documentation
    - a. The Contractor will manage Drawings, Specifications and Documents in the software to ensure that the current version of all applicable construction documentation is available to the entire team via web and mobile.
    - b. The Contractor will ensure that all RFIs which modify the current drawings are posted to the drawings and available via web and mobile within 24 hours of the RFI being responded to.
  3. Contractor will record and distribute meeting minutes and action items via the software.

4. Contractor will take daily site photos and make them publicly available.
  5. Punchlist
    - a. All punchlist items will be managed through the software.
    - b. Punchlist items will be created by the Contractor while walking with the Owner and applicable consultants.
    - c. It will be at the Owner's discretion whether or not Punchlist Items can be closed while a representative from the Owner or applicable consultant is not present.
  6. General
    - a. It is intended that the contractor will utilize the software for at least all functions identified in "Section B - Software Capabilities."
- G. PRICING
1. The Contractor's proposal shall be inclusive of all software costs.
  2. The cost of Procore Technologies services has been paid in full by the Architect/Engineer.
  3. The software must allow for unlimited users to ensure that all parties have access to the system.

### **3.02 PRECONSTRUCTION MEETING**

- A. Engineer/Architect will schedule a meeting within 7 days after Notice of Award.
- B. Attendance Required:
1. Owner.
  2. Engineer/Architect.
  3. Contractor.
- C. Agenda:
1. Execution of Owner-Contractor Agreement.
  2. Submission of executed bonds and insurance certificates.
  3. Submission of list of subcontractors, list of products, schedule of values, and progress schedule.
  4. Designation of personnel representing the parties of the owner, contractor and <1|A/E|>.
  5. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
  6. Owners requirements and work constraints.
- D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Engineer/Architect, Owner, participants, and those affected by decisions made.

### **3.03 PROGRESS MEETINGS**

- A. Schedule and administer meetings throughout progress of the Work at maximum monthly intervals.
- B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
- C. Attendance Required:
1. Contractor.
  2. Owner.
  3. Engineer/Architect.
  4. Contractor's superintendent.
  5. Major subcontractors.
- D. Agenda:
1. Review minutes of previous meetings.
  2. Review of work progress.
  3. Field observations, problems, and decisions.
  4. Identification of problems that impede, or will impede, planned progress.
  5. Review of submittals schedule and status of submittals.

6. Review of off-site fabrication and delivery schedules.
  7. Maintenance of progress schedule.
  8. Corrective measures to regain projected schedules.
  9. Planned progress during succeeding work period.
  10. Maintenance of quality and work standards.
  11. Effect of proposed changes on progress schedule and coordination.
  12. Other business relating to work.
- E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Engineer/Architect, Owner, participants, and those affected by decisions made.

### **3.04 CONSTRUCTION PROGRESS SCHEDULE - SEE SECTION 013216**

- A. If preliminary schedule requires revision after review, submit revised schedule within 10 days.
- B. Submit updated schedule with each Application for Payment.

### **3.05 REQUESTS FOR INTERPRETATION (RFI)**

- A. Definition: A request seeking one of the following:
  1. An interpretation, amplification, or clarification of some requirement of Contract Documents arising from inability to determine from them the exact material, process, or system to be installed; or when the elements of construction are required to occupy the same space (interference); or when an item of work is described differently at more than one place in Contract Documents.
- B. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
  1. Prepare a separate RFI for each specific item.
  2. Combine RFI and its attachments into a single electronic file. PDF format is preferred.
- C. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.
  1. Include in each request Contractor's signature attesting to good faith effort to determine from Contract Documents information requiring interpretation.
  2. Unacceptable Uses for RFIs: Do not use RFIs to request the following::
    - a. Approval of submittals (use procedures specified elsewhere in this section).
    - b. Approval of substitutions (see Section - 016000 - Product Requirements)
    - c. Changes that entail change in Contract Time and Contract Sum (comply with provisions of the Conditions of the Contract).
    - d. Different methods of performing work than those indicated in the Contract Drawings and Specifications (comply with provisions of the Conditions of the Contract).
  3. Improper RFIs: Requests not prepared in compliance with requirements of this section, and/or missing key information required to render an actionable response. They will be returned without a response, with an explanatory notation.
  4. Frivolous RFIs: Requests regarding information that is clearly indicated on, or reasonably inferable from, Contract Documents, with no additional input required to clarify the question. They will be returned without a response, with an explanatory notation.
- D. Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.
  1. Official Project name and number, and any additional required identifiers established in Contract Documents.
  2. Owner's, Engineer/Architect's, and Contractor's names.
  3. Discrete and consecutive RFI number, and descriptive subject/title.
  4. Issue date, and requested reply date.
  5. Reference to particular Contract Document(s) requiring additional information/interpretation. Identify pertinent drawing and detail number and/or

- specification section number, title, and paragraph(s).
6. Annotations: Field dimensions and/or description of conditions which have engendered the request.
  7. Contractor's suggested resolution: A written and/or a graphic solution, to scale, is required in cases where clarification of coordination issues is involved, for example; routing, clearances, and/or specific locations of work shown diagrammatically in Contract Documents. If applicable, state the likely impact of the suggested resolution on Contract Time or the Contract Sum.
- E. Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.
- F. RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.
1. Maintain on the Electronic Document Submittal Service.
- G. Review Time: Engineer/Architect will respond and return RFIs to Contractor within seven calendar days of receipt. For the purpose of establishing the start of the mandated response period, RFIs received after 12:00 noon will be considered as having been received on the following regular working day.
1. Response period may be shortened or lengthened for specific items, subject to mutual agreement, and recorded in a timely manner in progress meeting minutes.
- H. Responses: Content of answered RFIs will not constitute in any manner a directive or authorization to perform extra work or delay the project. If in Contractor's belief it is likely to lead to a change to Contract Sum or Contract Time, promptly issue a notice to this effect, and follow up with an appropriate Change Order request to Owner.
1. Response may include a request for additional information, in which case the original RFI will be deemed as having been answered, and an amended one is to be issued forthwith. Identify the amended RFI with an R suffix to the original number.
  2. Do not extend applicability of a response to specific item to encompass other similar conditions, unless specifically so noted in the response.
  3. Upon receipt of a response, promptly review and distribute it to all affected parties, and update the RFI Log.
  4. Notify Engineer/Architect within seven calendar days if an additional or corrected response is required by submitting an amended version of the original RFI, identified as specified above.

### **3.06 SUBMITTAL SCHEDULE**

- A. Submit to Engineer/Architect for review a schedule for submittals in tabular format.
1. Submit at the same time as the preliminary schedule specified in Section - 013216 - Construction Progress Schedule.

### **3.07 SUBMITTALS FOR REVIEW**

- A. When the following are specified in individual sections, submit them for review:
1. Product data.
  2. Shop drawings.
  3. Samples for selection.
  4. Samples for verification.
- B. The contractor who prepared the submittals for review must represent that they are licensed and qualified to perform the work in the submittal, and said work is in full compliance with applicable codes.
- C. The contractor agrees that all submittals have been reviewed by the Architect and/or Engineer only for conformance with the design concept of the project and with the information delineated in the contract drawings and specifications. A returned review whether marked as "No Exceptions" or "Exceptions as Noted" does not waive any provisions of the contract documents. Contractor shall verify all details, dimensions and quantities, and coordinate with the work of

other trades. Architect and/or Engineer's review of a submittal shall not relieve the contractor from responsibility for deviations, errors, or omissions in the shop drawings or submittals.

- D. Samples will be reviewed for aesthetic, color, or finish selection.
- E. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 017800 - Closeout Submittals.

### **3.08 SUBMITTALS FOR INFORMATION**

- A. When the following are specified in individual sections, submit them for information:
  - 1. Design data.
  - 2. Certificates.
  - 3. Test reports.
  - 4. Inspection reports.
  - 5. Manufacturer's instructions.
  - 6. Manufacturer's field reports.
  - 7. Other types indicated.

### **3.09 SUBMITTALS FOR PROJECT CLOSEOUT**

- A. Submit Correction Punch List for Substantial Completion.
- B. Submit Final Correction Punch List for Substantial Completion.
- C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 017800 - Closeout Submittals:
  - 1. Project record documents.
  - 2. Operation and maintenance data.
  - 3. Warranties.
  - 4. Bonds.
  - 5. Other types as indicated.
- D. Submit for Owner's benefit during and after project completion.

### **3.10 SUBMITTAL PROCEDURES**

- A. General Requirements:
  - 1. Use a separate transmittal for each item.
  - 2. Transmit using approved form.
    - a. Use Contractor's form, subject to prior approval by Engineer/Architect.
  - 3. Sequentially identify each item. For revised submittals use original number and a sequential numerical suffix.
  - 4. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
  - 5. Apply Contractor's stamp, signed or initialed certifying that review, approval, 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.
    - a. Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.
  - 6. Deliver each submittal on date noted in submittal schedule, unless an earlier date has been agreed to by all affected parties, and is of the benefit to the project.
    - a. Upload submittals in electronic form to Electronic Document Submittal Service website.
  - 7. Schedule submittals to expedite the Project, and coordinate submission of related items.
    - a. For each submittal for review, allow 10 working days excluding delivery time to and from the Contractor.

- b. For sequential reviews involving Engineer/Architect's consultants, Owner, or another affected party, allow an additional 7 days.
  8. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
  9. When revised for resubmission, identify all changes made since previous submission.
  10. Incomplete submittals will not be reviewed, unless they are partial submittals for distinct portion(s) of the work, and have received prior approval for their use.
- B. Product Data Procedures:
1. Submit only information required by individual specification sections.
  2. Collect required information into a single submittal.
  3. Do not submit (Material) Safety Data Sheets for materials or products.
  4. Submit manufacturer's standard published data. **Where multiple choices occur on a submittal, it will be the Contractor's responsibility to clearly mark in contrasting color by means of underlining, highlighting, circling, ect... each copy to identify applicable products, models, options, and other data.** Unmarked copies will be immediately rejected and sent back to the General Contractor. Supplement manufacturers' standard data to provide information specific to this Project.
- C. Shop Drawing Procedures:
1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work.
  2. Do not reproduce Contract Documents to create shop drawings.
  3. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.
  4. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances. **Canned or Typical drawings, unless they specifically apply to the project, will be immediately rejected.**
- D. Samples Procedures:
1. Transmit related items together as single package.
  2. Identify each item to allow review for applicability in relation to shop drawings showing installation locations.
  3. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
    - a. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.
    - b. **All submissions for the choosing of a products color must be physical samples indicating the products true and final color.** Digital and or printed samples will not be accepted.
- E. Transmit each submittal with a copy of approved submittal identification form.
- F. Contractor bears responsibility for all additional costs or work associated with work performed or materials installed prior to a returned approved submittal.

### 3.11 SUBMITTAL REVIEW

- A. Submittals for Review: Engineer/Architect will review each submittal, and provide no exceptions, or take other appropriate action.
- B. Submittals for Information: Engineer/Architect will acknowledge receipt and review. See below for actions to be taken.
- C. Engineer/Architect's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.
- D. Engineer/Architect's actions on items submitted for review:
  1. No Exceptions

- a. Purchase, Fabrication, delivery, and/or installation may take place.
- 2. Exceptions as Noted
  - a. Contractor's option to resubmit. However; all mark ups must be incorporated in the construction whether acknowledged in a resubmittal or not.
- 3. Revise and Resubmit
  - a. Must be resubmitted
- 4. Incomplete Submittal
  - a. Must be resubmitted
- 5. Submit Specified Item
  - a. Must be resubmitted
- 6. Submittal Rejected
  - a. Must be resubmitted
- E. Engineer/Architect's and consultants' actions on items submitted for information:

**END OF SECTION**



**SECTION 014000  
QUALITY REQUIREMENTS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Submittals.
- B. Quality assurance.
- C. References and standards.
- D. Testing and inspection agencies and services.
- E. Contractor's construction-related professional design services.
- F. Contractor's design-related professional design services.
- G. Control of installation.
- H. Mock-ups.
- I. Tolerances.
- J. Manufacturers' field services.
- K. Defect Assessment.

**1.02 REFERENCE STANDARDS**

- A. IAS AC89 - Accreditation Criteria for Testing Laboratories 2018.

**1.03 CONTRACTOR'S CONSTRUCTION-RELATED PROFESSIONAL DESIGN SERVICES**

- A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.
- B. Provide such engineering design services as may be necessary to plan and safely conduct certain construction operations, pertaining to, but not limited to the following:
  - 1. Temporary sheeting, shoring, or supports.
  - 2. Temporary bracing.

**1.04 CONTRACTOR'S DESIGN-RELATED PROFESSIONAL DESIGN SERVICES**

- A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.
- B. Base design on performance and/or design criteria indicated in individual specification sections.
- C. Scope of Contractor's Professional Design Services: Provide for the following items of work:
  - 1. Structural Design of Steel Trusses: As described in Section 054400 - Cold-Formed Steel Trusses.

**1.05 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Test Reports: After each test/inspection, promptly submit two copies of report to Engineer/Architect and to Contractor.
  - 1. Include:
    - a. Date issued.
    - b. Project title and number.
    - c. Name of inspector.
    - d. Date and time of sampling or inspection.
    - e. Identification of product and specifications section.
    - f. Location in the Project.
    - g. Type of test/inspection.
    - h. Date of test/inspection.

- i. Results of test/inspection.
  - j. Compliance with Contract Documents.
  - k. When requested by Engineer/Architect, provide interpretation of results.
- C. Certificates: When specified in individual specification sections or by code, submit certification by the manufacturer and Contractor or installation/application subcontractor to Engineer/Architect, in quantities specified for Product Data.
  - 1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
- D. Erection Drawings: Submit drawings for Engineer/Architect's benefit as contract administrator or for Owner.
  - 1. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.

#### **1.06 QUALITY ASSURANCE**

- A. Testing Agency Qualifications:
  - 1. Prior to start of work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
  - 2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.

#### **1.07 REFERENCES AND STANDARDS**

- A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Comply with reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.
- C. Obtain copies of standards where required by product specification sections.
- D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.
- E. Should specified reference standards conflict with Contract Documents, request clarification from Engineer/Architect before proceeding.
- F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Engineer/Architect shall be altered from Contract Documents by mention or inference otherwise in any reference document.

#### **1.08 TESTING AND INSPECTION AGENCIES AND SERVICES**

- A. Contractor shall employ and pay for services of an independent testing agency to perform specified testing and inspection.
- B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.
- C. Contractor Employed Agency:
  - 1. Testing agency: Comply with requirements of ASTM E329, ASTM E543, ASTM C1021, ASTM C1077, ASTM C1093, and ASTM D3740.
  - 2. Laboratory Qualifications: Accredited by IAS according to IAS AC89.
  - 3. Laboratory: Authorized to operate in the State in which the Project is located.
  - 4. Laboratory Staff: Maintain a full time registered Engineer on staff to review services.
  - 5. Testing Equipment: Calibrated at reasonable intervals either by NIST or using an NIST established Measurement Assurance Program, under a laboratory measurement quality assurance program.

## **PART 3 EXECUTION**

### **2.01 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. Should manufacturers' instructions conflict with Contract Documents, request clarification from Engineer/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. Have work performed by persons qualified to produce required and specified quality.
- F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

### **2.02 MOCK-UPS**

- A. Before installing portions of the Work where mock-ups are required, for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work. The purpose of mock-up is to demonstrate the proposed range of aesthetic effects and workmanship.
- B. Accepted mock-ups establish the standard of quality the Engineer/Architect will use to judge the Work.
- C. Integrated Exterior Mock-ups: Construct integrated exterior mock-up as indicated on drawings. Coordinate installation of exterior envelope materials and products as required in individual Specification Sections. Provide adequate supporting structure for mock-up materials as necessary.
- D. Notify Engineer/Architect seven (7) working days in advance of dates and times when mock-ups will be constructed.
- E. Tests shall be performed under provisions identified in this section and identified in the respective product specification sections.
- F. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.
- G. Obtain Engineer/Architect's approval of mock-ups before starting work, fabrication, or construction.
  - 1. Engineer/Architect will issue written comments within five (5) working days of initial review and each subsequent follow up review of each mock-up.
  - 2. Make corrections as necessary until Architect's approval is issued.
- H. Accepted mock-ups shall be a comparison standard for the remaining Work.
- I. Where mock-up has been accepted by Engineer/Architect and is specified in product specification sections to be removed, protect mock-up throughout construction, remove mock-up and clear area when directed to do so by Engineer/Architect.

### **2.03 TOLERANCES**

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Engineer/Architect before proceeding.

- C. Adjust products to appropriate dimensions; position before securing products in place.

## **2.04 TESTING AND INSPECTION**

- A. Testing Agency Duties:
  - 1. Test samples of mixes submitted by Contractor.
  - 2. Provide qualified personnel at site. Cooperate with Engineer/Architect and Contractor in performance of services.
  - 3. Perform specified sampling and testing of products in accordance with specified standards.
  - 4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
  - 5. Promptly notify Engineer/Architect and Contractor of observed irregularities or non-compliance of Work or products.
  - 6. Perform additional tests and inspections required by Engineer/Architect.
  - 7. Submit reports of all tests/inspections specified.
- B. Limits on Testing/Inspection Agency Authority:
  - 1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
  - 2. Agency may not approve or accept any portion of the Work.
  - 3. Agency may not assume any duties of Contractor.
  - 4. Agency has no authority to stop the Work.
- C. Contractor Responsibilities:
  - 1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
  - 2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
  - 3. Provide incidental labor and facilities:
    - a. To provide access to Work to be tested/inspected.
    - b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
    - c. To facilitate tests/inspections.
    - d. To provide storage and curing of test samples.
  - 4. Notify Engineer/Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
  - 5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
  - 6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
- D. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Engineer/Architect.
- E. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

## **2.05 MANUFACTURERS' FIELD SERVICES**

- A. 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, as applicable, and to initiate instructions when necessary.
- B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

## **2.06 DEFECT ASSESSMENT**

- A. Replace Work or portions of the Work not complying with specified requirements.

- B. If, in the opinion of Engineer/Architect, it is not practical to remove and replace the work, Engineer/Architect will direct an appropriate remedy or adjust payment.

**END OF SECTION**

**SECTION 014100  
REGULATORY REQUIREMENTS**

**PART 1 GENERAL**

**1.01 SUMMARY OF REFERENCE STANDARDS**

- A. Regulatory requirements applicable to this project that all work shall comply with are as follows:
- B. 28 CFR 35 - Nondiscrimination on the Basis of Disability in State and Local Government Services; Final Rule; Department of Justice current edition.
- C. 28 CFR 36 - Nondiscrimination by Public Accommodations and in Commercial Facilities; Final Rule; Department of Justice current edition.
- D. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines current edition.
- E. 49 CFR 37 - Transportation Services for Individuals with Disabilities (ADA) current edition.
- F. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.
- G. 29 CFR 1910 - Occupational Safety and Health Standards current edition.
- H. ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.
- I. Building Code: ICC (IBC) - International Building Code 2018.
- J. Plumbing Code: ICC International Plumbing Code 2018.
- K. Mechanical Code: ICC International Mechanical Code 2018.
- L. Fuel Gas Code: ICC Fuel Gas Code 2018.
- M. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

**1.02 RELATED REQUIREMENTS**

- A. Section 014000 - Quality Requirements.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION - NOT USED**

**END OF SECTION**

**SECTION 015000  
TEMPORARY FACILITIES AND CONTROLS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Temporary utilities.
- B. Temporary sanitary facilities.
- C. Temporary Controls: Barriers, enclosures, and fencing.
- D. Security requirements.
- E. Vehicular access and parking.
- F. Waste removal facilities and services.

**1.02 TEMPORARY UTILITIES**

- A. Owner will provide the following:
  - 1. Electrical power and metering, consisting of providing the power source. The contractor will be required to provide all means necessary to connect to it without added cost to the Owner.
  - 2. Water supply, consisting of provided the water source. The contractor will be required to provide all means necessary to connect to it without added cost to the Owner.
- B. Use trigger-operated nozzles for water hoses, to avoid waste of water.

**1.03 TEMPORARY SANITARY FACILITIES**

- A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
- B. Use of existing facilities is not permitted.
- C. Maintain daily in clean and sanitary condition.
- D. At end of construction, return facilities to same or better condition as originally found.

**1.04 BARRIERS**

- A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- B. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

**1.05 FENCING**

- A. Construction: Commercial grade chain link fence.
- B. Provide 6 foot (1.8 m) high fence around construction site; equip with vehicular and pedestrian gates with locks.

**1.06 EXTERIOR ENCLOSURES**

- A. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

**1.07 SECURITY**

- A. Coordinate with Owner's security program.

**1.08 VEHICULAR ACCESS AND PARKING**

- A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.

- B. Coordinate access and haul routes with governing authorities and Owner.
- C. Provide and maintain access to fire hydrants, free of obstructions.
- D. Provide means of removing mud from vehicle wheels before entering streets.
- E. Existing on-site roads may be used for construction traffic.
- F. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.
- G. Do not interrupt, alter, or disrupt bus or parent standard drop off or pick up times, procedures, or operations. Coordinate with Owner.

#### **1.09 WASTE REMOVAL**

- A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
- B. Provide containers with lids. Remove trash from site periodically.
- C. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.
- D. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

#### **1.10 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS**

- A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection.
- B. Remove underground installations to a minimum depth of 2 feet (600 mm). Grade site as indicated.
- C. Clean and repair damage caused by installation or use of temporary work.
- D. Restore existing facilities used during construction to original condition.

#### **1.11 TEMPORARY STORAGE**

- A. General Contractor will be required to provide lockable temporary storage as required or necessary to complete the job. Existing facilities will not be allowed to be used for storage of any kind.

#### **PART 2 PRODUCTS - NOT USED**

#### **PART 3 EXECUTION - NOT USED**

**END OF SECTION**



## SECTION 016000 PRODUCT REQUIREMENTS

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. General product requirements.
- B. Transportation, handling, storage and protection.
- C. Product option requirements.
- D. Substitution limitations.
- E. Maintenance materials, including extra materials, spare parts, tools, and software.
- F. Non Asbestos containing materials certification.

#### 1.02 RELATED REQUIREMENTS

- A. Section 012500 - Substitution Procedures: Substitutions made during procurement and/or construction phases.
- B. Section 017419 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting product selection, packaging and substitutions.

#### 1.03 SUBMITTALS

- A. Refer to Section 013000 Administrative Requirements for additional submittal requirements not indicated herein.
- B. Proposed Products List: Submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
  - 1. Submit within 7 days after date of Agreement of Notice of intent to award, whichever is sooner..
  - 2. For products specified only by reference standards, list applicable reference standards.
- C. Product Data Submittals: Submit manufacturer's standard published data. **Where multiple choices occur on a submittal, it will be the Contractor's responsibility to clearly mark in contrasting color by means of underlining, highlighting, circling, ect... each copy to identify applicable products, models, options, and other data.** Unmarked copies will be rejected and sent back to the General Contractor. Supplement manufacturers' standard data to provide information specific to this Project.
- D. Shop Drawing Submittals: Prepared specifically for this Project and submit individually per each School; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances. **Canned or Typical drawings, unless they specifically apply to the project, will be rejected.**
- E. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
  - 1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.
  - 2. All submissions for the choosing of a products color must be physical samples indicating the products true and final color. Digital and or printed samples will not be accepted.

### PART 2 PRODUCTS

#### 2.01 NEW PRODUCTS

- A. Provide new products unless specifically required or permitted by Contract Documents.
- B. Use of products having any of the following characteristics is not permitted:
  - 1. Made using or containing CFC's or HCFC's.
  - 2. Containing lead, cadmium, or asbestos.

## **2.02 PRODUCT OPTIONS**

- A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.
  - 1. Where more than one manufacturer is specified for one use, the Drawings have been prepared for the one listed first; and building adjustments may be necessary to accommodate the others. The Contractor will be responsible for any changes in the building construction required due to product selection, and shall make any such changes to the satisfaction of the Architect.
- C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions by "or approved equal/equal as approved" or "or equal", Contractor shall submit a request for substitution for any manufacturer not named prior to bid.

## **2.03 MAINTENANCE MATERIALS**

- A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.
- B. Deliver to Project site; obtain receipt prior to final payment.

## **PART 3 EXECUTION**

### **3.01 SUBSTITUTION LIMITATIONS**

- A. See Section 012500 - Substitution Procedures.
- B. Substitution Submittal Procedure:
  - 1. Submit substitution request at least 10 days prior to bid.
  - 2. The Architect/Engineer will notify all bidders via addendum of decision to accept a request.

### **3.02 TRANSPORTATION AND HANDLING**

- A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.
- B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.
- C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
- D. Transport and handle products in accordance with manufacturer's instructions.
- E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
- F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
- G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.
- H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

### **3.03 STORAGE AND PROTECTION**

- A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 017419.
- B. Store and protect products in accordance with manufacturers' instructions.
- C. Store with seals and labels intact and legible.

- D. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.
- E. For exterior storage of fabricated products, place on sloped supports above ground.
- F. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.
- G. Comply with manufacturer's warranty conditions, if any.
- H. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- I. Prevent contact with material that may cause corrosion, discoloration, or staining.
- J. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- K. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

#### **3.04 PRODUCT CERTIFICATION**

- A. Submit letter on company letterhead and signed by company executive stating and certifying that "This project (insert project name, description, and location) has been completed and that no asbestos containing materials were found at the project site that were not properly remedied and that no new materials were used or installed that contain asbestos." Final pay application will not be processed until certification is received.

**END OF SECTION**

**SECTION 017000  
EXECUTION AND CLOSEOUT REQUIREMENTS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Examination, preparation, and general installation procedures.
- B. Requirements for alterations work, including selective demolition, except removal, disposal, and/or remediation of hazardous materials and toxic substances , [\_\_\_\_\_].
- C. Pre-installation meetings.
- D. Cutting and patching.
- E. Surveying for laying out the work.
- F. Cleaning and protection.
- G. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.
- H. General requirements for maintenance service.

**1.02 RELATED REQUIREMENTS**

- A. Section 015000 - Temporary Facilities and Controls: Temporary exterior enclosures.
- B. Section 015000 - Temporary Facilities and Controls: Temporary interior partitions.
- C. Section 078400 - Firestopping.

**1.03 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
  - 1. On request, submit documentation verifying accuracy of survey work.
  - 2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in compliance with Contract Documents.
  - 3. Submit surveys and survey logs for the project record.
- C. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.
  - 1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences. Include design drawings and calculations for bracing and shoring.
  - 2. Identify demolition firm and submit qualifications.
  - 3. Include a summary of safety procedures.
- D. Cutting and Patching: Submit written request in advance of cutting or alteration that 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.

**1.04 QUALIFICATIONS**

- A. For asbestos demolition work, employ a firm specializing in the type of work required.
  - 1. Minimum of 5 years of documented experience.
- B. For surveying work, employ a land surveyor registered in the State in which the Project is located and acceptable to Engineer/Architect. Submit evidence of surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate. Employ only individual(s) trained and experienced in collecting and recording accurate data relevant to

ongoing construction activities,

- C. For design of temporary shoring and bracing, employ a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

#### **1.05 PROJECT CONDITIONS**

- A. Use of explosives is not permitted.
- B. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- C. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
  - 1. Provide dust-proof barriers between construction areas and areas continuing to be occupied by Owner.
- D. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
  - 1. Outdoors: Limit conduct of especially noisy exterior work to the hours of 8 am to 5 pm.
  - 2. Indoors: Limit conduct of especially noisy interior work to the hours of 6 pm to 7 am.

#### **1.06 COORDINATION**

- A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- B. Notify affected utility companies and comply with their requirements.
- C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- F. Coordinate completion and clean-up of work of separate sections.
- G. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

### **PART 2 PRODUCTS**

#### **2.01 PATCHING MATERIALS**

- A. New Materials: As specified in product sections; match existing products and work for patching and extending work.
- B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.
- C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 016000 - Product Requirements.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.

- B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.
- E. Verify that utility services are available, of the correct characteristics, and in the correct locations.
- F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

### **3.02 PREPARATION**

- A. Clean substrate surfaces prior to applying next material or substance.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

### **3.03 PREINSTALLATION MEETINGS**

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

### **3.04 LAYING OUT THE WORK**

- A. Verify locations of survey control points prior to starting work.
- B. Promptly notify Engineer/Architect of any discrepancies discovered.
- C. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- D. Promptly report to Engineer/Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
- E. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Engineer/Architect.
- F. Utilize recognized engineering survey practices.
- G. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
  - 1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations; and [\_\_\_\_\_].
  - 2. Grid or axis for structures.
  - 3. Building foundation, column locations, ground floor elevations, and [\_\_\_\_\_].
- H. Periodically verify layouts by same means.
- I. Maintain a complete and accurate log of control and survey work as it progresses.

### 3.05 GENERAL INSTALLATION REQUIREMENTS

- A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.
- B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
- C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
- D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
- E. Make neat transitions between different surfaces, maintaining texture and appearance.

### 3.06 ALTERATIONS

- A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
  - 1. Verify that construction and utility arrangements are as indicated.
  - 2. Report discrepancies to Engineer/Architect before disturbing existing installation.
  - 3. Beginning of alterations work constitutes acceptance of existing conditions.
- B. Keep areas in which alterations are being conducted separated from other areas that are still occupied.
  - 1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 015000 in locations indicated on drawings.
- C. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
  - 1. Where openings in exterior enclosure exist, provide construction to make exterior enclosure weatherproof.
  - 2. Insulate existing ducts or pipes that are exposed to outdoor ambient temperatures by alterations work.
- D. Remove existing work as indicated and as required to accomplish new work.
  - 1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction specified.
  - 2. Remove items indicated on drawings.
  - 3. Relocate items indicated on drawings.
  - 4. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
  - 5. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.
- E. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, Telecommunications, and [ ]): Remove, relocate, and extend existing systems to accommodate new construction.
  - 1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
  - 2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
  - 3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
    - a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
    - b. Provide temporary connections as required to maintain existing systems in service.

4. Verify that abandoned services serve only abandoned facilities.
  5. Remove abandoned pipe, ducts, conduits, and equipment , including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.
- F. Protect existing work to remain.
1. Prevent movement of structure; provide shoring and bracing if necessary.
  2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
  3. Repair adjacent construction and finishes damaged during removal work.
- G. Adapt existing work to fit new work: Make as neat and smooth transition as possible.
1. When existing finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Engineer/Architect.
  2. Where removal of partitions or walls results in adjacent spaces becoming one, rework floors, walls, and ceilings to a smooth plane without breaks, steps, or bulkheads.
  3. Where a change of plane of 1/4 inch (6 mm) or more occurs in existing work, submit recommendation for providing a smooth transition for Engineer/Architect review and request instructions.
- H. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.
- I. Refinish existing surfaces as indicated:
1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.
  2. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.
- J. Clean existing systems and equipment.
- K. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.
- L. Do not begin new construction in alterations areas before demolition is complete.
- M. Comply with all other applicable requirements of this section.

### **3.07 CUTTING AND PATCHING**

- A. Whenever possible, execute the work by methods that avoid cutting or patching.
- B. See Alterations article above for additional requirements.
- C. Perform whatever cutting and patching is necessary to:
1. Complete the work.
  2. Fit products together to integrate with other work.
  3. Provide openings for penetration of mechanical, electrical, and other services.
  4. Match work that has been cut to adjacent work.
  5. Repair areas adjacent to cuts to required condition.
  6. Repair new work damaged by subsequent work.
  7. Remove samples of installed work for testing when requested.
  8. Remove and replace defective and non-complying work.
- D. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.



- E. Employ skilled and experienced installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
- F. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
- G. Restore work with new products in accordance with requirements of Contract Documents.
- H. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- I. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 078400, to full thickness of the penetrated element.
- J. Patching:
  - 1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
  - 2. Match color, texture, and appearance.
  - 3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

### **3.08 PROGRESS CLEANING**

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- B. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

### **3.09 PROTECTION OF INSTALLED WORK**

- A. Protect installed work from damage by construction operations.
- B. Provide special protection where specified in individual specification sections.
- C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- G. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

### **3.10 FINAL CLEANING**

- A. Execute final cleaning after Substantial Completion but before making final application for payment.
  - 1. Clean areas to be occupied by Owner prior to final completion before Owner occupancy.
- B. Use cleaning materials that are nonhazardous.
- C. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces,
- D. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
- E. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

- F. Clean filters of operating equipment.
- G. Clean debris from roofs, gutters, downspouts, scuppers, and overflow drains.
- H. Clean site; sweep paved areas, rake clean landscaped surfaces.
- I. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

### **3.11 CLOSEOUT PROCEDURES**

- A. Make submittals that are required by governing or other authorities.
  - 1. Provide copies to Engineer/Architect and Owner.
- B. Accompany Project Coordinator on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Notice of Substantial Completion.
- C. Notify Engineer/Architect when work is considered ready for Engineer/Architect's Substantial Completion inspection.
- D. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Engineer/Architect's Substantial Completion inspection.
- E. Conduct Substantial Completion inspection and create Final Correction Punch List containing Engineer/Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Engineer/Architect.
- F. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.
- G. Notify Engineer/Architect when work is considered finally complete and ready for Engineer/Architect's Substantial Completion final inspection.
- H. Complete items of work determined by Engineer/Architect listed in executed Certificate of Substantial Completion.

### **3.12 MAINTENANCE**

- A. Provide service and maintenance of components indicated in specification sections.
- B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than 2 years from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.
- C. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

**END OF SECTION**

**SECTION 017800  
CLOSEOUT SUBMITTALS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Project Record Documents.
- B. Operation and Maintenance Data.
- C. Warranties and bonds.

**1.02 RELATED REQUIREMENTS**

- A. Section 007200 - General Conditions and 007300 - Supplementary Conditions: Performance bond and labor and material payment bonds, warranty, and correction of work.
- B. Section 013000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.
- C. Section 017000 - Execution and Closeout Requirements: Contract closeout procedures.
- D. Individual Product Sections: Specific requirements for operation and maintenance data.
- E. Individual Product Sections: Warranties required for specific products or Work.

**1.03 SUBMITTALS**

- A. Project Record Documents: Submit documents to Engineer/Architect with claim for final Application for Payment.
- B. Operation and Maintenance Data:
  - 1. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
  - 2. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Engineer/Architect comments. Revise content of all document sets as required prior to final submission.
  - 3. Submit two sets of revised final documents in final form within 10 days after final inspection.
- C. Warranties and Bonds:
  - 1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
  - 2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
  - 3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

**PART 3 EXECUTION**

**2.01 PROJECT RECORD DOCUMENTS**

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
  - 1. Drawings.
  - 2. Addenda.
  - 3. Change Orders and other modifications to the Contract.
- 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. Record Drawings: Legibly mark each item to record actual construction including:
  - 1. Field changes of dimension and detail.

2. Details not on original Contract drawings.

## **2.02 OPERATION AND MAINTENANCE DATA**

- A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.
- B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.
- D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

## **2.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES**

- A. For Each Product, Applied Material, and Finish:
  - 1. Product data, with catalog number, size, composition, and color and texture designations.
  - 2. Information for re-ordering custom manufactured products.
- B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.
- C. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

## **2.04 WARRANTIES AND BONDS**

- A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.
- B. Verify that documents are in proper form, contain full information, and are notarized.
- C. Co-execute submittals when required.
- D. Retain warranties and bonds until time specified for submittal.

**END OF SECTION**

## **SECTION 024100 DEMOLITION**

### **PART 1 GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Selective demolition of building elements for alteration purposes.

#### **1.02 RELATED REQUIREMENTS**

- A. Section 011000 - Summary: Limitations on Contractor's use of site and premises.
- B. Section 015000 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.
- C. Section 017000 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.

#### **1.03 REFERENCE STANDARDS**

- A. 29 CFR 1926 - Safety and Health Regulations for Construction Current Edition.
- B. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations 2019.

#### **1.04 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.
  - 1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences.
  - 2. Identify demolition firm and submit qualifications.
- C. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

### **PART 2 PRODUCTS**

### **PART 3 EXECUTION**

#### **3.01 SCOPE**

- A. Remove items as indicated on the drawings..

#### **3.02 GENERAL PROCEDURES AND PROJECT CONDITIONS**

- A. Contractor will be required to conduct a site visit to field inspect and verify all existing conditions as it relates to the scope of work described in the drawings and specifications, and if necessary, submit and RFI to the Architect/Engineer and the Owner to bring up any potential conflicts.
- B. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
  - 1. Obtain required permits.
  - 2. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
  - 3. Provide, erect, and maintain temporary barriers and security devices.
  - 4. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
  - 5. Do not close or obstruct roadways or sidewalks without permit.
  - 6. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.

7. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.
- C. Do not begin removal until receipt of notification to proceed from Owner.
- D. Do not begin removal until built elements to be salvaged or relocated have been removed.
- E. Protect existing structures and other elements that are not to be removed.
  1. Provide bracing and shoring.
  2. Prevent movement or settlement of adjacent structures.
  3. Stop work immediately if adjacent structures appear to be in danger.
- F. Minimize production of dust due to demolition operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.
- G. If hazardous materials are discovered during removal operations, stop work and notify Engineer/Architect and Owner; hazardous materials include regulated asbestos containing materials, lead, PCB's, and mercury.

### **3.03 EXISTING UTILITIES**

- A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.
- B. Protect existing utilities to remain from damage.
- C. Do not disrupt public utilities without permit from authority having jurisdiction.
- D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.
- E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.
- F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.
- G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

### **3.04 SELECTIVE DEMOLITION FOR ALTERATIONS**

- A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
  1. Verify that construction and utility arrangements are as indicated.
  2. Report discrepancies to Engineer/Architect before disturbing existing installation.
  3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.
- B. Remove existing work as indicated and as required to accomplish new work.
  1. Remove items indicated on drawings.
- C. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, Telecommunications, and [ ]): Remove existing systems and equipment as indicated.
  1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components.
  2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
  3. Verify that abandoned services serve only abandoned facilities before removal.
  4. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification.

- D. Protect existing work to remain.
  - 1. Prevent movement of structure; provide shoring and bracing if necessary.
  - 2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
  - 3. Repair adjacent construction and finishes damaged during removal work.
  - 4. Patch as specified for patching new work.

### **3.05 REPAIR**

- A. Unless otherwise indicated or directed on the drawings or elsewhere in the specifications, it will be the Contractor's responsibility to patch and repair all surfaces to match adjacent existing conditions where items are removed or altered.
- B. Exterior wall repair must not compromise the existing drainage plain.
- C. Roof repairs must not void or compromise the existing roof warranty.
- D. The Contractor will be required to conduct a site visit to field inspect and verify all existing conditions as it relates to the scope of work described in the drawings and specifications, and if necessary, submit an RFI to the Architect/Engineer and the Owner to bring up any potential conflicts.

### **3.06 DEBRIS AND WASTE REMOVAL**

- A. Remove debris, junk, and trash from site.
- B. Leave site in clean condition, ready for subsequent work.
- C. Clean up spillage and wind-blown debris from public and private lands.

**END OF SECTION**

**SECTION 051200  
STRUCTURAL STEEL FRAMING**

**PART 1 - GENERAL**

**1.01 RELATED SECTIONS**

- A. Division 1 Sections

**1.02 REFERENCES**

- A. AISC – Steel Construction Manual, Latest Edition.
- B. AISC 303 – Code of Standard Practice for Steel Buildings and Bridges.
- C. AISC 341-05 – Seismic Provisions for Structural Steel Buildings, including Supplement No. 1 dated 2006.
- D. AISC 360-05 – Specification for Structural Steel Buildings.
- E. AISC – Specification for Structural Joints Using ASTM A325 or A490 Bolts prepared by the Research Council on Structural Connections.
- F. AWS D1.1 – Structural Welding Code.
- G. AWS A5.1 – Specification for Carbon Steel Electrodes for Shield Metal Arc Welding.
- H. AWS A5.5 – Specification for Low-Alloy Steel Covered Arc Welding Electrodes.
- I. AWS A5.17 – Specification for Carbon Steel Electrodes and Fluxes for Submerged Arc Welding.
- J. AWS A5.20 – Specification for Carbon Steel Electrodes for Flux Cored Arc Welding.
- K. SSPC – Steel Structures Painting Manual.
- L. ASTM A6 – Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.
- M. ASTM A36 – Standard Specification for Carbon Structural Steel.
- N. ASTM A123 – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- O. ASTM A153 – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- P. ASTM A307 – Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- Q. ASTM A325 – Standard Specification for Structural Bolts, Heat Treated, 120/105 KSI Minimum Tensile Strength.
- R. ASTM A490 – Standard Specification for Structural Bolts, Alloy Steel, Heat-Treated, 150 KSI Minimum Tensile Strength.
- S. ASTM A500 – Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- T. ASTM A501 – Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
- U. ASTM A563 – Standard Specification for Carbons and Alloy Steel Nuts
- V. ASTM A572 – Standard Specification for High-Strength Low-Alloy Columbium Vanadium Structural Steel.
- W. ASTM A780 – Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
- X. ASTM A992 – Standard Specification for Structural Steel Shapes.
- Y. ASTM F436 – Standard Specification for Hardened Steel Washers.



- Z. ASTM F844 – Standard Specification for Washers, Steel, Plain (Flat), Unhardened for General Use.
- AA. ASTM F1554 – Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-Ksi Yield Strength.
- BB. ASTM F1852 – Standard Specification for “Twist Off” Type Tension Control Structural Bolt/Nut/Washer Assemblies, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.

### **1.03 SUBMITTALS**

- A. Shop Drawings:
  - 1. Contact Structural Engineer's Construction Administrator prior to detailing structural steel shop drawings.
  - 2. Shop drawings shall be submitted on a 24" x 36" sheet minimum.
  - 3. Shop drawings shall clearly indicate the profiles, sizes, ASTM Grade, spacing and locations of structural steel members, including connections, attachments, anchorages, framed openings, sizes and types of fasteners, method of tightening fasteners, cambers, and the number, type and spacing of the stud shear connectors and headed studs.
  - 4. Beam sizes shall be shown on the erection drawings (plans).
  - 5. Submit shop drawings for review.
  - 6. Reproduction of Structural Drawings for shop drawings is not permitted. Electronic drawing files will not be provided to the Contractor.
  - 7. Maintain at construction office written welding procedures for each type of welded joint used in accordance with AWS D1.1.
  - 8. Submit certification that the fabricator meets the required qualifications and ultrasonic testing reports for complete penetration welds. If fabricator has an independent testing agency inspect fabrication as required by these specifications, submit the name and qualifications of the independent testing agency.
  - 9. Upon request, submit the erection sequence and procedures to be used by the steel erector.
  - 10. Submit certification that the erector meets the required qualifications.

### **1.04 FABRICATOR'S QUALIFICATIONS**

- A. Steel fabricator shall have a minimum of 10 years experience and be AISC Certified.

### **1.05 ERECTOR'S QUALIFICATIONS**

- A. Erector shall be experienced in erecting structural systems similar in complexity to this Project as evidenced by 10 completed projects.
- B. Erector shall have a minimum of 5 years experience in the erection of structural steel or is an AISC Certified Advanced Steel Erector.

### **1.06 STORAGE**

- A. Store materials off ground to permit easy access for inspection and identification. Store steel members and packaged items in a manner that provides protection against contact with deleterious materials.

## **PART 2 - PRODUCTS**

### **2.01 ANCHOR RODS**

- A. Anchor Rods: Headed rod or a threaded rod with a heavy hexagonal nut and plate washer welded to the bottom of the threaded rod conforming to ASTM F1554, Hot Dip Galvanized.
- B. Nuts and Washers: Two hexagonal nuts and two plate washers conforming to ASTM A36 for each anchor rod assembly, Hot Dip Galvanized

## **2.02 ROLLED STEEL SHAPES, PLATES, AND BARS**

- A. Rolled Steel Shapes, Plates, and Bars: ASTM A36; ASTM A572, Grade 50; or ASTM A992 as indicated by the Structural Drawings. ASTM A572, Grade 50 may be substituted for ASTM A992.

## **2.03 ROUND STRUCTURAL STEEL TUBING**

- A. Round Structural Steel Tubing: ASTM A501, 36 ksi minimum yield strength.

## **2.04 SHAPED STRUCTURAL STEEL TUBING**

- A. Shaped Structural Steel Tubing: ASTM A500, Grade C, 50 ksi minimum yield strength.

## **2.05 NON-HIGH-STRENGTH FASTENERS**

- A. Non-High-Strength Bolts: ASTM A307, Grade A, 60 ksi minimum, where noted on the Structural Drawings.
- B. Hardened Steel Washers: ASTM F436.

## **2.06 HIGH-STRENGTH FASTENERS**

- A. High-Strength Bolts: ASTM A325 or ASTM A490 as noted on the Structural Drawings. 3/4-inch minimum diameter.
- B. Hardened steel washers shall conform to ASTM F436.
- C. Spline-Type Tension Control Bolts: ASTM spline-type tension control bolts with plain hardened washers and suitable nuts are an acceptable alternate design bolt assembly.
- D. Do not use load indicating washers.

## **2.07 STUD SHEAR CONNECTORS**

- A. Stud Shear Connectors: 3/4-inch diameter in compliance with AWS D1.1.

## **2.08 HEADED STUDS**

- A. Headed Studs: Comply with AWS D1.1. Provide studs with the diameter shown on the Structural Drawings.

## **2.09 EXPANSION ANCHORS**

- A. Expansion Anchors: See Structural Notes.

## **2.10 ADHESIVE ANCHORS**

- A. Adhesive Anchors: See Structural Notes.
- B. SCREW ANCHORS
- C. Screw Anchors: See Structural Notes.

## **2.11 WELD ELECTRODES**

- A. Weld Electrodes: AWS A5.1, A5.5, A5.17, or A5.20 E-70 series low hydrogen electrodes.
- B. Properly store electrodes to maintain flux quality.

## **2.12 GALVANIZE**

- A. Galvanized Coating: ASTM A123.
- B. Galvanize Bolts, Nuts, and Washers: ASTM A153 when used to connect steel members that are specified to be galvanized.
- C. Expansion Anchors, Adhesive Anchors, or Screw Anchors: Where specified to be galvanized, anchors shall be mechanically galvanized in accordance with ASTM B695, Class 65, Type I.

## **PART 3 - EXECUTION**

### **3.01 GENERAL**

- A. Fabricate and erect structural steel in accordance with AISC Specifications and Code of Standard Practice.
- B. Notify Architect/Structural Engineer and Structural Testing/Inspection Agency at least 48 hours prior to structural steel fabrication and erection.

### **3.02 ANCHOR ROD SETTING**

- A. Provide templates for setting anchor rods. Position anchor rods by using templates with two nuts to secure in place prior to placement of concrete.
- B. Do not erect steel where anchor rod nuts will not have full threads.

### **3.03 CONNECTIONS**

- A. Provide a minimum of two fasteners at each bolted connection.
- B. Ensure fasteners are lubricated prior to installation.
- C. Provide high-strength bolted connections in accordance with AISC Specifications for Structural Joints using ASTM A325 or A490 Bolts.
- D. Provide connections for expansion and contraction where steel beams connect to concrete walls or concrete columns and at expansion joints. Secure nuts on bolts against loosening. (Dent threads with a chisel.)

### **3.04 FASTENER INSTALLATION**

- A. Bolts shall be installed in holes of the connection and brought to snug tight condition. Tighten connection progressing systematically from the most rigid part to the free edges of the connection to minimize relaxation of the bolts.
- B. High-strength bolts installed shall have a hardened washer under the element turned in tightening.
- C. Installation and tightening of bolts shall conform to the AISC Specifications for Structural Joints.

**END OF SECTION**

**SECTION 220533  
HEAT TRACING FOR PLUMBING PIPING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Self-regulating parallel resistance electric heating cable.
- B. Cable outer jacket markings.
- C. Connection kits.
- D. Accessories.
- E. Controls.

**1.02 RELATED REQUIREMENTS**

- A. Section 220553 - Identification for Plumbing Piping and Equipment

**1.03 REFERENCE STANDARDS**

- A. IEEE 515.1 - IEEE Standard for the Testing, Design, Installation, and Maintenance of Electrical Resistance Trace Heating for Commercial Applications 2012.
- B. ITS (DIR) - Directory of Listed Products current edition.
- C. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. UL (DIR) - Online Certifications Directory Current Edition.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.
- B. Coordinate the work with other trades to provide ground fault protection for electric heat tracing circuits as required by NFPA 70.
- C. Coordinate the work with other trades to provide circuit breaker ratings suitable for installed circuit lengths.

**1.05 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data for electric heat tracing.
- C. Field Quality Control Submittals: Indicate test reports and inspection reports.
- D. Project Record Documents: Record actual locations of electric heat tracing lines and thermostats.
- E. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions of equipment and controls, maintenance and repair data, and parts listings.
- F. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

**1.06 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

**1.07 WARRANTY**

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

- B. Provide two year manufacturer warranty for cables, connection kits, accessories, and controls.

## **PART 2 PRODUCTS**

### **2.01 SELF-REGULATING PARALLEL RESISTANCE ELECTRIC HEATING CABLE**

- A. Manufacturers:
1. Chromalox, Inc; [ ]: [www.chromalox.com/#sle](http://www.chromalox.com/#sle).
  2. Pentair; [ ]: [www.pentairthermal.com/#sle](http://www.pentairthermal.com/#sle).
  3. Thermon Manufacturing Company; [ ]: [www.thermon.com/#sle](http://www.thermon.com/#sle).
  4. Substitutions: See Section 016000 - Product Requirements.
- B. Product shall be manufactured in the USA.
- C. Provide products listed, classified, and labeled by UL (DIR), ITS (DIR), or testing firm acceptable to authorities having jurisdiction (AHJ).
- D. Factory Rating and Testing: Comply with IEEE 515.1.
- E. Heating Element:
1. Provide pair of parallel No.16 tinned or nickel coated stranded copper bus wires embedded in cross linked conductive polymer core with varying heat output in response to temperature along its length.
  2. Terminations: Waterproof, factory assembled, non-heating leads with connector at one end and water-tight seal at opposite end.
  3. Capable of crossing over itself without overheating.
- F. Insulated Jacket: Flame retardant polyolefin.
- G. Cable Cover: Provide tinned copper and polyolefin outer jacket with UV inhibitor.
- H. Maximum Power-On Operating Temperature: 150 degrees F (65 degrees C).
- I. Maximum Power-Off Exposure Temperature: 185 degrees F (85 degrees C).
- J. Electrical Characteristics:
1. 3 W/lineal ft ([ ] W/lineal m).

### **2.02 CABLE OUTER JACKET MARKINGS**

- A. Name of manufacturer, trademark, or other recognized symbol of identification.
- B. Catalog number, reference number, or model.
- C. Month and year of manufacture, date coding, applicable serial number, or equivalent.
- D. Agency listing or approval.
- E. Any applicable warning/caution statements such as "WARNING: De-energize circuit before removing cover.

### **2.03 CONNECTION KITS**

- A. Provide power connection, splice/tee, and end seal kits compatible with the heating cable and without requiring cutting of the cable core to expose bus wires.
- B. Provide with NEMA 4X rating for prevention of corrosion and water ingress.
- C. Provide UV stabilized components.

### **2.04 ACCESSORIES**

- A. Provide Accessories As Indicated or As Required for Complete Installation, Including but Not Limited To:
1. High temperature, glass filament tape for attachment of heating cable to metal piping.
  2. Aluminum self-adhesive tape for attachment of heating cable to plastic piping.
  3. Heat-conductive putty.
  4. Cable ties.

5. Silicone end seals and splice kits.
6. Installation clips.
7. Warning labels for attachment to exterior of piping insulation. Refer to Section 220553.

## **2.05 CONTROLS**

- A. Pipe Mounted Thermostats:
  1. Remote bulb unit with adjustable temperature range from 30 to 50 degrees F (minus one to 10 degrees C).
  2. Snap-action, open-on-rise, single pole switch with minimum current rating adequate for the connected cable.
  3. Remote bulb on capillary, resistance temperature device (RTD) or thermistor for direct sensing of pipe wall temperature.
  4. Control Enclosure: Corrosion resistant and waterproof.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that piping and equipment are ready to receive work.
- B. Verify field measurements are as indicated on shop drawings.
- C. Verify required power is available, in proper location, and ready for use.

### **3.02 PREPARATION**

- A. Clean exposed surfaces prior to installation.
- B. Prepare surfaces using approved methods as recommended by manufacturer.

### **3.03 INSTALLATION**

- A. Install in accordance with manufacturer's written installation instructions.
- B. Comply with installation requirements of IEEE 515.1 and NFPA 70, Article 427.
- C. Apply heating cable linearly on pipe with fiberglass tape only after piping has successfully completed any required pressure testing.
- D. Comply with applicable local building codes and requirements of authorities having jurisdiction.
- E. Identification:
  1. After thermal insulation installation, apply external pipeline decals to indicate presence of the thermal insulation cladding at intervals not to exceed 20 ft (6 m) including cladding over each valve or other equipment that may require maintenance.

### **3.04 FIELD QUALITY CONTROL**

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Perform start-up by factory technician or factory representative as per Owner's requirements.
- C. Field Testing and Inspections:
  1. Commission system in accordance with installation and operation manual.
  2. Inspect for sources of water entry and proper sealing.
  3. Inspect weather barrier to confirm that no sharp edges are contacting the trace heating.
  4. Insulation Resistance: Greater than 20 megohms at a test voltage of 2500 VDC for polymer insulated trace heaters.
  5. Test heating cable integrity with megohmmeter at the following intervals:
  6. Measure voltage and current at each unit.
  7. Controls:
  8. Submit written test report showing values measured on each test for each cable.

### **3.05 CLOSEOUT ACTIVITIES**

- A. See Section 017900 - Demonstration and Training, for additional requirements.

**END OF SECTION**

**SECTION 220553**  
**IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Nameplates.
- B. Tags.
- C. Stencils.
- D. Pipe markers.

**1.02 RELATED REQUIREMENTS**

- A. Section 099123 - Interior Painting: Identification painting.

**1.03 REFERENCE STANDARDS**

- A. ASME A13.1 - Scheme for the Identification of Piping Systems 2020.
- B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials 2017.

**1.04 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide manufacturers catalog literature for each product required.
- C. Project Record Documents: Record actual locations of tagged valves.

**PART 2 PRODUCTS**

**2.01 PLUMBING COMPONENT IDENTIFICATION GUIDELINE**

- A. Nameplates:
  - 1. Control panels, transducers, and other related control equipment products.
- B. Tags:
  - 1. Piping: 3/4 inch (20 mm) diameter and smaller.
  - 2. Manual operated and automated control valves.
- C. Stencil:
  - 1. Piping: 3/4 inch (20 mm) diameter and higher.
- D. Pipe Markers: 3/4 inch (20 mm) diameter and higher.

**2.02 NAMEPLATES**

- A. Manufacturers:
  - 1. Brimar Industries, Inc; [\_\_\_\_]: [www.pipemarker.com/#sle](http://www.pipemarker.com/#sle).
  - 2. Kolbi Pipe Marker Co; [\_\_\_\_]: [www.kolbipipemarkers.com/#sle](http://www.kolbipipemarkers.com/#sle).
  - 3. Seton Identification Products; [\_\_\_\_]: [www.seton.com/#sle](http://www.seton.com/#sle).
- B. Product shall be manufactured in the USA.
- C. Description: Laminated piece with up to three lines of text.
  - 1. Letter Color: White.
  - 2. Letter Height: 1/4 inch (6 mm).
  - 3. Background Color: Black.
  - 4. Nameplate Material:
    - a. Flexible: Vinyl with adhesive backing per ASTM D709.
    - b. Metal: Brass with center-side holes for screw fastening.

**2.03 TAGS**

- A. Manufacturers:
  - 1. Advanced Graphic Engraving; [\_\_\_\_]: [www.advancedgraphicengraving.com/#sle](http://www.advancedgraphicengraving.com/#sle).



2. Brady Corporation; [ ]: [www.bradycorp.com/#sle](http://www.bradycorp.com/#sle).
  3. Brimar Industries, Inc; [ ]: [www.pipemarker.com/#sle](http://www.pipemarker.com/#sle).
  4. Craftmark Pipe Markers; [ ]: [www.craftmarkid.com/#sle](http://www.craftmarkid.com/#sle).
  5. Kolbi Pipe Marker Co; [ ]: [www.kolbipipemarkers.com/#sle](http://www.kolbipipemarkers.com/#sle).
  6. Seton Identification Products; [ ]: [www.seton.com/#sle](http://www.seton.com/#sle).
- B. Product shall be manufactured in the USA.
- C. Metal: Brass, 19 gauge 1-1/2 inch (40 mm) in diameter with smooth edges, blank, smooth edges, and corrosion-resistant ball chain. Up to three lines of text.

## 2.04 STENCILS

- A. Manufacturers:
1. Brady Corporation; [ ]: [www.bradycorp.com/#sle](http://www.bradycorp.com/#sle).
  2. Craftmark Pipe Markers; [ ]: [www.craftmarkid.com/#sle](http://www.craftmarkid.com/#sle).
  3. Insite Solutions, LLC; [ ]: [www.stop-painting.com/#sle](http://www.stop-painting.com/#sle).
  4. Kolbi Pipe Marker Co.; [ ]: [www.kolbipipemarkers.com/#sle](http://www.kolbipipemarkers.com/#sle).
  5. Seton Identification Products; [ ]: [www.seton.com/#sle](http://www.seton.com/#sle).
- B. Product shall be manufactured in the USA.
- C. Pipe: Stencil size required per external insulated or uninsulated pipe diameter.
1. 3/4 to 1-1/4 inch (20 to 30 mm) Range: 1/2 inch (15 mm) text over 8 inch (200 mm) long background.
  2. 1-1/2 to 2 inch (40 to 50 mm) Range: 3/4 inch (20 mm) text over 8 inch (200 mm) long background.
  3. 8 to 10 inch (200 to 250 mm) Range: 2-1/2 inch (65 mm) text over 24 inch (600 mm) long background.
  4. Over 10 inches (250 mm): 3-1/2 inch (90 mm) text over 32 inch (800 mm) long background.
- D. Background Paint: Semi-gloss enamel in compliance with Section 099123.

## 2.05 PIPE MARKERS

- A. Manufacturers:
1. Brady Corporation; [ ]: [www.bradycorp.com/#sle](http://www.bradycorp.com/#sle).
  2. Brimar Industries, Inc; [ ]: [www.pipemarker.com/#sle](http://www.pipemarker.com/#sle).
  3. Craftmark Pipe Markers; [ ]: [www.craftmarkid.com/#sle](http://www.craftmarkid.com/#sle).
  4. Kolbi Pipe Marker Co; [ ]: [www.kolbipipemarkers.com/#sle](http://www.kolbipipemarkers.com/#sle).
  5. Seton Identification Products; [ ]: [www.seton.com/#sle](http://www.seton.com/#sle).
- B. Product shall be manufactured in the USA.
- C. Comply with ASME A13.1.
- D. Flexible Tape Marker: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.
- E. Identification Scheme, ASME A13.1:
1. Primary: External Pipe Diameter, Uninsulated or Insulated.
  2. Secondary: Color scheme per fluid service.
    - a. Water; Potable, Cooling, Boiler Feed, and Other: White text on green background.

## PART 3 EXECUTION

### 3.01 PREPARATION

- A. Degrease and clean surfaces to receive identification products.

### **3.02 INSTALLATION**

- A. Install flexible nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install tags in clear view and align with axis of piping
- C. Install plastic tape pipe marker around pipe in accordance with manufacturer's instructions.

**END OF SECTION**

**SECTION 220719  
PLUMBING PIPING INSULATION**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Glass fiber insulation.
- B. Jacket insulation.

**1.02 REFERENCE STANDARDS**

- A. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate 2014.
- B. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric) 2014.
- C. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus 2019.
- D. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement 2007 (Reapproved 2013).
- E. ASTM C449 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement 2007 (Reapproved 2013).
- F. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation 2019.
- G. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel 2008 (Reapproved 2018).
- H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2021a.
- I. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials 2016.
- J. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials Current Edition, Including All Revisions.

**1.03 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittal procedures.

**1.04 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum [ ] years of experience.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

**1.06 FIELD CONDITIONS**

- A. Maintain ambient conditions required by manufacturers of each product.
- B. Maintain temperature before, during, and after installation for minimum of 24 hours.

**PART 2 PRODUCTS**

**2.01 REGULATORY REQUIREMENTS**

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

**2.02 GLASS FIBER INSULATION**

- A. Manufacturers:

1. CertainTeed Corporation; [ ]: [www.certainteed.com/#sle](http://www.certainteed.com/#sle).
  2. Johns Manville Corporation; [ ]: [www.jm.com/#sle](http://www.jm.com/#sle).
  3. Knauf Insulation; Earthwool 1000 Degree Pipe Insulation: [www.knaufinsulation.com/#sle](http://www.knaufinsulation.com/#sle).
  4. Owens Corning Corporation; Fiberglas Pipe Insulation ASJ: [www.ocbuildingspec.com/#sle](http://www.ocbuildingspec.com/#sle).
  5. Owens Corning Corporation; VaporWick Pipe Insulation: [www.ocbuildingspec.com/#sle](http://www.ocbuildingspec.com/#sle).
  6. Substitutions: See Section 016000 - Product Requirements.
- B. Product shall be manufactured in the USA.
- C. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible, with wicking material to transport condensed water to the outside of the system for evaporation to the atmosphere.
1. K (Ksi) Value: ASTM C177, 0.23 at 75 degrees F (0.034 at 24 degrees C).
  2. Maximum Service Temperature: 220 degrees F (104 degrees C).
  3. Maximum Moisture Absorption: 0.2 percent by volume.
- D. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches (0.029 ng/Pa s m).
- E. Tie Wire: 0.048 inch (1.22 mm) stainless steel with twisted ends on maximum 12 inch (300 mm) centers.
- F. Vapor Barrier Lap Adhesive: Compatible with insulation.
- G. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.
- H. Fibrous Glass Fabric:
- I. Outdoor Vapor Barrier Mastic: Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.
- J. Outdoor Breather Mastic: Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.
- K. Insulating Cement: ASTM C449.

## **2.03 JACKET INSULATION**

- A. Product shall be manufactured in the USA.
- B. Aluminum Jacket: ASTM B209 (ASTM B209M) formed aluminum sheet.
1. Thickness: 0.016 inch (0.40 mm) sheet.
  2. Finish: Smooth.
  3. Joining: Longitudinal slip joints and 2 inch (50 mm) laps.
  4. Fittings: 0.016 inch (0.4 mm) thick die shaped fitting covers with factory attached protective liner.
  5. Metal Jacket Bands: 3/8 inch (10 mm) wide; 0.015 inch (0.38 mm) thick aluminum.
  6. Metal Jacket Bands: 3/8 inch (10 mm) wide; 0.010 inch (0.25 mm) thick stainless steel.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that piping has been tested before applying insulation materials.
- B. Verify that surfaces are clean and dry, with foreign material removed.

### **3.02 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with North American Insulation Manufacturers Association (NAIMA) National Insulation Standards.
- C. Exposed Piping: Locate insulation and cover seams in least visible locations.

- D. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping.
- E. Heat Traced Piping: Insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Size large enough to enclose pipe and heat tracer. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

### **3.03 SCHEDULES**

- A. Plumbing Systems:
  - 1. Domestic Hot Water Supply:
    - a. Glass Fiber Insulation:

**END OF SECTION**

**SECTION 221005  
PLUMBING PIPING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Sanitary sewer
- B. Domestic water
- C. Domestic water piping, above grade.
- D. Pipe flanges, unions, and couplings.
- E. Pipe hangers and supports.

**1.02 RELATED REQUIREMENTS**

- A. Section 220553 - Identification for Plumbing Piping and Equipment.

**1.03 REFERENCE STANDARDS**

- A. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings 2018.
- B. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings 2018.
- C. ASME B31.9 - Building Services Piping 2020.
- D. ASTM B32 - Standard Specification for Solder Metal 2020.
- E. ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes 2020.
- F. ASTM B88 - Standard Specification for Seamless Copper Water Tube 2020.
- G. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric) 2020.
- H. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube 2016.
- I. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings 2016.
- J. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120 2021.
- K. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems 2020.
- L. ASTM D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings 2020.
- M. ASTM D2855 - Standard Practice for the Two-Step (Primer & Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets 2020.
- N. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings 2016.
- O. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation 2018.
- P. NSF 61 - Drinking Water System Components - Health Effects 2020.
- Q. NSF 372 - Drinking Water System Components - Lead Content 2020.

**1.04 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

- C. Project Record Documents: Record actual locations of valves.

#### **1.05 QUALITY ASSURANCE**

- A. Perform work in accordance with applicable codes.
- B. Valves: Manufacturer's name and pressure rating marked on valve body.
- C. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

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

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- C. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

### **PART 2 PRODUCTS**

#### **2.01 GENERAL REQUIREMENTS**

- A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

#### **2.02 SANITARY SEWER PIPING, ABOVE GRADE**

- A. Product shall be manufactured in the USA.
- B. PVC Pipe: ASTM D2665 or ASTM D3034.
  - 1. Fittings: PVC.
  - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.

#### **2.03 DOMESTIC WATER PIPING, ABOVE GRADE**

- A. Product shall be manufactured in the USA.
- B. Copper Tube: ASTM B88 (ASTM B88M), Type K (A), Drawn (H).
  - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
  - 2. Joints: ASTM B32, alloy Sn95 solder.

#### **2.04 PIPE FLANGES, UNIONS, AND COUPLINGS**

- A. Product shall be manufactured in the USA.
- B. Unions for Pipe Sizes 3 inch (80 mm, DN) and Under:
  - 1. Copper Tube and Pipe: Class 150 bronze unions with soldered joints.
- C. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

#### **2.05 PIPE HANGERS AND SUPPORTS**

- A. Product shall be manufactured in the USA.
- B. Provide hangers and supports that comply with MSS SP-58.
  - 1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
  - 2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
  - 3. Trapeze Hangers: Welded steel channel frames attached to structure.
  - 4. Vertical Pipe Support: Steel riser clamp.
  - 5. Floor Supports: Concrete pier or steel pedestal with floor flange; fixture attachment.
- C. Plumbing Piping - Drain, Waste, and Vent:

1. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
- D. Plumbing Piping - Water:
  1. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
  2. Floor Support for Hot Pipe Sizes to 4 inch (100 mm, DN): Cast iron adjustable pipe saddle, locknut, nipple, floor flange, and concrete pier or steel support.
  3. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

## **PART 3 EXECUTION**

### **3.01 PREPARATION**

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

### **3.02 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- D. Install piping to maintain headroom, conserve space, and not interfere with use of space.
- E. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- F. Install bell and spigot pipe with bell end upstream.
- G. Install valves with stems upright or horizontal, not inverted. See Section 220523.
- H. Install water piping to ASME B31.9.
- I. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.
- J. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.
- K. Pipe Hangers and Supports:
  1. Install in accordance with ASME B31.9.
  2. Provide copper plated hangers and supports for copper piping.
  3. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
- L. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

### **3.03 APPLICATION**

- A. Install unions downstream of valves and at equipment or apparatus connections.
- B. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.
- C. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.



### **3.04 TOLERANCES**

- A. Drainage Piping: Establish invert elevations within 1/2 inch (10 mm) vertically of location indicated and slope to drain at minimum of 1/4 inch per foot (1:50) slope.

**END OF SECTION**

**SECTION 221006  
PLUMBING PIPING SPECIALTIES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Backflow preventers.

**1.02 REFERENCE STANDARDS**

- A. ASSE 1013 - Performance Requirements for Reduced Pressure Principle Backflow Preventers and Reduced Pressure Principle Fire Protection Backflow Preventers 2011.
- B. NSF 61 - Drinking Water System Components - Health Effects 2020.
- C. NSF 372 - Drinking Water System Components - Lead Content 2020.

**1.03 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.
- C. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.
- D. Project Record Documents: Record actual locations of equipment, cleanouts, backflow preventers, and water hammer arrestors.

**1.04 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years documented experience.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Accept specialties on site in original factory packaging. Inspect for damage.

**PART 2 PRODUCTS**

**2.01 GENERAL REQUIREMENTS**

- A. Specialties in Potable Water Supply Systems: Provide products that comply with NSF 61 and NSF 372 for maximum lead content.

**2.02 BACKFLOW PREVENTERS**

- A. Manufacturers:
  - 1. Watts Regulator Company, a part of Watts Water Technologies; [ ]:  
[www.wattsregulator.com/#sle](http://www.wattsregulator.com/#sle).
  - 2. Zurn Industries, LLC; 375XL: [www.zurn.com/#sle](http://www.zurn.com/#sle).
- B. Product shall be manufactured in the USA.
- C. Reduced Pressure Backflow Preventer Assembly:
  - 1. ASSE 1013; cast bronze body and stainless steel springs; two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve that opens under back pressure in case of diaphragm failure, and non-threaded vent outlet.
  - 2. Size: [ ] inch ([ ] mm) assembly with threaded gate valves.

**PART 3 EXECUTION**

**3.01 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.

- B. Install approved potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibbs.

**END OF SECTION**

**SECTION 230523**  
**GENERAL-DUTY VALVES FOR HVAC PIPING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Applications.
- B. Butterfly valves.

**1.02 REFERENCE STANDARDS**

- A. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250 2020.
- B. ASME B16.10 - Face-to-Face and End-to-End Dimensions of Valves 2017.
- C. ASME B16.34 - Valves - Flanged, Threaded and Welding End 2017.
- D. ASME B31.9 - Building Services Piping 2020.
- E. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings 2004 (Reapproved 2019).
- F. ASTM A536 - Standard Specification for Ductile Iron Castings 1984 (Reapproved 2019)e1.
- G. MSS SP-45 - Bypass and Drain Connections 2003 (Reaffirmed 2008).
- H. MSS SP-67 - Butterfly Valves 2017.

**1.03 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.
- C. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

**1.04 QUALITY ASSURANCE**

- A. Manufacturer:
  - 1. Obtain valves for each valve type from single manufacturer.
  - 2. Company must specialize in manufacturing products specified in this section, with not less than three years of documented experience.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Prepare valves for shipping as follows:
  - 1. Protect valve parts exposed to piped medium against rust and corrosion.
  - 2. Protect valve piping connections such as grooves, weld ends, threads, and flange faces.
  - 3. Adjust butterfly valves to closed or partially closed position.
- B. Use the following precautions during storage:
  - 1. Maintain valve end protection and protect flanges and specialties from dirt.
    - a. Provide temporary inlet and outlet caps.
    - b. Maintain caps in place until installation.
  - 2. Store valves in shipping containers and maintain in place until installation.
    - a. Store valves indoors in dry environment.
    - b. Store valves off the ground in watertight enclosures when indoor storage is not an option.
- C. Exercise the following precautions for handling:
  - 1. Avoid the use of operating handles or stems as rigging or lifting points.

## **PART 2 PRODUCTS**

### **2.01 APPLICATIONS**

- A. See drawings for specific valve locations.
- B. Provide the following valves for the applications if not indicated on drawings:
  - 1. Isolation (Shutoff): Butterfly.
- C. Condenser Water Valves:
  - 1. 2-1/2 NPS (65 DIN) and Larger, Iron Valves:
    - a. Single-Flange Butterfly: 2-1/2 NPS (65 DN) to 12 NPS (300 DN), aluminum-bronze disc, EPDM seat, 200 CWP.

### **2.02 GENERAL REQUIREMENTS**

- A. Product shall be manufactured in the USA.
- B. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.
- C. Valve Sizes: Match upstream piping unless otherwise indicated.
- D. Valve Actuator Types:
  - 1. Hand Lever: Quarter-turn valves 6 NPS (150 DN) and smaller.
- E. Valves in Insulated Piping: Provide 2 NPS (50 DN) stem extensions and the following features:
  - 1. Butterfly Valves: Extended neck.
- F. Valve-End Connections:
  - 1. Flanges on Iron Valves: ASME B16.1 for flanges on iron valves.
- G. General ASME Compliance:
  - 1. Ferrous Valve Dimensions and Design Criteria: ASME B16.10 and ASME B16.34.
  - 2. Building Services Piping Valves: ASME B31.9.
- H. Valve Bypass and Drain Connections: MSS SP-45.
- I. Source Limitations: Obtain each valve type from a single manufacturer.

### **2.03 IRON, SINGLE FLANGE BUTTERFLY VALVES**

- A. Product shall be manufactured in the USA.
- B. Lug Style: Bi-directional dead-end service without use of downstream flange.
  - 1. Comply with MSS SP-67, Type I.
  - 2. CWP Rating: 150 psig (1035 kPa) and 200 psig (1680 kPa).
  - 3. Body Material: ASTM A126 cast iron or ASTM A536 ductile iron.
  - 4. Stem: One or two-piece stainless steel.
  - 5. Seat: EPDM.
  - 6. Disc: Stainless steel.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Discard all packing materials and verify that valve interior, including threads and flanges, are completely clean without signs of damage or degradation that could result in leakage.
- B. Verify valve parts to be fully operational in all positions from closed to fully open.
- C. Confirm gasket material to be suitable for the service, to be of correct size, and without defects that could compromise effectiveness.
- D. Should valve is determined to be defective, replace with new valve.

### **3.02 INSTALLATION**

- A. Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.
- B. Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.

**END OF SECTION**

**SECTION 230553**  
**IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Nameplates.
- B. Tags.
- C. Pipe markers.

**1.02 REFERENCE STANDARDS**

- A. ASME A13.1 - Scheme for the Identification of Piping Systems 2020.
- B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials 2017.

**1.03 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Project Record Documents: Record actual locations of tagged valves.

**PART 2 PRODUCTS**

**2.01 IDENTIFICATION APPLICATIONS**

- A. Control Panels: Nameplates.
- B. Heat Transfer Equipment: Nameplates.
- C. Major Control Components: Nameplates.
- D. Piping: Tags.
- E. Valves: Tags and ceiling tacks where located above lay-in ceiling.
- F. Water Treatment Devices: Nameplates.

**2.02 NAMEPLATES**

- A. Manufacturers:
  - 1. Advanced Graphic Engraving, LLC: [www.advancedgraphicengraving.com/#sle](http://www.advancedgraphicengraving.com/#sle).
  - 2. Brimar Industries, Inc: [www.pipemarker.com/#sle](http://www.pipemarker.com/#sle).
  - 3. Craftmark Pipe Markers: [www.craftmarkid.com/#sle](http://www.craftmarkid.com/#sle).
  - 4. Kolbi Pipe Marker Co: [www.kolbipipemarkers.com/#sle](http://www.kolbipipemarkers.com/#sle).
  - 5. Seton Identification Products, a Tricor Direct Company: [www.seton.com/#sle](http://www.seton.com/#sle).
- B. Product shall be manufactured in the USA.
- C. Letter Color: White.
- D. Letter Height: 1/4 inch (6 mm).
- E. Background Color: Black.
- F. Plastic: Comply with ASTM D709.

**2.03 TAGS**

- A. Manufacturers:
  - 1. Advanced Graphic Engraving: [www.advancedgraphicengraving.com/#sle](http://www.advancedgraphicengraving.com/#sle).
  - 2. Brady Corporation: [www.bradycorp.com/#sle](http://www.bradycorp.com/#sle).
  - 3. Brimar Industries, Inc: [www.pipemarker.com/#sle](http://www.pipemarker.com/#sle).
  - 4. Craftmark Pipe Markers: [www.craftmarkid.com/#sle](http://www.craftmarkid.com/#sle).
  - 5. Kolbi Pipe Marker Co: [www.kolbipipemarkers.com/#sle](http://www.kolbipipemarkers.com/#sle).
  - 6. Seton Identification Products, a Tricor Company: [www.seton.com/#sle](http://www.seton.com/#sle).
  - 7. Substitutions: See Section 016000 - Product Requirements.

- B. Product shall be manufactured in the USA.
- C. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch (40 mm) diameter with smooth edges.

#### **2.04 PIPE MARKERS**

- A. Manufacturers:
  - 1. Brady Corporation: [www.bradycorp.com/#sle](http://www.bradycorp.com/#sle).
  - 2. Brimar Industries, Inc: [www.pipemarker.com/#sle](http://www.pipemarker.com/#sle).
  - 3. Craftmark Pipe Markers: [www.craftmarkid.com/#sle](http://www.craftmarkid.com/#sle).
  - 4. Kolbi Pipe Marker Co: [www.kolbipipemarkers.com/#sle](http://www.kolbipipemarkers.com/#sle).
  - 5. Seton Identification Products, a Tricor Company; [ ]: [www.seton.com/#sle](http://www.seton.com/#sle).
  - 6. Substitutions: See Section 016000 - Product Requirements.
- B. Product shall be manufactured in the USA.
- C. Color: Comply with ASME A13.1.
- D. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.
- E. Color code as follows:
  - 1. Heating, Cooling, and Boiler Feedwater: Green with white letters.

### **PART 3 EXECUTION**

#### **3.01 PREPARATION**

- A. Degrease and clean surfaces to receive adhesive for identification materials.

#### **3.02 INSTALLATION**

- A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install tags with corrosion resistant chain.
- C. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

**END OF SECTION**



**SECTION 230593**  
**TESTING, ADJUSTING, AND BALANCING FOR HVAC**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Testing, adjustment, and balancing of hydronic, steam, and refrigerating systems.
- B. Measurement of final operating condition of HVAC systems.

**1.02 REFERENCE STANDARDS**

- A. AABC (NSTSB) - AABC National Standards for Total System Balance, 7th Edition 2016.
- B. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems 2008 (Reaffirmed 2017).
- C. NEBB (TAB) - Procedural Standards for Testing Adjusting and Balancing of Environmental Systems 2015, with Errata (2017).
- D. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing 2002.

**1.03 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Installer Qualifications: Submit name of adjusting and balancing agency and TAB supervisor for approval within 30 days after award of Contract.
- C. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
  - 1. Include at least the following in the plan:
    - a. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
    - b. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
    - c. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
    - d. Final test report forms to be used.
    - e. Procedures for formal deficiency reports, including scope, frequency and distribution.
- D. Control System Coordination Reports: Communicate in writing to the controls installer all setpoint and parameter changes made or problems and discrepancies identified during TAB that affect, or could affect, the control system setup and operation.
- E. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
  - 1. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Engineer/Architect and for inclusion in operating and maintenance manuals.
  - 2. Provide reports in soft cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.
  - 3. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
  - 4. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
  - 5. Units of Measure: Report data in both I-P (inch-pound) and SI (metric) units.
  - 6. Include the following on the title page of each report:
    - a. Name of Testing, Adjusting, and Balancing Agency.
    - b. Address of Testing, Adjusting, and Balancing Agency.

- c. Telephone number of Testing, Adjusting, and Balancing Agency.
- d. Project name.
- e. Project location.
- f. Project Engineer/Architect.
- g. Project Engineer.
- h. Project Contractor.
- i. Project altitude.
- j. Report date.

## **PART 2 PRODUCTS - NOT USED**

## **PART 3 EXECUTION**

### **3.01 GENERAL REQUIREMENTS**

- A. Perform total system balance in accordance with one of the following:
  - 1. AABC (NSTSB), AABC National Standards for Total System Balance.
  - 2. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
  - 3. SMACNA (TAB).
- B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.
- C. TAB Agency Qualifications:
  - 1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
  - 2. Having minimum of three years documented experience.
  - 3. Certified by one of the following:
    - a. AABC, Associated Air Balance Council: [www.aabc.com/#sle](http://www.aabc.com/#sle); upon completion submit AABC National Performance Guaranty.
    - b. NEBB, National Environmental Balancing Bureau: [www.nebb.org/#sle](http://www.nebb.org/#sle).
    - c. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: [www.tabbcertified.org/#sle](http://www.tabbcertified.org/#sle).
- D. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

### **3.02 EXAMINATION**

- A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
  - 1. Systems are started and operating in a safe and normal condition.
  - 2. Temperature control systems are installed complete and operable.
  - 3. Proper thermal overload protection is in place for electrical equipment.
  - 4. Fans are rotating correctly.
  - 5. Hydronic systems are flushed, filled, and vented.
  - 6. Pumps are rotating correctly.
  - 7. Service and balance valves are open.
- B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.
- C. Beginning of work means acceptance of existing conditions.

### **3.03 ADJUSTMENT TOLERANCES**

- A. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

### **3.04 RECORDING AND ADJUSTING**

- A. Ensure recorded data represents actual measured or observed conditions.

- B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

### **3.05 WATER SYSTEM PROCEDURE**

- A. Adjust water systems to provide required or design quantities.
- B. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gauges to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.

### **3.06 SCOPE**

- A. Test, adjust, and balance the following:
  - 1. HVAC Pumps.
  - 2. Induced Draft Cooling Tower.

### **3.07 MINIMUM DATA TO BE REPORTED**

- A. Electric Motors:
  - 1. Manufacturer.
  - 2. Model/Frame.
  - 3. HP/BHP.
  - 4. Phase, voltage, amperage; nameplate, actual, no load.
  - 5. RPM.
  - 6. Service factor.
- B. V-Belt Drives:
  - 1. Identification/location.
  - 2. Required driven RPM.
  - 3. Driven sheave, diameter and RPM.
  - 4. Belt, size and quantity.
  - 5. Motor sheave diameter and RPM.
  - 6. Center to center distance, maximum, minimum, and actual.
- C. Pumps:
  - 1. Identification/number.
  - 2. Manufacturer.
  - 3. Size/model.
  - 4. Impeller.
  - 5. Service.
  - 6. Design flow rate, pressure drop, BHP.
  - 7. Actual flow rate, pressure drop, BHP.
  - 8. Discharge pressure.
  - 9. Suction pressure.
  - 10. Total operating head pressure.
  - 11. Shut off, discharge and suction pressures.
  - 12. Shut off, total head pressure.
- D. Cooling Tower:
  - 1. Tower identification/number.
  - 2. Manufacturer.
  - 3. Model number.
  - 4. Serial number.

5. Rated capacity.
6. Entering air WB temperature, specified and actual.
7. Leaving air WB temperature, specified and actual.
8. Ambient air DB temperature.
9. Condenser water entering temperature.
10. Condenser water leaving temperature.
11. Condenser water flow rate.
12. Fan RPM.

**END OF SECTION**

**SECTION 230719**  
**HVAC PIPING INSULATION**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Piping insulation.
- B. Flexible removable and reusable blanket insulation.
- C. Jackets and accessories.

**1.02 REFERENCE STANDARDS**

- A. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate 2014.
- B. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric) 2014.
- C. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus 2019.
- D. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement 2007 (Reapproved 2013).
- E. ASTM C449 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement 2007 (Reapproved 2013).
- F. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation 2019.
- G. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel 2008 (Reapproved 2018).
- H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2021a.
- I. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials 2016.
- J. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials Current Edition, Including All Revisions.

**1.03 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

**1.04 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

**1.06 FIELD CONDITIONS**

- A. Maintain ambient conditions required by manufacturers of each product.
- B. Maintain temperature before, during, and after installation for minimum of 24 hours.

**PART 2 PRODUCTS**

**2.01 REGULATORY REQUIREMENTS**

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

## **2.02 GLASS FIBER, RIGID**

- A. Product shall be manufactured in the USA.
- B. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible, with wicking material to transport condensed water to the outside of the system for evaporation to the atmosphere.
  - 1. K (Ksi) Value: ASTM C177, 0.23 at 75 degrees F (0.034 at 24 degrees C).
  - 2. Maximum Service Temperature: 220 degrees F (104 degrees C).
  - 3. Maximum Moisture Absorption: 0.2 percent by volume.
- C. Vapor Barrier Jacket: White kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches (0.029 ng/Pa s m).
- D. Tie Wire: 0.048 inch (1.22 mm) stainless steel with twisted ends on maximum 12 inch (300 mm) centers.
- E. Vapor Barrier Lap Adhesive: Compatible with insulation.
- F. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.
- G. Fibrous Glass Fabric:
  - 1. Cloth: Untreated; 9 oz/sq yd (305 g/sq m) weight.
  - 2. Weave: 5 by 5.
- H. Outdoor Vapor Barrier Mastic: Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.
- I. Insulating Cement: ASTM C449.

## **2.03 JACKETS**

- A. Product shall be manufactured in the USA.
- B. Aluminum Jacket: ASTM B209 (ASTM B209M) formed aluminum sheet.
  - 1. Thickness: 0.016 inch (0.40 mm) sheet.
  - 2. Finish: Smooth.
  - 3. Joining: Longitudinal slip joints and 2 inch (50 mm) laps.
  - 4. Fittings: 0.016 inch (0.4 mm) thick die shaped fitting covers with factory attached protective liner.
  - 5. Metal Jacket Bands: 3/8 inch (10 mm) wide; 0.015 inch (0.38 mm) thick aluminum.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Test piping for design pressure, liquid tightness, and continuity prior to applying insulation materials.
- B. Verify that surfaces are clean and dry, with foreign material removed.

### **3.02 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NAIMA National Insulation Standards.
- C. Exposed Piping: Locate insulation and cover seams in least visible locations.
- D. Insulated Pipes Conveying Fluids Below Ambient Temperature:
  - 1. Insulate entire system, including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
- E. Glass Fiber Insulated Pipes Conveying Fluids Below Ambient Temperature:
  - 1. Provide vapor barrier jackets, factory-applied or field-applied; secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.

2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.
- F. Inserts and Shields:
1. Application: Piping 1-1/2 inches (40 mm) diameter or larger.
  2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
  3. Insert location: Between support shield and piping and under the finish jacket.
  4. Insert Configuration: Minimum 6 inches (150 mm) long, of same thickness and contour as adjoining insulation; may be factory fabricated.
  5. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.
- G. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping. Provide two coats of UV resistant finish for flexible elastomeric cellular insulation without jacketing.

**END OF SECTION**

**SECTION 230913**  
**INSTRUMENTATION AND CONTROL DEVICES FOR HVAC**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Control panels.
- B. Control Valves:
  - 1. Electronic operators.
- C. Flow Sensors:
  - 1. Flow switches.

**1.02 REFERENCE STANDARDS**

- A. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.
- B. NEMA DC 3 - Residential Controls - Electrical Wall-Mounted Room Thermostats 2013.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.
- B. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

**1.04 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide description and engineering data for each control system component. Include sizing as requested. Provide data for each system component and software module.
- C. Shop Drawings: Indicate complete operating data, system drawings, wiring diagrams, and written detailed operational description of sequences. Submit schedule of valves indicating size, flow, and pressure drop for each valve. For automatic dampers indicate arrangement, velocities, and static pressure drops for each system.
- D. Manufacturer's Instructions: Provide for all manufactured components.
- E. Operation and Maintenance Data: Include inspection period, cleaning methods, recommended cleaning materials, and calibration tolerances.
- F. Project Record Documents: Record actual locations of control components, including panels, thermostats, and sensors. Accurately record actual location of control components, including panels, thermostats, and sensors.
  - 1. Revise shop drawings to reflect actual installation and operating sequences.
- G. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

**1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years experience.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum three years experience approved by manufacturer.
- C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

**1.06 WARRANTY**

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective work within a five year period after Substantial Completion.



## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Siemens Talon.
- B. Substitutions: See Section 016000 - Product Requirements.

### **2.02 EQUIPMENT - GENERAL**

- A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

### **2.03 CONTROL PANELS**

- A. NEMA 250, general purpose utility enclosures with enameled finished face panel.
- B. Provide common keying for all panels.

### **2.04 CONTROL VALVES**

- A. Two way modulating valves shall be pressure independent type rated for design flow at 5 psi. Valve shall have integral pressure/temperature ports.
- B. Three way valves shall have linear characteristics
- C. Rate for service pressure of 200 psi at 250 degrees F.
  - 1. Up to 2 inches (50 mm): Bronze body, bronze trim, rising stem, renewable composition disc, screwed ends with backseating capacity repackable under pressure.
  - 2. Over 2 inches (50 mm): Iron body, bronze trim, rising stem, plug-type disc, flanged ends, renewable seat and disc.
- D. Electronic Operators:
  - 1. Compatible with control system.

### **2.05 TIME CLOCKS**

- A. Seven day programming switch timer with synchronous timing motor and seven day dial, continuously charged Ni-cad battery driven power failure 8 hour carry over and multiple switch trippers to control systems for minimum of two and maximum of eight signals per day with two normally open and two normally closed output switches.
- B. Solid state programmable time control with 2 separate programs, 24 hour battery carry over, 365 day calendar with 20 programmable holidays.

### **2.06 TRANSMITTERS**

- A. Pressure Transmitters:
  - 1. Manufacturers:
    - a. Siemens Talon.
    - b. Substitutions: See Section 016000 - Product Requirements.
  - 2. One pipe direct acting indicating type for gas, liquid, or steam service, range suitable for system, proportional electronic output.
- B. Air Pressure Transmitters:
  - 1. Manufacturers:
    - a. Siemens Talon.
    - b. Substitutions: See Section 016000 - Product Requirements.
  - 2. General: Provide dry media differential pressure transducers to monitor duct pressure.
    - a. Media Compatibility: Dry air.
    - b. Input Power: Class 2; 12 to 30 VDC; 2-wire: 20 mA max.
    - c. Output: Field selectable, 2-wire, loop-powered 4 to 20 mA (DC only, clipped and capped).
    - d. Pressure Ranges: 4 and 7, field selectable.
    - e. Response Time:

- 1) Fast: T95 in 2 seconds.
  - f. Mode: Switch selectable, unidirectional.
  - g. Proof Pressure (pressure differential): 3 psid (20.6 kPa).
  - h. Burst Pressure (pressure differential): 5 psid (34.5 kPa).
  - i. Accuracy: Plus/minus 1 percent f.s. (full scale) of selected range (combined linearity & hysteresis).
  - j. Temperature Effect (per transmitter size):
    - 1) 1 inch w.c. (250 Pa): 2.0 percent per degree C.
    - 2) 10 inch w.c. (2.5 kPa): 0.01 percent per degree C.; (Relative to 25 degrees C) 32 degrees F (0 degrees C) to 122 degrees F (50 degrees C).
  - k. Zero Drift (1-year) (per transmitter size):
    - 1) 1 inch w.c. (250 Pa): 2 percent maximum.
    - 2) 10 inch (2.5 kPa): 0.05 percent maximum.
  - l. Zero adjust: Pushbutton auto-zero and digital input (2-pos terminal block).
  - m. Operating Environment:
    - 1) 32 degrees F (0 degrees C) to 140 degrees F (60 degrees C).
    - 2) 0 to 90 percent RH noncondensing.
  - n. Fittings:
    - 1) Brass barb.
    - 2) 0.24 inches (6.1 mm) outer diameter.
- C. Water Pressure Transmitters (Liquid Differential Pressure Transmitters):
- 1. Manufacturers:
    - a. Siemens Talon.
    - b. Substitutions: See Section 016000 - Product Requirements.
  - 2. General: Provide wet media differential pressure transducers with 6 ft (1.83 m) armored cable, to allow remote pressure sensing capability using existing plumbing runs.
    - a. Input Power: Class 2; 15 to 30 VDC, 24VAC nominal, 50/60 Hz.
    - b. Maximum Current Draw:
      - 1) DC: 125 mA.
      - 2) AC: 280 mA.
    - c. Output: 3-wire transmitter; user-selectable, 4 to 20 mA (0 to 5V/0 to 10V).
    - d. Sensor:
      - 1) Media Compatibility: 17 to 4 PH stainless steel.
      - 2) Status Indication: Dual color LED.
      - 3) Proof Pressure: 2x max. F.S. range.
      - 4) Burst Pressure: 5x max. F.S. range.
      - 5) Accuracy at 77 degrees F (25 degrees C) for less than or equal 20 ft (6.1 m):
        - (a) Ranges A and B: Plus/minus 1 percent F.S. typical.
        - (b) Range C: Plus/minus 1.5 percent F.S. typical.
        - (c) Range D: Plus/minus 2 percent F.S. typical.
      - 6) Surge Damping: Electronic; 1 second averaging.
      - 7) Long Term Stability: Plus/minus 0.25 percent.
      - 8) Zero Offset (Bidirectional and Port Swap Modes Only): 0.5 percent.
    - e. Reverser:
      - 1) Zero Adjust: Push button auto-zero and digital input (2-position terminal block).
      - 2) Fittings:
        - (a) 27 NPT (28 BSP) female thread, stainless steel 17 to 4 PH.
    - f. Pressure Ranges:
      - 1) 0 psi (0 kPa) to 50 psi (345 kPa) (Gauge): 5 psid (34.5 kPa)/10 psid (68.9 kPa)/25 psid (172.4 kPa)/50 psid (344.7 kPa) (pressure differential).

- 2) 0 psi (0 kPa) to 100 psi (690 kPa) (Gauge): 10 psid (68.9 kPa)/20 psid (137.9 kPa)/50 psid (344.7 kPa)/100 psid (689.5 kPa) (pressure differential).
- 3) 0 psi (0 kPa) to 250 psi (1724 kPa) (Gauge): 25 psid (172.4 kPa)/50 psid (172.4 kPa)/125 psid (861.8 kPa)/250 psid (1723.7 kPa) (pressure differential).
- g. Operating Conditions:
  - 1) Temperature Compensated Range:
    - (a) 32 degrees F (0 degrees C).
    - (b) TC Zero less than 1.5 percent of product F.S. (full scale) per sensor.
    - (c) TC Span less than 1.5 percent of product F.S. (full scale) per sensor.
  - 2) Sensor Operating Range: Minus 4 degrees F (Minus 20 degrees C) to 185 degrees F (85 degrees C).
  - 3) Operating Environment: 14 degrees F (Minus 10 degrees C) to 122 degrees F (50 degrees C); 10 to 90 percent RH noncondensing.
- h. Enclosure: NEMA 250, Type 4.
- D. Temperature Transmitters:
  1. Manufacturers:
    - a. Siemens Talon.
    - b. Substitutions: See Section 016000 - Product Requirements.
- E. Humidity Transmitters:
  1. Manufacturers:
    - a. Siemens Talon.
    - b. Substitutions: See Section 016000 - Product Requirements.
  2. One pipe, directly proportioned output signal to measured variable, linearity within plus or minus 1 percent for 70 percent relative humidity span, capable of withstanding 95 percent relative humidity without loss of calibration.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify that systems are ready to receive work.
- C. Beginning of installation means installer accepts existing conditions.
- D. Sequence work to ensure installation of components is complementary to installation of similar components in other systems.
- E. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.
- F. Ensure installation of components is complementary to installation of similar components.
- G. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.

### **3.02 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Check and verify location of exposed control sensors with plans and room details before installation. Locate 48 inches (1200 mm) above floor. Align with lighting switches controllers. Refer to Section 262726.
- C. Mount outdoor reset thermostats and outdoor sensors indoors, with sensing elements outdoors with sun shield.
- D. Provide guards on thermostats in public areas.
- E. Provide valves with position indicators and with pilot positioners where sequenced with other controls.

- F. Provide mixing dampers of opposed blade construction arranged to mix streams. Provide pilot positioners on mixed air damper motors. Provide separate minimum outside air damper section adjacent to return air dampers with separate damper motor.
- G. Provide isolation (two position) dampers of parallel blade construction.
- H. Install damper motors on outside of duct in warm areas. Do not install motors in locations at outdoor temperatures.
- I. Mount control panels adjacent to associated equipment on vibration free walls or free standing angle iron supports. One cabinet may accommodate more than one system in same equipment room. Provide engraved plastic nameplates for instruments and controls inside cabinet and engraved plastic nameplates on cabinet face.
- J. Provide conduit and electrical wiring in accordance with Section 260583. Electrical material and installation shall be in accordance with appropriate requirements.

### **3.03 MAINTENANCE**

- A. Provide service and maintenance of control system for one year from Date of Substantial Completion.
- B. Provide complete service of controls systems, including call backs, and submit written report of each service call.
- C. In addition to normal service calls, make minimum of 4 complete normal inspections of approximately 4 hours duration to inspect, calibrate, and adjust controls.

**END OF SECTION**

**SECTION 230923**  
**DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. System description.
- B. Operator interface.
- C. Power supplies and line filtering.
- D. System software.
- E. Controller software.
- F. HVAC control programs.

**1.02 REFERENCE STANDARDS**

- A. ASHRAE Std 135 - A Data Communication Protocol for Building Automation and Control Networks 2020.
- B. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

**1.04 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data for each system component and software module.
- C. Shop Drawings:
  - 1. Indicate trunk cable schematic showing programmable control unit locations, and trunk data conductors.
  - 2. List connected data points, including connected control unit and input device.
  - 3. Indicate system graphics indicating monitored systems, data (connected and calculated) point addresses, and operator notations. Provide demonstration digital media containing graphics.
  - 4. Show system configuration with peripheral devices, batteries, power supplies, diagrams, modems, and interconnections.
  - 5. Indicate description and sequence of operation of operating, user, and application software.
- D. Manufacturer's Instructions: Indicate manufacturer's installation instructions for all manufactured components.
- E. Project Record Documents: Record actual locations of control components, including control units, thermostats, and sensors.
  - 1. Revise shop drawings to reflect actual installation and operating sequences.
  - 2. Include submittals data in final "Record Documents" form.
- F. Operation and Maintenance Data:
  - 1. Include interconnection wiring diagrams complete field installed systems with identified and numbered, system components and devices.
  - 2. Include keyboard illustrations and step-by-step procedures indexed for each operator function.
  - 3. Include inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.

- G. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

#### **1.05 QUALITY ASSURANCE**

- A. Perform work in accordance with NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of experience.
- C. Installer Qualifications: Company specializing in performing work of the type specified and with minimum three years of experience.
- D. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for purpose specified and indicated.

#### **1.06 WARRANTY**

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Correct defective Work within a five year period after Substantial Completion.
- C. Provide five year manufacturer's warranty for field programmable micro-processor based units.

#### **1.07 PROTECTION OF SOFTWARE RIGHTS**

- A. Prior to delivery of software, the Owner and the party providing the software will enter into a software license agreement with provisions for the following:
  - 1. Limiting use of software to equipment provided under these specifications.
  - 2. Limiting copying.
  - 3. Preserving confidentiality.
  - 4. Prohibiting transfer to a third party.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Siemens Talon.
- B. Substitutions: See Section 016000 - Product Requirements.

#### **2.02 SYSTEM DESCRIPTION**

- A. Automatic temperature control field monitoring and control system using field programmable micro-processor based units.
- B. Base system on distributed system of fully intelligent, stand-alone controllers, operating in a multi-tasking, multi-user environment on token passing network, with central and remote hardware, software, and interconnecting wire and conduit.
- C. Include computer software and hardware, operator input/output devices, control units, local area networks (LAN), sensors, control devices, actuators.
- D. Controls for variable air volume terminals, radiation, reheat coils, unit heaters, fan coils, and the like when directly connected to the control units. Individual terminal unit control is specified in Section 230913.
- E. Provide control systems consisting of thermostats, control valves, dampers and operators, indicating devices, interface equipment and other apparatus and accessories required to operate mechanical systems, and to perform functions specified.
- F. Include installation and calibration, supervision, adjustments, and fine tuning necessary for complete and fully operational system.

#### **2.03 OPERATOR INTERFACE**

- A. PC Based Work Station:
  - 1. Resides on high speed network with building controllers.
  - 2. Connected to server for full access to all system information.

- B. Workstation, controllers, and control backbone to communicate using BACnet protocol and addressing.
- C. BACnet protocol to comply with ASHRAE Std 135.
- D. Hardware:
  - 1. Desktop:
    - a. Computer(s) and display(s) to be provided by DDC controls manufacturer.
    - b. Quantity: Provide allowance for 1 computer(s).
    - c. Location(s): As directed by the Owner.
    - d. Network Connection:
      - 1) Ethernet interface card.
  - 2. Laptop:
    - a. Laptop(s) to be provided by DDC controls manufacturer.
    - b. Quantity: Provide allowance for 1 computer(s).
    - c. Network Connection:
      - 1) Ethernet interface card.
  - 3. Hand Held Device:
    - a. Provide remote system access via iPad or Smart Phone with browser agnostic connectivity, including controller point monitor and control access to the following data:
      - 1) Alarm.
      - 2) Summary.
      - 3) Schedule.
      - 4) Trend.
    - b. Provide the capability to view in text list based format.
    - c. Minimum Functionality:
      - 1) Set point adjustment.
      - 2) Alarm acknowledgement.
      - 3) Scheduling.

## **2.04 CONTROLLERS**

- A. BUILDING CONTROLLERS
  - a. Manage global strategies by one or more, independent, standalone, microprocessor based controllers.
  - b. Provide sufficient memory to support controller's operating system, database, and programming requirements.
  - c. Share data between networked controllers.
  - d. Controller operating system manages input and output communication signals allowing distributed controllers to share real and virtual object information and allowing for central monitoring and alarms.
  - e. Utilize real-time clock for scheduling.
  - f. Continuously check processor status and memory circuits for abnormal operation.
  - g. Controller to assume predetermined failure mode and generate alarm notification upon detection of abnormal operation.
  - h. Communication with other network devices to be based on assigned protocol.
  - i. Controller to reside on a BACnet network using ISO 8802-3 (ETHERNET) Data Link/Physical layer protocol.
  - j. Perform routing when connected to a network of custom application and application specific controllers.
  - k. Provide service communication port for connection to a portable operator's terminal or hand held device with compatible protocol.
  - l. Outdoors and/or in Wet Ambient Conditions:
    - 1) Mount within waterproof enclosures.

- 2) Rated for operation at 40 to 150 degrees F (4 to 65 degrees C).
  - m. Conditioned Space:
    - 1) Mount within dustproof enclosures.
    - 2) Rated for operation at 32 to 120 degrees F (0 to 50 degrees C).
  - n. Diagnostic LEDs for power, communication, and processor.
  - o. Make all wiring connections to field removable, modular terminal strips, or to a termination card connected by a ribbon cable.
  - p. Maintain operation at 90 to 110 percent of nominal voltage rating.
  - q. Perform orderly shutdown below 80 percent of nominal voltage.
  - r. Operation protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W. at 3 feet (1 m).
- B. CUSTOM APPLICATION CONTROLLERS
- a. Provide sufficient memory to support controller's operating system, database, and programming requirements.
  - b. Share data between networked, microprocessor based controllers.
  - c. Controller operating system manages input and output communication signals allowing distributed controllers to share real and virtual object information and allowing for central monitoring and alarms.
  - d. Utilize real-time clock for scheduling.
  - e. Continuously check processor status and memory circuits for abnormal operation.
  - f. Controller to assume predetermined failure mode and generate alarm notification upon detection of abnormal operation.
  - g. Communication with other network devices to be based on assigned protocol.
  - h. Controller to reside on a BACnet network using MS/TP Data Link/Physical layer protocol.
  - i. Provide service communication port for connection to a portable operator's terminal or hand held device with compatible protocol.
  - j. Outdoors and/or in Wet Ambient Conditions:
    - 1) Mount within waterproof enclosures.
    - 2) Rated for operation at 40 to 150 degrees F (4 to 65 degrees C).
  - k. Conditioned Space:
    - 1) Mount within dustproof enclosures.
    - 2) Rated for operation at 32 to 120 degrees F (0 to 50 degrees C).
  - l. Diagnostic LED's for power, communication, and processor.
  - m. Make all wiring connections to field removable, modular terminal strips, or to a termination card connected by a ribbon cable.
2. Memory: In the event of a power loss, maintain all BIOS and programming information for a minimum of 72 hours.
- a. Maintain operation at 90 to 110 percent of nominal voltage rating.
  - b. Perform orderly shutdown below 80 percent of nominal voltage.
  - c. Operation protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W. at 3 feet (1 m).
- C. APPLICATION SPECIFIC CONTROLLERS
- a. Not fully user programmable, microprocessor based controllers dedicated to control specific equipment.
  - b. Customized for operation within the confines of equipment served.
  - c. Communication with other network devices to be based on assigned protocol.
  - d. Controller to reside on a BACnet network using MS/TP Data Link/Physical layer protocol.
  - e. Provide service communication port for connection to a portable operator's terminal or hand held device with compatible protocol.
  - f. Outdoors and/or in Wet Ambient Conditions:



- 1) Mount within waterproof enclosures.
- 2) Rated for operation at 40 to 150 degrees F (4 to 65 degrees C).
- g. Conditioned Space:
  - 1) Mount within dustproof enclosures.
  - 2) Rated for operation at 32 to 120 degrees F (0 to 50 degrees C).
- h. Diagnostic LEDs for power, communication, and processor.
- i. Make all wiring connections to field removable, modular terminal strips, or to a termination card connected by a ribbon cable.
- j. Maintain operation at 90 to 110 percent of nominal voltage rating.
- k. Perform orderly shutdown below 80 percent of nominal voltage.
- l. Operation protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W at 3 feet (1 m).

#### D. INPUT/OUTPUT INTERFACE

- a. Protect controller from damage resulting from any point short-circuiting or grounding and from voltage up to 24 volts of any duration.
- b. Provide universal type for building and custom application controllers where input or output is software designated as either binary or analog type with appropriate properties.
- c. Allow monitoring of On/Off signals from remote devices.
- d. Provide wetting current of 12 mA minimum, compatible with commonly available control devices and protected against the effects of contact bounce and noise.
- e. Sense dry contact closure with power provided only by the controller.
- f. Used for On/Off operation or a pulsed low-voltage signal for pulse width modulation control.
- g. Outputs provided with three position (On/Off/Auto) override switches.
- h. Status lights for building and custom application controllers to be selectable for normally open or normally closed operation.
- i. Monitoring signal provides a 0 to 10 VDC or a 4 to 20 mA output signal for end device control.
- j. Provide status lights and two position (AUTO/MANUAL) switch for building and custom application controllers with manually adjustable potentiometer for manual override on building and custom application controllers.
- k. Drift to not exceed 0.4 percent of range per year.
- l. Coordinate two binary outputs to control three point, floating type, electronic actuators without feedback.
- m. Limit the use of three point, floating devices to the following zone and terminal unit control applications:
- n. Control algorithms run the zone actuator to one end of its stroke once every 24 hours for verification of operator tracking.
- o. System size to be expandable to twice the number of input output objects required by providing additional controllers, including associated devices and wiring.
- p. Hardware additions or software revisions for the installed operator interfaces are not to be required for future, system expansions.

## 2.05 POWER SUPPLIES AND LINE FILTERING

- A. Power Supplies:
  1. Provide UL listed control transformers with Class 2 current limiting type or over-current protection in both primary and secondary circuits for Class 2 service as required by the NEC.
  2. Limit connected loads to 80 percent of rated capacity.
  3. Match DC power supply to current output and voltage requirements.
  4. Unit to be full wave rectifier type with output ripple of 5.0 mV maximum peak to peak.

5. Regulation to be 1 percent combined line and load with 100 microsecond response time for 50 percent load changes.
6. Provide over-voltage and over-current protection to withstand a 150 percent current overload for 3 seconds minimum without trip-out or failure.
7. Operational Ambient Conditions: 32 to 120 degrees F (0 to 50 degrees C).
8. EM/RF meets FCC Class B and VDE 0871 for Class B and MIL-STD 810 for shock and vibration.
9. Line voltage units UL recognized and CSA approved.
- B. Power Line Filtering:
  1. Provide external or internal transient voltage and surge suppression component for all workstations and controllers.
  2. Minimum surge protection attributes:
    - a. Dielectric strength of 1000 volts minimum.
    - b. Response time of 10 nanoseconds or less.
    - c. Transverse mode noise attenuation of 65 dB or greater.
    - d. Common mode noise attenuation of 150 dB or greater at 40 to 100 Hz.

## **2.06 LOCAL AREA NETWORK (LAN)**

- A. Provide communication between control units over local area network (LAN).
- B. LAN Capacity: Not less than 60 stations or nodes.
- C. Break in Communication Path: Alarm and automatically initiate LAN reconfiguration.
- D. LAN Data Speed: Minimum 19.2 Kb.
- E. Communication Techniques: Allow interface into network by multiple operation stations and by auto-answer/auto-dial modems. Support communication over telephone lines utilizing modems.
- F. Transmission Median: Fiber optic or single pair of solid 24 gage twisted, shielded copper cable.
- G. Network Support: Time for global point to be received by any station, shall be less than 3 seconds. Provide automatic reconfiguration if any station is added or lost. If transmission cable is cut, reconfigure two sections with no disruption to system's operation, without operator intervention.

## **2.07 SYSTEM SOFTWARE**

- A. Operating System:
  1. Concurrent, multi-tasking capability.
    - a. Common Software Applications Supported: Microsoft Excel.
    - b. Acceptable Operating Systems: Windows.
  2. System Graphics:
    - a. Allow up to 10 graphic screens, simultaneously displayed for comparison and monitoring of system status.
    - b. Animation displayed by shifting image files based on object status.
    - c. Provide method for operator with password to perform the following:
      - 1) Move between, change size, and change location of graphic displays.
      - 2) Modify on-line.
      - 3) Add, delete, or change dynamic objects consisting of:
        - (a) Analog and binary values.
        - (b) Dynamic text.
        - (c) Static text.
        - (d) Animation files.
  3. Custom Graphics Generation Package:
    - a. Create, modify, and save graphic files and visio format graphics in PCX formats.
    - b. HTML graphics to support web browser compatible formats.
    - c. Capture or convert graphics from AutoCAD.

4. Standard HVAC Graphics Library:
  - a. HVAC Equipment:
    - 1) Boilers.
    - 2) Air Handlers.
    - 3) Terminal HVAC Units.
    - 4) Fan Coil Units.
  - b. Ancillary Equipment:
    - 1) Fans.
    - 2) Pumps.
    - 3) Coils.
    - 4) Valves.
    - 5) Piping.
    - 6) Dampers.
    - 7) Ductwork.
  - c. File Format Compatible with Graphics Generation Package Program.
- B. Workstation System Applications:
  1. Automatic System Database Save and Restore Functions:
    - a. Current database copy of each Building Controller is automatically stored on hard disk.
    - b. Automatic update occurs upon change in any system panel.
    - c. In the event of database loss in any system panel, the first workstation to detect the loss automatically restores the database for that panel unless disabled by the operator.
  2. Manual System Database Save and Restore Functions by Operator with Password Clearance:
    - a. Save database from any system panel.
    - b. Clear a panel database.
    - c. Initiate a download of a specified database to any system panel.
  3. Software provided allows system configuration and future changes or additions by operators under proper password protection.
  4. On-line Help:
    - a. Context-sensitive system assists operator in operation and editing.
    - b. Available for all applications.
    - c. Relevant screen data provided for particular screen display.
    - d. Additional help available via hypertext.
  5. Security:
    - a. Operator log-on requires user name and password to view, edit, add, or delete data.
    - b. System security selectable for each operator.
    - c. System supervisor sets passwords and security levels for all other operators.
    - d. Operator passwords to restrict functions accessible to viewing and/or changing system applications, editor, and object.
    - e. Automatic, operator log-off results from keyboard or mouse inactivity during user-adjustable, time period.
    - f. All system security data stored in encrypted format.
  6. System Diagnostics:
    - a. Operations Automatically Monitored:
      - 1) Workstations.
      - 2) Printers.
      - 3) Modems.
      - 4) Network connections.
      - 5) Building management panels.
      - 6) Controllers.

- b. Device failure is annunciated to the operator.
- 7. Alarm Processing:
  - a. All system objects are configurable to "alarm in" and "alarm out" of normal state.
  - b. Configurable Objects:
    - 1) Alarm limits.
    - 2) Alarm limit differentials.
    - 3) States.
    - 4) Reactions for each object.
- 8. Alarm Messages:
  - a. Descriptor: English language.
  - b. Recognizable Features:
    - 1) Source.
    - 2) Location.
    - 3) Nature.
- 9. Configurable Alarm Reactions by Workstation and Time of Day:
  - a. Logging.
  - b. Printing.
  - c. Starting programs.
  - d. Displaying messages.
  - e. Dialing out to remote locations.
  - f. Paging.
  - g. Providing audible annunciation.
  - h. Displaying specific system graphics.
- 10. Custom Trend Logs:
  - a. Definable for any data object in the system including interval, start time, and stop time.
  - b. Trend Data:
    - 1) Sampled and stored on the building controller panel.
    - 2) Archivable on hard disk.
    - 3) Retrievable for use in reports, spreadsheets and standard database programs.
    - 4) Archival on LAN accessible storage media including hard disk, tape, Raid array drive, and virtual cloud environment.
    - 5) Protected and encrypted format to prevent manipulation, or editing of historical data and event logs.
- 11. Alarm and Event Log:
  - a. View all system alarms and change of states from any system location.
  - b. Events listed chronologically.
  - c. Operator with proper security acknowledges and clears alarms.
  - d. Alarms not cleared by operator are archived to the workstation hard disk.
- 12. Object, Property Status and Control:
  - a. Provide a method to view, edit if applicable, the status of any object and property in the system.
  - b. Status Available by the Following Methods:
    - 1) Menu.
    - 2) Graphics.
    - 3) Custom Programs.
- 13. Reports and Logs:
  - a. Reporting Package:
    - 1) Allows operator to select, modify, or create reports.
    - 2) Definable as to data content, format, interval, and date.
    - 3) Archivable to hard disk.
  - b. Real-time logs available by type or status such as alarm, lockout, normal, etc.

- c. Stored on hard disk and readily accessible by standard software applications, including spreadsheets and word processing.
  - d. Set to be printed on operator command or specific time(s).
- 14. Reports:
  - a. Standard:
    - 1) Objects with current values.
    - 2) Current alarms not locked out.
    - 3) Disabled and overridden objects, points and SNVTs.
    - 4) Objects in manual or automatic alarm lockout.
    - 5) Objects in alarm lockout currently in alarm.
    - 6) Logs:
      - (a) Alarm History.
      - (b) System messages.
      - (c) System events.
      - (d) Trends.
  - b. Custom:
    - 1) Daily.
    - 2) Weekly.
    - 3) Monthly.
    - 4) Annual.
    - 5) Time and date stamped.
    - 6) Title.
    - 7) Facility name.
  - c. Tenant Override:
    - 1) Monthly report showing total, requested, after-hours HVAC and lighting services on a daily basis for each tenant.
    - 2) Annual report showing override usage on a monthly basis.
- C. Workstation Applications Editors:
  - 1. Provide editing software for each system application at PC workstation.
  - 2. Downloaded application is executed at controller panel.
  - 3. Full screen editor for each application allows operator to view and change:
    - a. Configuration.
    - b. Name.
    - c. Control parameters.
    - d. Set-points.
  - 4. Scheduling:
    - a. Monthly calendar indicates schedules, holidays, and exceptions.
    - b. Allows several related objects to be scheduled and copied to other objects or dates.
    - c. Start and stop times adjustable from master schedule.
  - 5. Custom Application Programming:
    - a. Create, modify, debug, edit, compile, and download custom application programming during operation and without disruption of all other system applications.
    - b. Programming Features:
      - 1) English oriented language, based on BASIC, FORTRAN, C, or PASCAL syntax allowing for free form programming.
      - 2) Alternative language graphically based using appropriate function blocks suitable for all required functions and amenable to customizing or compounding.
      - 3) Insert, add, modify, and delete custom programming code that incorporates word processing features such as cut/paste and find/replace.
      - 4) Allows the development of independently, executing, program modules designed to enable and disable other modules.

- 5) Debugging/simulation capability that displays intermediate values and/or results including syntax/execution error messages.
- 6) Support for conditional statements (IF/THEN/ELSE/ELSE-F) using compound Boolean (AND, OR, and NOT) and/or relations (EQUAL, LESS THAN, GREATER THAN, NOT EQUAL) comparisons.
- 7) Support for floating-point arithmetic utilizing plus, minus, divide, times, square root operators; including absolute value; minimum/maximum value from a list of values for mathematical functions.
- 8) Language consisting of resettable, predefined, variables representing time of day, day of the week, month of the year, date; and elapsed time in seconds, minutes, hours, and days where the variable values can be used in IF/THEN comparisons, calculations, programming statement logic, etc.
- 9) Language having predefined variables representing status and results of the system software enables, disables, and changes the set points of the controller software.

## **2.08 CONTROLLER SOFTWARE**

- A. All applications reside and operate in the system controllers and editing of all applications occurs at the operator workstation.
- B. System Security:
  1. User access secured via user passwords and user names.
  2. Passwords restrict user to the objects, applications, and system functions as assigned by the system manager.
  3. User Log On/Log Off attempts are recorded.
  4. Automatic Log Off occurs following the last keystroke after a user defined delay time.
- C. Object or Object Group Scheduling:
  1. Weekly Schedules Based on Separate, Daily Schedules:
    - a. Include start, stop, optimal stop, and night economizer.
    - b. 10 events maximum per schedule.
    - c. Start/stop times adjustable for each group object.
  2. Exception Schedules:
    - a. Based on any day of the year.
    - b. Defined up to one year in advance.
    - c. Automatically discarded and replaced with standard schedule for that day of the week upon execution.
  3. Holiday or Special Schedules:
    - a. Capability to define up to 99 schedules.
    - b. Repeated annually.
    - c. Length of each period is operator defined.
- D. Provide standard application for equipment coordination and grouping based on function and location to be used for scheduling and other applications.
- E. Alarms:
  1. Binary object is set to alarm based on the operator specified state.
  2. Analog object to have high/low alarm limits.
  3. All alarming is capable of being automatically and manually disabled.
  4. Alarm Reporting:
    - a. Operator determines action to be taken for alarm event.
    - b. Alarms to be routed to appropriate workstation.
    - c. Reporting Options:
      - 1) Start programs.
      - 2) Print.

- 3) Logged.
  - 4) Custom messaging.
  - 5) Graphical displays.
  - 6) Dial out to workstation receivers via system protocol.
- F. Maintenance Management: System monitors equipment status and generates maintenance messages based upon user-designated run-time limits.
- G. PID Control Characteristics:
1. Direct or reverse action.
  2. Anti-windup.
  3. Calculated, time-varying, analog value, positions an output or stages a series of outputs.
  4. User selectable controlled variable, set-point, and PED gains.
- H. Staggered Start Application:
1. Prevents all controlled equipment from simultaneously restarting after power outage.
  2. Order of equipment startup is user selectable.
- I. Energy Calculations:
1. Accumulated instantaneous power or flow rates are converted to energy use data.
  2. Algorithm calculates a rolling average and allows window of time to be user specified in minute intervals.
  3. Algorithm calculates a fixed window average with a digital input signal from a utility meter defining the start of the window period that in turn synchronizes the fixed-window average with that used by the power company.
- J. Anti-Short Cycling:
1. All binary output objects protected from short-cycling.
  2. Allows minimum on-time and off-time to be selected.
- K. On-Off Control with Differential:
1. Algorithm allows binary output to be cycled based on a controlled variable and set-point.
  2. Algorithm to be direct-acting or reverse-acting incorporating an adjustable differential.
- L. Run-Time Totalization:
1. Totalize run-times for all binary input objects.
  2. Provides operator with capability to assign high run-time alarm.

## **2.09 HVAC CONTROL PROGRAMS**

- A. General:
1. Support Inch-pounds units of measurement.
  2. Identify each HVAC Control system.
- B. Optimal Run Time:
1. Control start-up and shutdown times of HVAC equipment for both heating and cooling.
  2. Base on occupancy schedules, outside air temperature, seasonal requirements, and interior room mass temperature.
  3. Operator commands:
    - a. Define term schedule.
    - b. Add/delete fan status point.
    - c. Add/delete outside air temperature point.
    - d. Add/delete mass temperature point.
    - e. Define heating/cooling parameters.
    - f. Request optimal run time control summary.
    - g. Request HVAC point summary.
    - h. Request HVAC saving profile summary.
  4. Control Summary:
    - a. HVAC Control system begin/end status.

- b. Optimal run time lock/unlock control status.
  - c. Heating/cooling mode status.
  - d. Optimal run time schedule.
  - e. Start/Stop times.
  - f. Optimal run time system normal start times.
  - g. Occupancy and vacancy times.
  - h. Optimal run time system heating/cooling mode parameters.
- 5. HVAC point summary:
  - a. Control system identifier and status.
  - b. Point ID and status.
  - c. Outside air temperature point ID and status.
  - d. Calculated optimal start and stop times.
  - e. Period start.
- C. Supply Air Reset:
  - 1. Adjust discharge temperatures to most energy efficient levels satisfying measured load by:
    - a. Raising cooling temperatures to highest possible value.
    - b. Reducing heating temperatures to lowest possible level.
  - 2. Operator commands:
    - a. Add/delete fan status point.
    - b. Lock/unlock program.
    - c. Request HVAC point summary.
    - d. Add/Delete discharge controller point.
    - e. Define discharge controller parameters.
    - f. Add/delete air flow rate.
    - g. Define space load and load parameters.
    - h. Request space load summary.
  - 3. Control summary:
    - a. HVAC control system status (begin/end).
    - b. Supply air reset system status.
    - c. Optimal run time system status.
    - d. Heating and cooling loop.
    - e. High/low limits.
    - f. Deadband.
    - g. Response timer.
    - h. Reset times.
  - 4. Space load summary:
    - a. HVAC system status.
    - b. Optimal run time status.
    - c. Heating/cooling loop status.
    - d. Space load point ID.
    - e. Current space load point value.
    - f. Control heat/cool limited.
    - g. Gain factor.
    - h. Calculated reset values.
    - i. Fan status point ID and status.
    - j. Control discharge temperature point ID and status.
    - k. Space load point ID and status.
    - l. Air flow rate point ID and status.
- D. Enthalpy Switchover:
  - 1. Calculate outside and return air enthalpy using measured temperature and relative humidity; determine energy expended and control outside and return air dampers.



2. Operator commands:
  - a. Add/delete fan status point.
  - b. Add/delete outside air temperature point.
  - c. Add/delete discharge controller point.
  - d. Define discharge controller parameters.
  - e. Add/delete return air temperature point.
  - f. Add/delete outside air dew point/humidity point.
  - g. Add/delete return air dew point/humidity point.
  - h. Add/delete damper switch.
  - i. Add/delete minimum outside air.
  - j. Add/delete atmospheric pressure.
  - k. Add/delete heating override switch.
  - l. Add/delete evaporative cooling switch.
  - m. Add/delete air flow rate.
  - n. Define enthalpy deadband.
  - o. Lock/unlock program.
  - p. Request control summary.
  - q. Request HVAC point summary.
3. Control summary:
  - a. HVAC control system begin/end status.
  - b. Enthalpy switchover optimal system status.
  - c. Optimal return time system status.
  - d. Current outside air enthalpy.
  - e. Calculated mixed air enthalpy.
  - f. Calculated cooling coil enthalpy using outside air.
  - g. Calculated cooling coil enthalpy using mixed air.
  - h. Calculated enthalpy difference.
  - i. Enthalpy switchover deadband.
  - j. Status of damper mode switch.

### **PART 3 EXECUTION**

#### **3.01 INSTALLERS**

- A. Installer List:
  1. Siemens Talon.
  2. Substitution Limitations: Same as specified for products; see Section 016000 - Product Requirements.

#### **3.02 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify that conditioned power supply is available to the control units and to the operator work station. Verify that field end devices, wiring, and pneumatic tubing is installed prior to installation proceeding.

#### **3.03 INSTALLATION**

- A. Install control units and other hardware in position on permanent walls where not subject to excessive vibration.
- B. Install software in control units and in operator work station. Implement all features of programs to specified requirements and appropriate to sequence of operation. Refer to Section 230993.
- C. Provide with 120v AC, 15 amp dedicated emergency power circuit to each programmable control unit.

- D. Provide conduit and electrical wiring in accordance with Section 260583. Electrical material and installation shall be in accordance with appropriate requirements of Division 26.

#### **3.04 MANUFACTURER'S FIELD SERVICES**

- A. Start and commission systems. Allow sufficient time for start-up and commissioning prior to placing control systems in permanent operation.
- B. Provide service engineer to instruct Owner's representative in operation of systems plant and equipment for 4 day period.
- C. Provide basic operator training for 4 persons on data display, alarm and status descriptors, requesting data, execution of commands and request of logs. Include a minimum of 40 hours dedicated instructor time. Provide training on site.

#### **3.05 DEMONSTRATION AND INSTRUCTIONS**

- A. Demonstrate complete and operating system to Owner.

#### **3.06 MAINTENANCE**

- A. Provide service and maintenance of energy management and control systems for one years from Date of Substantial Completion.
- B. Provide four complete inspections per year, one in each season, to inspect, calibrate, and adjust controls as required, and submit written reports.
- C. Provide complete service of systems, including call backs. Make minimum of 4 complete normal inspections of approximately 4 hours duration in addition to normal service calls to inspect, calibrate, and adjust controls, and submit written reports.

**END OF SECTION**

## **SECTION 232113 HYDRONIC PIPING**

### **PART 1 GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Hydronic system requirements.
- B. Condenser water piping, above grade.
- C. Equipment drains and overflows.
- D. Pipe hangers and supports.
- E. Unions, flanges, mechanical couplings, and dielectric connections.
- F. Valves:
  - 1. Ball valves.
  - 2. Butterfly valves.

#### **1.02 RELATED REQUIREMENTS**

- A. Section 230516 - Expansion Fittings and Loops for HVAC Piping.
- B. Section 230719 - HVAC Piping Insulation.
- C. Section 232500 - HVAC Water Treatment: Pipe cleaning.

#### **1.03 REFERENCE STANDARDS**

- A. ASME BPVC-IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators - Welding Brazing and Fusing Qualifications 2019.
- B. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300 2016.
- C. ASME B31.9 - Building Services Piping 2020.
- D. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless 2020.
- E. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service 2019.
- F. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120 2021.
- G. ASTM D2241 - Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series) 2020.
- H. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40 2021.
- I. ASTM D2467 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80 2020.
- J. ASTM D2855 - Standard Practice for the Two-Step (Primer & Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets 2020.
- K. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers 1992, with Editorial Revision (2018).
- L. AWS D1.1/D1.1M - Structural Welding Code - Steel 2020.
- M. AWWA C606 - Grooved and Shouldered Joints 2015.
- N. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation 2018.

#### **1.04 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data:
  - 1. Include data on pipe materials, pipe fittings, valves, and accessories.
  - 2. Provide manufacturers catalog information.
  - 3. Indicate valve data and ratings.
- C. Project Record Documents: Record actual locations of valves.
- D. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

#### **1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified in this section, with minimum [ ] years of experience.
- C. Date stamp all castings used for coupling housings, fittings, valve bodies, etc. for quality assurance and traceability.
- D. Welder Qualifications: Certify in accordance with ASME BPVC-IX.

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

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary protective coating on cast iron and steel valves.
- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

### **PART 2 PRODUCTS**

#### **2.01 HYDRONIC SYSTEM REQUIREMENTS**

- A. Comply with ASME B31.9 and applicable federal, state, and local regulations.
- B. Piping: Provide piping, fittings, hangers, and supports as required, as indicated, and as follows:
  - 1. Where more than one piping system material is specified, provide joining fittings that are compatible with piping materials and ensure that the integrity of the system is not jeopardized.
  - 2. Use non-conducting dielectric connections whenever jointing dissimilar metals.
  - 3. Provide pipe hangers and supports in accordance with ASME B31.9 or MSS SP-58 unless indicated otherwise.
- C. Pipe-to-Valve and Pipe-to-Equipment Connections: Use flanges, unions, or grooved couplings to allow disconnection of components for servicing; do not use direct welded, soldered, or threaded connections.
- D. Valves: Provide valves where indicated:
  - 1. Provide drain valves where indicated, and if not indicated, provide at least at main shut-off, low points of piping, bases of vertical risers, and at equipment. Use 3/4 inch (20 mm) gate valves with cap; pipe to nearest floor drain.
  - 2. For shut-off and to isolate parts of systems or vertical risers, use butterfly valves.

#### **2.02 CONDENSER WATER PIPING, ABOVE GRADE**

- A. Product shall be manufactured in the USA.
- B. Steel Pipe: ASTM A53/A53M, Schedule 40, black.

1. Welded Joints: ASTM A234/A234M, wrought steel welding type fittings with finish matching piping; AWS D1.1/D1.1M welded.
2. Threaded Joints: ASME B16.3, malleable iron fittings with finish matching piping.
3. Grooved Joints: AWWA C606 grooved pipe, fittings of same material, and mechanical couplings.

### **2.03 EQUIPMENT DRAINS AND OVERFLOWS**

- A. Product shall be manufactured in the USA.
- B. PVC Pipe: ASTM D1785, Schedule 40, or ASTM D2241, SDR 21 or 26.
  1. Fittings: ASTM D2466 or D2467, PVC.
  2. Joints: Solvent welded in accordance with ASTM D2855.

### **2.04 PIPE HANGERS AND SUPPORTS**

- A. Product shall be manufactured in the USA.
- B. Provide hangers and supports that comply with MSS SP-58.
  1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
  2. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
- C. In grooved installations, use rigid couplings with offsetting angle-pattern bolt pads or with wedge-shaped grooves in header piping to permit support and hanging in accordance with ASME B31.9.

### **2.05 UNIONS, FLANGES, MECHANICAL COUPLINGS, AND DIELECTRIC CONNECTIONS**

- A. Product shall be manufactured in the USA.
- B. Unions for Pipe 2 Inches (50 mm) and Less:
- C. Flanges for Pipe 2 Inches (50 mm) and Greater:
- D. Dielectric Connections:
  1. Waterways:
    - a. Water impervious insulation barrier capable of limiting galvanic current to 1 percent of short circuit current in a corresponding bimetallic joint.
    - b. Dry insulation barrier able to withstand 600-volt breakdown test.
    - c. Construct of galvanized steel with threaded end connections to match connecting piping.
    - d. Suitable for the required operating pressures and temperatures.
  2. Flanges:
    - a. Dielectric flanges with same pressure ratings as standard flanges.
    - b. Water impervious insulation barrier capable of limiting galvanic current to 1 percent of short circuit current in a corresponding bimetallic joint.
    - c. Dry insulation barrier able to withstand 600-volt breakdown test.
    - d. Construct of galvanized steel with threaded end connections to match connecting piping.
    - e. Suitable for the required operating pressures and temperatures.

### **2.06 BALL VALVES**

- A. Manufacturers:
  1. Apollo Valves: [www.apollovalves.com/#sle](http://www.apollovalves.com/#sle).
  2. Substitutions: See Section 016000 - Product Requirements.
- B. Product shall be manufactured in the USA.

### **2.07 BUTTERFLY VALVES**

- A. Manufacturers:

1. Grinnell Products; [\_\_\_\_]: [www.grinnell.com/#sle](http://www.grinnell.com/#sle).
  2. Substitutions: See Section 016000 - Product Requirements.
- B. Product shall be manufactured in the USA.
- C. Body: Cast or ductile iron with resilient replaceable EPDM seat, wafer, lug, or grooved ends, extended neck.
- D. Disc: Construct of stainless steel.
- E. Stem: Stainless steel with stem offset from the centerline to provide full 360-degree circumferential setting.
- F. Operator: 10 position lever handle.

### **PART 3 EXECUTION**

#### **3.01 PREPARATION**

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare piping connections to equipment using jointing system specified.
- D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.
- E. After completion, fill, clean, and treat systems. See Section 232500 for additional requirements.

#### **3.02 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.
- C. Route piping in orderly manner, parallel to building structure, and maintain gradient.
- D. Install piping to conserve building space and to avoid interference with use of space.
- E. Group piping whenever practical at common elevations.
- F. Slope piping and arrange to drain at low points.
- G. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. See Section 230516.
- H. Pipe Hangers and Supports:
1. Install in accordance with ASME B31.9, ASTM F708, or MSS SP-58.
  2. Support horizontal piping as scheduled.
  3. Install hangers to provide minimum 1/2-inch (13 mm) space between finished covering and adjacent work.
  4. Place hangers within 12 inches (300 mm) of each horizontal elbow.
  5. Use hangers with 1-1/2 inches (38 mm) minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
  6. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
  7. Prime coat exposed steel hangers and supports. See Section 09 9123. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
- I. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. See Section 230719.
- J. Install valves with stems upright or horizontal, not inverted.

#### **3.03 SCHEDULES**

- A. Hanger Spacing for Steel Piping.

1. 2 Inches (50 mm): Maximum span, 10 feet (3.0 m); minimum rod size, 3/8 inch (9 mm).
  2. 2-1/2 Inches (65 mm): Maximum span, 11 feet (3.4 m); minimum rod size, 3/8 inch (9 mm).
  3. 3 Inches (80 mm): Maximum span, 12 feet (3.6 m); minimum rod size, 3/8 inch (9 mm).
  4. 4 Inches (100 mm): Maximum span, 14 feet (4.3 m); minimum rod size, 1/2 inch (13 mm).
  5. 6 Inches (150 mm): Maximum span, 17 feet (5.1 m); minimum rod size, 1/2 inch (13 mm).
  6. 8 Inches (200 mm): Maximum span, 19 feet (5.8 m); minimum rod size, 5/8 inch (16 mm).
  7. 10 Inches (250 mm): Maximum span, 20 feet (6.1 m); minimum rod size, 3/4 inch (19 mm).
  8. 12 Inches (300 mm): Maximum span, 23 feet (7.0 m); minimum rod size, 7/8 inch (22 mm).
- B. Hanger Spacing for Plastic Piping.
1. 2 Inches (50 mm): Maximum span, 69 inches (1700 mm); minimum rod size, 3/8 inch (9 mm).
  2. 3 Inches (80 mm): Maximum span, 7 feet (2100 mm); minimum rod size, 3/8 inch (9 mm).
  3. 4 Inches (100 mm): Maximum span, 8 feet (2400 mm); minimum rod size, 1/2 inch (13 mm).

**END OF SECTION**

**SECTION 236500  
CLOSED CIRCUIT COOLERS**

**PART 1 - GENERAL**

**1.01 RELATED DOCUMENTS**

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

**1.02 SUMMARY**

- A. This Section includes factory assembled and tested, closed circuit mechanical induced-draft vertical discharge closed circuit cooler.

**1.03 SUBMITTALS**

- A. Product Data: For each type of product indicated. Include rated capacities, pressure drop, performance curves with selected points indicated, furnished specialties, and accessories.
- B. Shop Drawings: Complete set of manufacturer's prints of equipment assemblies, control panels, sections and elevations, and unit isolation. Include the following:
  - 1. Assembled unit dimensions.
  - 2. Weight and load distribution.
  - 3. Required clearances for maintenance and operation.
  - 4. Sizes and locations of piping and wiring connections.
  - 5. Wiring Diagrams: For power, signal, and control wiring. Differentiate between manufacturer installed and field installed wiring.
- C. Operation and Maintenance Data: Each unit to include operation and maintenance manual.

**1.04 QUALITY ASSURANCE**

- A. Verification of Performance:
  - 1. The thermal performance shall be certified by the Cooling Technology Institute in accordance with CTI Certification Standard STD-201. Lacking such certification, a field acceptance test shall be conducted within the warranty period in accordance with CTI Acceptance Test Code ATC-105, by a Certified CTI Thermal Testing Agency. The Evaporative Heat Rejection Equipment shall comply with the energy efficiency requirements of ASHRAE Standard 90.1.
  - 2. Unit Sound Performance ratings shall be tested according to CTI ATC-128 standard. Sound ratings shall not exceed specified ratings.
- B. Unit shall meet or exceed energy efficiency per ASHRAE 90.1

**1.05 WARRANTY**

- A. Submit a written warranty executed by the manufacturer, agreeing to repair or replace components of the unit that fail in materials and workmanship within the specified warranty period.
  - 1. The Entire Unit shall have a comprehensive five (5) year warranty against defects in materials and workmanship from date of shipment.
  - 2. Fan Motor/Drive System: Warranty Period shall be Five (5) years from date of unit shipment from Factory (fan motor(s), fan(s), bearings, mechanical support, sheaves, bushings and belt(s)).
  - 3. Heat Transfer Coil: Warranty Period shall be One (5) year from date of unit shipment from Factory.

**PART 2 - PRODUCTS**

**2.01 MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide closed circuit coolers manufactured by one of the following:



1. EVAPCO Model ESWA-216-44M-C
  2. Approved Substitute
- B. Product shall be manufactured in the USA.

## **2.02 THERMAL PERFORMANCE**

- A. Each unit shall be capable to cool 1,038.00 GPM of water entering at 100.00° F leaving at 90.00° F at a design wet bulb of 83.00° F with a pressure drop across the coil not to exceed 14.8 ft of water column.

## **2.03 IBC COMPLIANCE**

- A. The unit structure shall be designed, analyzed, and constructed in accordance with the latest edition of International Building Code (IBC) for: IP = 1.0, Sos = 1.6; z/h = 0, P = 119 psf.

## **2.04 COMPONENTS**

- A. Description: Factory assembled and tested, induced draft counter flow closed circuit cooler complete with fan, coil, fill, louvers, accessories and rigging supports
- B. Materials of Construction
1. All cold water basin components including vertical supports, air inlet louver frames and panels up to rigging seam shall be constructed of Type 304 Stainless Steel. All factory cold water basin seams shall be welded for water tight construction.
  2. Casing and fan section, including channels and angle supports, shall be constructed of Type 304 stainless steel. Fan cowl and guard shall be constructed of Type 304 Stainless Steel. "Series 300" stainless steel will not be acceptable as equivalent to Type 304 Stainless Steel.
- C. Fan(s):
1. Fan(s) shall be high efficiency axial propeller type with aluminum wide chord blade construction. Each fan shall be dynamically balanced and installed in a closely fitted cowl with venturi air inlet for maximum fan efficiency.
- D. Drift Eliminators
1. Drift eliminators shall be constructed entirely of Polyvinyl Chloride (PVC) in easily handled sections. Design shall incorporate three changes in air direction and limit the water carryover to a maximum of 0.001% of the recirculating water rate.
- E. Water Distribution System
1. Spray nozzles shall be precision molded ABS, large orifice spray nozzles utilizing fluidic technology for superior water distribution over the fill media. Nozzles shall be designed to minimize water distribution system maintenance. Spray header, branches, and riser shall be Schedule 40 Polyvinyl Chloride (PVC) for corrosion resistance.
- F. Heat Transfer Media
1. Heat transfer coil shall be tightly spaced elliptical tubes of prime surface stainless steel, encased in steel framework with the entire assembly hot-dip galvanized after fabrication. The coil assembly shall be designed with sloping tubes for liquid drainage and air pressure tested to 390 psig. ASME/ANSI B31.5.
- G. Pump
1. Unit shall have EISA close-coupled centrifugal pump with mechanical seal. The pump shall be installed in a vertical position so that water will drain from the pump when the cold water basin is emptied. Pump motor shall be totally enclosed with protective canopy for outdoor operation.
- H. Bleed-off
1. Unit shall have a waste water bleed line with a manual adjustable valve provided.
- I. Air Inlet Louvers

1. The air inlet louver screens shall be constructed from UV inhibited polyvinyl chloride (PVC) and incorporate a framed interlocking design that allows for easy removal of louver screens for access to the entire basin area for maintenance. The louver screens shall have a minimum of two changes in air direction and shall be of a non-planar design to prevent splash-out and block direct sunlight & debris from entering the basin.
- J. Make up Float Valve Assembly
  1. Make up float assembly shall be a mechanical brass valve with an adjustable plastic float.
- K. Pan Strainer
  1. Pan Strainers) shall be all Type 304 Stainless Steel construction with large area removable perforated screens.

## **2.05 MOTORS AND DRIVES**

- A. General requirements for motors are specified in Division 23 Section "Motors"
- B. Fan Motor
  1. Fan motor(s) shall be totally enclosed, ball bearing type electric motor(s) suitable for moist air service. Motor(s) are Premium Efficient, Class F insulated, 1.15 service factor design. Inverter rated per NEMA MG1 Part 31.4.4.2 and suitable for variable torque applications and constant torque speed range with properly sized and adjusted variable frequency drives.
  2. Fan motor(s) shall include strip-type space heaters with separate leads brought to the motor conduit box.
- C. Fan Drive
  1. The fan drive shall be multigroove, solid back V-belt type with QD tapered bushings designed for 150% of the motor nameplate power. The belt material shall be neoprene reinforced with polyester cord and specifically designed for evaporative equipment service. Fan sheave shall be aluminum alloy construction. Belt adjustment shall be accomplished from the exterior of the unit.
- D. Fan Shaft
  1. Fan shaft shall be solid, ground and polished steel. Exposed surface shall be coated with rust preventative.
- E. Fan Shaft Bearings
  1. Fan Shaft Bearings shall be heavy-duty, self-aligning ball type bearings with extended lubrication lines to grease fittings located on access door frame. Bearings shall be designed for a minimum L-10 life of 100,000 hours.
- F. Vibration Switch
  1. Unit shall be provided with a Vibration Cutout Switch, operating on 120 VAC feed, to protect the fan and drive assembly from damage in the event of excess vibration. Vibration switch shall be DPDT.

## **2.06 MAINTENANCE ACCESS**

- A. Fan Section
  1. Access door shall be hinged and located in the fan section for fan drive and water distribution system access.
- B. Basin Section
  1. Framed removable louver panels shall be on all four (4) sides of the unit for pan and sump access.
- C. Internal Working Platform
  1. Internal working platform shall provide easy access to the fans, belts, motors, sheaves, bearings, all mechanical equipment and complete water distribution system. The fill shall be an acceptable means of accessing these components.
- D. External Service Platform with Ladder

1. An external service platform compliant with OSHA shall be provided at the motor access door of the unit extending the full length of the access door. Each platform shall have at least a 36 inch wide walking surface. The platforms shall have galvanized steel grating, supported by galvanized steel framework attached to the unit and surrounded by a handrail, knee rail and toe plate system that is compliant with OSHA. Mounting channels shall be the same material as the casing section (galvanized or stainless steel). A vertical ladder shall be provided from the base of the unit to the platform.
- E. Louver Access Door
  1. Hinged access door in louver shall be provided.

## **2.07 ACCESSORIES**

- A. Basin Heater Package
  1. Cold water basin shall be fitted with copper element, electric immersion heater(s) with a separate thermostat and low water protection device. Heaters shall be selected to maintain
    - a. +40° F pan water at 00 F ambient temperature.
  2. Electric immersion heater package shall include a factory-supplied NEMA 4x enclosure containing a magnetic contactor with 120 VAC control circuit, transformer, and main power disconnect. Control package wired by others.
- B. Sump Sweeper Piping
  1. Cold water basin shall be fitted with schedule 80 PVC sump sweeper piping complete with high-flow eductor nozzles to facilitate basin cleaning. The system shall contain one inlet connection and one outlet connection per basin.

## **2.08 EVAPORATIVE COOLING WATER TREATMENT SYSTEM**

- A. General
  1. DESCRIPTION
    - a. Work Includes:
      - 1) Furnish all labor, materials, tools, equipment and services for condenser water treatment system as indicated, in accordance with provisions of the contract documents.
      - 2) Completely coordinate with work of all other trades.
      - 3) See Division 1 for General Requirements.
      - 4) Manufacturer's representative company will provide automatically controlled water treatment program and equipment as specified herein.
      - 5) Provide monthly service for the condenser water treatment program designed to minimize corrosion, scale formation and biological growth in the following mechanical systems:
        - (a) Condenser Water Piping System
    - b. Description of System:
      - 1) Riser mounted purification chamber with shielded cable by equipment manufacturer.
      - 2) Unit mounted Pulse Panel by equipment manufacturer.
      - 3) Factory mounted (by equipment manufacturer) conductivity controller and bleed valve as specified below. System shall be self-draining to minimize the need for heat trace and insulation.
  2. SUBMITTALS (See Division 1)
    - a. Submit per the requirements Division 1.
    - b. Shop drawings: Show all water treatment equipment, including the following:
      - 1) Conductivity control panel and wiring diagrams (show all field wiring required). Include bill of materials showing model number, manufacturer, physical layout drawings, panel and equipment catalog cuts.

- c. Operation and maintenance manuals: Include testing procedures for each of the treated systems.
  - d. Laboratory analysis of project site make-up water: Submit a copy of a laboratory analysis documenting the quality of the project's make-up water. Make-up water analysis to include the following analytes as a minimum:
    - 1) Calcium Hardness (as ppm CaCO<sub>3</sub>) Total Hardness (as ppm CaCO<sub>3</sub>)
    - 2) Total Alkalinity or m-Alkalinity (as ppm CaCO<sub>3</sub>)
    - 3) pH
    - 4) Silica (as SiO<sub>2</sub>)
    - 5) Specific Conductivity (micro S/cm) Sulfate (as SO<sub>4</sub>)
    - 6) Chloride (as Cl<sup>-</sup>)
    - 7) Phosphate (as PO<sub>4</sub>)
  - 3. QUALITY ASSURANCE
    - a. The water treatment supplier shall:
      - 1) Obtain water samples from the site and furnish a laboratory analysis of the water supply with submittal.
      - 2) Review the make-up water analysis to ensure compatibility with the water treatment program.
      - 3) Propose water treatment methods and appropriate non chemical treatment required to minimize scale, corrosion and biological growth. Submit all of the above with shop drawings and other required submittals.
    - b. Methods selected shall comply with all the requirements of the American Public Health Association (APHA), the Environmental Protection Agency (EPA) and local environmental agencies.
  - 4. PERFORMANCE CRITERIA
    - a. Maintain the conditions listed below in the water system(s):
      - 1) Conductivity range of 300 to 5,000 micro S/cm.
      - 2) pH range of 7.0 to 8.8
      - 3) Local environmental regulations may dictate the highest pH permitted for blowdown. The conductivity setting can be adjusted up or down to change the pH by the balancing of fresh make-up water.
      - 4) Total bacteria count (TBC) of less than 10,000 CFU/ml.
      - 5) Keep condenser water system scale free and corrosion to levels acceptable by AWT guidelines.
- B. PRODUCTS
- 1. WATER TREATMENT SYSTEM
    - a. Acceptable Products:
      - 1) Non-Chemical Water Treatment System
        - (a) Factory mounted purification chamber
        - (b) Factory mounted electrical Pulse Panel
        - (c) Factory mounted conductivity controller, motorized bleed valve and toroidal probe
    - b. Furnish a factory installed non-chemical water treatment system. System shall be selected based on the riser size. System shall be Pulse-Pure® by EVAPCO. System shall have a 12 month money back guarantee if the system fails to perform as outlined below.
    - c. Electrical Requirements:
      - 1) The system shall have a Total Harmonic Distortion (THO) of less than 15%.
      - 2) The system shall meet UL and cUL specifications for electrical components.
      - 3) The system shall have an 8' shielded cable to minimize susceptibility to external electro-magnetic field interference.

- 4) The system shall meet FCC requirements for electromagnetic emissions per Title 47 CFR part 18 for Industrial, Scientific and Medical Equipment.
- 5) The coil assemblies shall be enclosed in a NEMA 4x water resistant shell and be provided with indicator lights that signify the system is on and operational.
- 6) All water sensors for conductivity shall be toroidal type.
- d. Construction Requirements:
  - 1) The system shall have remote start-up and monitoring capabilities via a control relay wired from the pump or through the building management system using a MODBUS protocol.
  - 2) The chamber shall contain two separate coil sections housing a minimum of four low frequency and two high frequency coils per chamber. Chamber shall be factory mounted by the evaporative cooling system manufacturer.
  - 3) The Conductivity controller shall be integral to the chamber control panel to allow for simplified calibration and single source power. This single panel shall be factory mounted and have a local 60 day downloadable USB port for retrieving operational data of:
    - (a) Bleed Valve
    - (b) System Conductivity
    - (c) Output contact
    - (d) Make-up/bleed metering
  - 4) This single control panel per chamber shall have the capability of receiving input from local make-up and bleed water meters and activating a 120 VAC contact.
- e. Testing equipment: Provide water test kits and equipment necessary to control the condenser water systems treatment program. Test kits to include the following as a minimum:
  - 1) Reagents and apparatus for determination of pH, total alkalinity, conductivity, chloride, calcium hardness, and total hardness.
  - 2) Apparatus for determination of microbiological colony population and biocide effectiveness.

## C. EXECUTION

### 1. INSTALLATION AND SERVICES

- a. Installation of water system will include:
  - 1) All components shall be mounted by the evaporative equipment manufacturer during unit construction and prior to shipment from the factory.
  - 2) Supply all components (coils, transformers, conductivity meters, blow down valves etc) necessary for a completely automated stand-alone system. Blow down valves shall be motorized ball valves power open, spring return factory mounted during unit construction.
  - 3) Immediately after hydrostatic testing of piping is completed the mechanical contractor shall drain, flush, clean and passivate all systems. Subsequent to the cleaning process, each system shall be re-filled with clean water prior to the system being placed into operation. Once filled the condenser water pump and cooling tower fans shall be operated until conductivity set point is achieved.
- b. Provide all consulting services, for a period of 1-year from start-up of the cooling system, which will include:
  - 1) Installation and system start-up procedure recommendations.
  - 2) Pre-operation system clean-out procedure supervision.
  - 3) Initial water analysis and recommendations.
  - 4) Training of operating personnel on proper feeding and control techniques.
  - 5) Monthly field service visits during wet operation.
  - 6) Any necessary log sheets and record forms.

- c. All services will be provided by a factory authorized service provider of the evaporative condenser or closed circuit cooler manufacturer.

**END OF SECTION**

**SECTION 260010  
BASIC ELECTRICAL REQUIREMENTS**

**PART 1 GENERAL**

**1.01 DESCRIPTION**

- A. This section is an extension of the General Requirements and certain items of a common or administrative nature that pertain to all electrical work.
- B. The work of this section consists of furnishing materials, equipment, constant competent supervision, special tools, test equipment, technicians, and labor necessary for installation of a complete working electrical system as indicated herein and on the Drawings.
- C. The work shall include but not necessarily be limited to the following:
  - 1. Temporary electrical service for construction.
  - 2. Power System.
  - 3. Mechanical Power Systems
  - 4. Grounding and Bonding system.
  - 5. Conduit and Cable for the HVAC Control System

**1.02 QUALITY ASSURANCE**

- A. The electrical installation shall conform to the requirements of the latest edition of the National Electrical Code (NEC). Notify Architect/Engineer of conflicts before performance.
- B. Electrical material shall be built and tested in accordance with the applicable standards of the (NEMA), (ANSI), (ASTM), and (IEEE).
- C. Electrical materials shall be new and unused and shall be listed and labeled for the service intended by Underwriters' Laboratories, Inc., where such labeling service is available.
- D. Applicable sections of all codes and standards shall also be followed:
  - 1. NFPA – National Fire Protection Association including NFPA-101, Life Safety Code NFPA 70, National Electrical Code
  - 2. OSHA Code of Federal Regulations (for construction practices)
  - 3. International Building Code
  - 4. Applicable state and local codes/ordinances
  - 5. CBM – Certified Ballast Manufacturer
  - 6. IPCEA – Insulated Power Cable Engineers' Association
  - 7. FM – Factory Mutual
  - 8. ETL – Electrical Testing Laboratories
  - 9. IES – Illuminating Engineering Society
  - 10. NFPA – National Fire Protection Association, including NFPA 72

**1.03 REGULATORY REQUIREMENTS**

- A. Permits: Obtain and pay for all necessary permits, inspections, connection charges, fees, insurance, bond, licenses, and comply with all governing laws, ordinances, rules and regulations.

**1.04 COORDINATION**

- A. Contractor shall be responsible for coordination of all work with other disciplines.
- B. Arrange work in a neat, well organized manner with exposed conduit and similar services running parallel with primary lines of the building construction, high as possible with a minimum of 8'-0" overhead clearance or as directed by the Engineer.
- C. Where the method of installation is not certain, ask for details. Lack of details, not requested, will not be an excuse for improper installation, and any such work must be corrected at contractor's cost.

- D. Coordination Drawings: For locations where several elements of electrical or combined mechanical and electrical work must be sequenced and positioned with precision in order to fit into the available space, prepare coordination drawings showing the actual physical dimensions (at accurate scale, minimum 1/4") required for the installation. Prepare and submit coordination drawings prior to purchase-fabrication-installation of any of the elements involved in the coordination.
- E. All Bidders shall be responsible to insure that equipment selected, switchboards, panel boards, etc., fit in spaces selected, along with NEC compliance. If standard equipment does not fit, Contractor shall be required to utilize custom equipment as required.

#### **1.05 DRAWINGS AND SPECIFICATIONS**

- A. Contract Documents (Drawings and Specifications) are intended to convey the scope of work and indicate general arrangements of equipment, fixtures and piping, and approximate sizes and locations of equipment and outlets. Follow these documents in laying out the work, check all Drawings to become familiar with all conditions affecting the work, and verify spaces in which the work will be installed.
- B. The contractor shall fully coordinate installation of electrical system with other disciplines. The Drawings show approximate locations only of selected feeders, branch circuits, outlets, etc., except where specific routing or dimensions are indicated. The Engineer reserves the right to make reasonable changes in locations indicated before roughing-in without additional cost to the Owner.
  - 1. Contractor shall investigate the structural and finish conditions affecting Division 26 work and shall arrange such work accordingly, furnishing fittings, bends, junction boxes, pull boxes, access panels, and accessories required to meet such conditions.
  - 2. These Specifications, together with the accompanying Drawings, contemplate apparatus fully erected, and in satisfactory operating condition with the Contractor furnishing and installing everything that may be necessary to complete the job.
  - 3. Contractor shall install circuits, breakers, equipment, etc. as indicated and label the above as noted. Contractor shall not deviate from equipment/circuit identification unless approved by Owner/Engineer.

#### **1.06 SUBMITTALS**

- A. Shop Drawings:
  - 1. Listed below are shop drawings required for transmittal. Refer to Phasing Plan for scheduling of submittal. No time delays will be allowed for failure to be so informed.
    - a. Raceways and Supports
    - b. Connectors
    - c. Safety Switches
    - d. Fuses
    - e. Circuit Breakers
    - f. Wiring Devices
    - g. Motor Controls
    - h. Panel boards
    - i. Conductors and Termination Hardware
    - j. Grounding products
  - k. Further descriptions or information required with shop drawings shall be included with the description of materials specified herein as follows:
    - 1) Grounding Products: Include a complete grounding system diagram with materials and ground conductor sizes.
    - 2) Miscellaneous Electrical Controls and Control Wiring: Include control wiring diagrams for all miscellaneous electrical controls.
  - l. Firestops: Include all firestop materials for the project, indicating intended use and UL fire rating where applicable.



- 1) Provide "SpecSeal" products or equal. Provide SSB series firestop pillows (or equal) around the cable tray where cable trays make penetration in the walls, etc. Provide "LC150" series sealant (or equal) to seal the penetrations made by conduits.
- m. Contractor prepared, new, detailed, dimensioned shop Drawings for the installation of the work in the electrical equipment rooms areas shall be prepared and submitted for review. In preparing shop Drawings, establish lines and levels for the work specified and check the drawings to avoid interference with structural features and the work of other trades. Immediately call to the attention of the engineer in writing and interferences for clarification.
- n. Corrections or comments made on shop Drawings during the review do not relieve the Contractor from compliance with requirements of the contract documents. Review of shop Drawings shall not permit any deviation from Drawings and Specifications. Shop Drawings must be accompanied by signed statement from contractor, stating that he has reviewed the submittal and checked it for compliance.
- o. Contractor shall provide products as specified if submittals for review of materials are not received within thirty (30) days after award of the Contract.

#### **1.07 PROJECT/SITE CONDITIONS**

- A. Visit the site before bidding to become familiar with conditions under which the work will be performed.
- B. No additional compensation will be allowed for failure to be so informed.

#### **1.08 CUTTING AND PATCHING**

- A. Do all cutting, patching, fitting, and all other work that may be required to make the several parts come together and fit.
- B. Provide, everything required for the work or to conceal any of the work, in any part of the structure.
- C. Fireproofing:
  1. Plastic sleeves/pipe shall not be used within the building when penetrating a fire-resistant-rated wall, ceiling, partition, or floor.

#### **1.09 RECORD DRAWINGS**

- A. Upon completion of the project, provide a complete set of detailed electronic as-built drawings in AutoCAD 2005 format with all information required. Contractor shall also produce (2) sets of as-built drawings with modifications to construction documents in red ink. Contractor shall maintain a current set of as-built drawings on site at all times. As-built drawings shall include, but not be limited to detailed dimensions of all conduits, ductbank, etc. install in slab or below grade.
  1. Equipment Manuals:
    - a. Before the date of substantial completion, Contractor shall furnish to the Architect/Engineer three (3) bound sets of descriptive, dimensional and parts data on all major items of electrical equipment and material including those items listed above under "Shop Drawings".
    - b. This submittal shall be accompanied by final Electrical Inspection Certificate from Ingalls.

#### **1.10 WARRANTY/GUARANTEE**

- A. Except where longer periods of warranty are specified, guarantee all labor and materials for a period of twelve (12) months from the date of substantial completion of the particular phase of the work. Repair all defective materials and work; replace with new materials and/or equipment, any material and/or equipment failing to give satisfactory service.
- B. During the period of guarantee, promptly correct any defects in equipment, materials or workmanship without cost to the Owner.

- C. Guarantee includes equipment capacity and performance ratings specified without excessive noise levels. Any deficiencies in equipment specified shall be promptly corrected.
- D. Contractor's warranty shall include an inspection of the system one (1) week before the end of the one (1) year warranty period. Replace or repair any items found to be defective at this time.

#### **1.11 TESTS AND BALANCING**

- A. At such times as the Engineer directs, conduct operating tests to demonstrate that the electrical systems are installed and will operate properly and in accordance with the requirements of this Specification. Tests shall be performed in the presence of the Engineer's representative. Furnish instruments and personnel required for such tests.
- B. Any work and materials tested and found varying from the requirements of the Drawings and Specifications shall be replaced without additional cost to the Owner.
- C. This section does not relieve the Contractor from testing equipment installed under this Division but not listed in this section. Contractor is required to test all equipment, feeders, etc., installed under this Division.

### **PART 2 PRODUCTS**

#### **2.01 GENERAL**

- A. Refer to DIVISION 1 sections for general requirements on products, materials and equipment. Refer to other DIVISION 26 sections for additional requirements.
- B. Provide products which are compatible with other products of the electrical work, and with other work requiring interface with the electrical work, including electrical connections and control devices. Determine in advance of purchase that equipment and materials proposed for installation will fit into the confines indicated, leaving adequate clearance as required by applicable codes, and for adjustment, repair, or replacement.

#### **2.02 MANUFACTURERS' NAMEPLATES**

- A. Each major component of the equipment shall have the manufacturer's name, address, model number, and rating on a plate securely affixed in a conspicuous place.

### **PART 3 EXECUTION**

#### **3.01 GENERAL**

- A. Visit the building site before bidding to determine existing conditions and assume all responsibility and bear all expenses in allowing for these conditions in the bid.
- B. Obtain all necessary permits, pay all legal fees and charges.
- C. No work shall be concealed until approved by the inspector and all local regulations are adhered to. Provide certificate of completion.
- D. Cooperate with other trades in installing work in order that there will be no conflict of space required by conduit, piping, ducts, outlets, etc.
- E. Verify dimensions with certified shop Drawings of the materials actually approved and purchased.

#### **3.02 TEMPORARY WIRING, LIGHTING AND POWER AT THE SITE**

- A. Furnish and install provisions for temporary electrical service and construction light and power during the construction period.
- B. Furnish, install, and maintain all temporary service equipment as required until permanent service is installed, switch-over temporary systems to the permanent service when latter is ready for same.
- C. Furnish, install, maintain, and switch on and off on all regular work days a complete temporary light system, for the building while under construction.

- D. Provide any and/or all relocations of temporary electric facilities as necessary to avoid the permanent installations of all trades.

### **3.03 WIRING FOR EQUIPMENT BY OTHERS**

- A. Electrical service for all equipment furnished under this Specification and/or indicated on the Drawings shall be roughed-in and connected under this Section.
- B. Electrical work for equipment specified in Division 25 - Mechanical shall be as specified.
- C. Raceways, outlets, backboards, cabinets, grounding connections, handholes, underground distribution system, and other roughing-in indicated shall be provided as work of this division for telephone system, data system, fire alarm system and HVAC Control (Contractor to provide cable as well).

### **3.04 WORKMANSHIP**

- A. Install all materials and electrical components of the work in accordance with instructions of manufacturer following the best modern construction practices and conforming with the Contract Documents. Workmanship shall be first class, in both function and appearance, whether finally concealed or exposed and shall be performed by experienced workmen skilled in the type of work. As practicable, the lines of all components of the system shall be perpendicular or parallel. In general, workmanship shall conform to guidelines set forth in N.E.C.A. manuals.

### **3.05 MOUNTING HEIGHTS**

- A. Upon approval of the Architect/Engineer mounting heights may be adjusted.

**END OF SECTION**

**SECTION 260051  
ELECTRICAL RELATED WORK**

**PART 1 GENERAL**

**1.01 DESCRIPTION**

- A. Extent of electrical related work required by this section is indicated on Drawings and/or specified in other Division 16 sections.

**1.02 PROJECT/SITE CONDITIONS**

- A. Protect property from damage which might result from excavating and backfilling.
- B. Protect persons from injury at excavations by barricades, warnings and illumination.
- C. Coordinate excavations with weather conditions, to minimize possibility of washouts, settlements and other damages and hazards.

**PART 2 PRODUCTS**

**2.01 ACCESS TO ELECTRICAL WORK**

- A. Provide removable access doors of types and sizes needed for access requirements of electrical Equipment.

**PART 3 EXECUTION**

**3.01 EXCAVATION, TRENCHING AND BACKFILLING**

- A. Perform all excavation of every description and of whatever substances encountered to the depths indicated on the Drawings or as otherwise specified or as required based on field condition. All excavated materials not required or not suitable for backfill shall be removed and delivered to Ingalls Resource Recovery.
- B. Sheet piling and shoring shall be done as necessary for the protection of the work and for the safety of personnel.
- C. No excavation or trenches shall be cut near or under footings without first consulting the Engineer.
- D. Provide uniform circumferential support to lower third of each conduit or pipe. Each conduit or pipe shall be laid true to line and grade to prevent sudden offset to flow line. As work progresses, interior of conduit or pipe shall be cleared of dirt and superfluous materials of every description.
- E. Provide proper supporting material as required based on field condition.
  - 1. Trenches for utilities shall be of a depth that will provide the following minimum depth of cover from existing grade or from indicated finish grade, whichever is lower, unless otherwise specifically shown:
    - a. 30-Inch Minimum Cover - Electrical Conduits/Cables over 600 volts
    - b. 24-inch Minimum (See NEC 300-5) - Electrical Cables/Conduits under 600 volts.
  - 2. Backfill shall be installed in layers 6" deep, adequately wetted and tamped using materials as noted above. Refer to Division 2 for compaction densities.
  - 3. Restore all hard finished surfaces such as roadways, sidewalks, grass, shrubbery, etc., removed for installation of utilities (and not shown on Drawings or specified to be reworked under other sections of the work) to their original condition. Restore to near original condition acceptable to Architect/Engineer.
  - 4. Carefully plan all work to avoid existing utilities and other interferences. The Drawings do not indicate all existing underground utilities. Existing utility lines to be retained that are shown on the Drawings or the locations of which are made known to the Contractor prior to excavation, as well as all utility lines uncovered during excavation operations, shall be protected from damage during excavation and backfilling and, if damaged, shall be repaired by Contractor at his expense. Prior to doing any excavation with power tools,

carefully investigate and locate any exiting conduit, pipes, and other lines.

### **3.02 FOUNDATIONS AND SUPPORTS**

- A. Provide concrete pedestals, bases, pads, curbs, anchor blocks, anchor bolts, slab inserts, hangers channels, cradles, saddles, etc. for installation of floor mounted equipment.
- B. Concrete pads for floor mounted electrical equipment shall be 3.5 inches high, unless otherwise indicated, poured integral with the floor slab wherever practical. Wherever integral slab poured pads are not practicable, construct 3.5 inch high housekeeping pads, reinforced with No. 3 steel wire mesh 6 X 6 inches, fastened to structural slabs with 1/2 inch diameter bolts embedded in structural slabs with expansion bolts at all corners (inset 3 inches) and no further apart than 18 inches. Score structural slab thoroughly to assure concrete bonding between structural slab and housekeeping pad. Construct in full accordance with "concrete" specifications for 2500 psi minimum compressive strength. Finish tops of housekeeping pads smooth and level within 1 percent of span. Pads shall be extended at least 4" (10 cm) beyond the equipment outline on all four sides with chamfered edges.

### **3.03 PAINTING**

- A. Factory painted equipment shall have finish restored to Manufacturer's finish if scratched or damaged before acceptance or use by Owner.

**END OF SECTION**

**SECTION 260170  
CIRCUIT AND MOTOR DISCONNECTS**

**PART 1 GENERAL**

**1.01 DESCRIPTION OF WORK**

- A. The work of this section consists of providing labor, materials, tools, appliances and miscellaneous accessories associated with the circuit and motor disconnect switch work indicated herein and on Drawings and schedules.
- B. Types of circuit and motor disconnect switches in this section include the following:
  - 1. Equipment disconnects.
  - 2. Appliance disconnects.
  - 3. Motor circuit disconnects.

**PART 2 PRODUCTS**

**2.01 ACCEPTABLE MANUFACTURER**

- A. Square D or approved equal

**2.02 FABRICATED SWITCHES**

- A. Provide Heavy Duty safety switches and the best possible quality which yields the most protection for equipment and personnel for the intended use.
  - 1. Fused switches shall include the following:
    - a. All fusible switches shall accept Class R fuses and have provision for field installation of U.L. listed rejection feature.
    - b. The U.L. listed short circuit rating shall be 100,000 symmetrical amperes when Class R fuses and fuse kits are installed.
- B. Type of Enclosure for the Different Locations:
  - 1. Recess panel board.
    - a. NEMA Type 12/3R: Indoor and Outdoor use.
- C. All switches shall be listed per U.L. Standard 98; comply with Federal Specifications W-S-865; comply with NEMA KS-1.

**PART 3 EXECUTION**

**3.01 INSTALLATION OF CIRCUIT DISCONNECT SWITCHES**

- A. Install 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. Provide and install fuses where applicable and/or shown on the Drawings.
- C. Install label nameplate as required.

**END OF SECTION**

**SECTION 260505  
SELECTIVE DEMOLITION FOR ELECTRICAL**

**PART 3 EXECUTION**

**1.01 EXAMINATION**

- A. Verify field measurements and circuiting arrangements are as indicated.
- B. Verify that abandoned wiring and equipment serve only abandoned facilities.
- C. Demolition drawings are based on casual field observation and existing record documents. All items may not be shown on the drawings. Contractor shall field verify and coordinate with Architectural Scope of work.
- D. Report discrepancies to Engineer/Architect before disturbing existing installation.
- E. Beginning of demolition means installer accepts existing conditions.

**1.02 PREPARATION**

- A. Disconnect electrical systems in walls, floors, and ceilings to be removed.
- B. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.

**1.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK**

- A. Remove, relocate, and extend existing installations to accommodate new construction.
- B. Remove abandoned wiring to source of supply.
- C. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.
- D. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets that are not removed.
- E. Repair adjacent construction and finishes damaged during demolition and extension work.
- F. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.

**1.04 CLEANING AND REPAIR**

- A. Clean and repair existing materials and equipment that remain or that are to be reused.

**END OF SECTION**

**SECTION 260519**  
**LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Single conductor building wire.
- B. Wiring connectors.
- C. Electrical tape.
- D. Heat shrink tubing.
- E. Oxide inhibiting compound.
- F. Wire pulling lubricant.
- G. Cable ties.

**1.02 RELATED REQUIREMENTS**

- A. Section 078400 - Firestopping.
- B. Section 260526 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.
- C. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- D. Section 262100 - Low-Voltage Electrical Service Entrance: Additional requirements for electrical service conductors.

**1.03 REFERENCE STANDARDS**

- A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire 2013 (Reapproved 2018).
- B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft 2011 (Reapproved 2017).
- C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes 2010, with Editorial Revision (2020).
- D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation 2004 (Reapproved 2020).
- E. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape 2017.
- F. ASTM D4388 - Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes 2013.
- G. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- H. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy 2009.
- I. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems 2017.
- J. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- K. UL 44 - Thermoset-Insulated Wires and Cables Current Edition, Including All Revisions.
- L. UL 83 - Thermoplastic-Insulated Wires and Cables Current Edition, Including All Revisions.
- M. UL 486A-486B - Wire Connectors Current Edition, Including All Revisions.
- N. UL 486C - Splicing Wire Connectors Current Edition, Including All Revisions.
- O. UL 486D - Sealed Wire Connector Systems Current Edition, Including All Revisions.



- P. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape Current Edition, Including All Revisions.
- Q. UL 854 - Service-Entrance Cables Current Edition, Including All Revisions.

#### **1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
  - 2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
  - 3. Notify Engineer/Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

#### **1.05 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.
- C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- D. Project Record Documents: Record actual installed circuiting arrangements. Record actual routing for underground circuits.

#### **1.06 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

#### **1.08 FIELD CONDITIONS**

- A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F (-10 degrees C), unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Engineer/Architect and obtain direction before proceeding with work.

### **PART 2 PRODUCTS**

#### **2.01 CONDUCTOR AND CABLE APPLICATIONS**

- A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.
- B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.

## **2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS**

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.
- D. Comply with NEMA WC 70.
- E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.
- F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.
- G. Conductors for Grounding and Bonding: Also comply with Section 260526.
- H. Conductor Material:
  - 1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
  - 2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
- I. Minimum Conductor Size:
  - 1. Branch Circuits: 12 AWG.
    - a. Exceptions:
      - 1) 20 A, 120 V circuits longer than 75 feet (23 m): 10 AWG, for voltage drop.
      - 2) 20 A, 120 V circuits longer than 150 feet (46 m): 8 AWG, for voltage drop.
      - 3) 20 A, 277 V circuits longer than 150 feet (46 m): 10 AWG, for voltage drop.
- J. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- K. Conductor Color Coding:
  - 1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
  - 2. Color Coding Method: Integrally colored insulation.
    - a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.
  - 3. Color Code:
    - a. 480Y/277 V, 3 Phase, 4 Wire System:
      - 1) Phase A: Brown.
      - 2) Phase B: Orange.
      - 3) Phase C: Yellow.
      - 4) Neutral/Grounded: Gray.
    - b. 208Y/120 V, 3 Phase, 4 Wire System:
      - 1) Phase A: Black.
      - 2) Phase B: Red.
      - 3) Phase C: Blue.
      - 4) Neutral/Grounded: White.
    - c. 240/120 V, 3 Phase, 4 Wire System:
      - 1) Phase A: Black.
      - 2) Phase B: Red.
      - 3) Neutral/Grounded: White.
    - d. Equipment Ground, All Systems: Green.

## **2.03 SINGLE CONDUCTOR BUILDING WIRE**

- A. Manufacturers:
  - 1. Copper Building Wire:

- a. Cerro Wire LLC: [www.cerrowire.com/#sle](http://www.cerrowire.com/#sle).
  - b. Encore Wire Corporation: [www.encorewire.com/#sle](http://www.encorewire.com/#sle).
  - c. General Cable Technologies Corporation: [www.generalcable.com/#sle](http://www.generalcable.com/#sle).
  - d. Southwire Company: [www.southwire.com/#sle](http://www.southwire.com/#sle).
  - e. Or Approve Equal.
- B. Description: Single conductor insulated wire.
- C. Conductor Stranding:
1. Feeders and Branch Circuits:
    - a. Size 10 AWG and Smaller: Stranded.
    - b. Size 8 AWG and Larger: Stranded.
- D. Insulation Voltage Rating: 600 V.
- E. Insulation:
1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.
    - a. Size 4 AWG and Larger: Type XHHW-2.
    - b. Installed Underground: Type XHHW-2.
- F. Manufacturers:
1. AFC Cable Systems Inc: [www.afcweb.com/#sle](http://www.afcweb.com/#sle).
  2. Encore Wire Corporation: [www.encorewire.com/#sle](http://www.encorewire.com/#sle).
  3. Southwire Company: [www.southwire.com/#sle](http://www.southwire.com/#sle).

## **2.04 WIRING CONNECTORS**

- A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.
- B. Connectors for Grounding and Bonding: Comply with Section 260526.
- C. Wiring Connectors for Splices and Taps:
1. Copper Conductors Size 8 AWG and Smaller: Use Barrel Crimp Sleeves.
  2. Copper Conductors Size 6 AWG and Larger: Use Barrel Crimp Sleeves.
- D. Wiring Connectors for Terminations:
1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
  2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.
  3. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.
  4. Provide motor pigtail connectors for connecting motor leads in order to facilitate disconnection.
  5. Copper Conductors Size 8 AWG and Larger: Use compression connectors where connectors are required.
- E. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.
- F. Do not use push-in wire connectors as a substitute for Barrel Crimp connectors.
- G. Mechanical or twist on Connectors: Provide bolted type or set-screw type.
1. Manufacturers:
    - a. IlSCO: [www.ilsco.com/#sle](http://www.ilsco.com/#sle).
    - b. Thomas & Betts Corporation: [www.tnb.com/#sle](http://www.tnb.com/#sle).
- H. Compression Connectors: Provide circumferential type or hex type crimp configuration.
1. Manufacturers:

- a. Thomas & Betts Corporation: [www.tnb.com/#sle](http://www.tnb.com/#sle).
- b. Or Approved Equal.

## **2.05 ACCESSORIES**

- A. Electrical Tape:
  - 1. Manufacturers:
    - a. 3M: [www.3m.com/#sle](http://www.3m.com/#sle).
  - 2. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
  - 3. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F (-18 degrees C) and suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
  - 4. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil (0.76 mm); suitable for continuous temperature environment up to 194 degrees F (90 degrees C) and short-term 266 degrees F (130 degrees C) overload service.
  - 5. Electrical Filler Tape: Rubber-based insulating moldable putty, minimum thickness of 125 mil (3.2 mm); suitable for continuous temperature environment up to 176 degrees F (80 degrees C).
  - 6. Varnished Cambric Electrical Tape: Cotton cambric fabric tape, with or without adhesive, oil-primed and coated with high-grade insulating varnish; minimum thickness of 7 mil (0.18 mm); suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
  - 7. Moisture Sealing Electrical Tape: Insulating mastic compound laminated to flexible, all-weather vinyl backing; minimum thickness of 90 mil (2.3 mm).
- B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.
- C. Oxide Inhibiting Compound: Listed; suitable for use with the conductors or cables to be installed.
- D. Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.
- E. Cable Ties: Material and tensile strength rating suitable for application.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that interior of building has been protected from weather.
- B. Verify that work likely to damage wire and cable has been completed.
- C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70 and these specifications.
- D. Verify that field measurements are as indicated.
- E. Verify that conditions are satisfactory for installation prior to starting work.

### **3.02 PREPARATION**

- A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

### **3.03 INSTALLATION**

- A. Circuiting Requirements:

1. Unless dimensioned, circuit routing indicated is diagrammatic.
  2. When circuit destination is indicated without specific routing, determine exact routing required.
  3. Arrange circuiting to minimize splices.
  4. Include circuit lengths required to install connected devices within 10 ft (3.0 m) of location indicated.
  5. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
  6. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
  7. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are indicated as separate, combining them together in a single raceway is not permitted.
    - a. Provide no more than six current-carrying conductors in a single raceway. Dedicated neutral conductors are considered current-carrying conductors.
    - b. Increase size of conductors as required to account for ampacity derating.
    - c. Size raceways, boxes, etc. to accommodate conductors.
  8. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.
- B. Install products in accordance with manufacturer's instructions.
- C. No conductor shall bear more than eight percent (80%) of its rated ampacity.
- D. The system shall be properly grounded and continuously polarized throughout following the color coding specified.
- E. Do not use mechanical means to pull wire No. 8 AWG. or smaller.
- F. Perform work in accordance with NECA 1 (general workmanship).
- G. Installation in Raceway:
1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
  2. Pull all conductors and cables together into raceway at same time.
  3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
  4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.
- H. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.
- I. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
- J. Terminate cables using suitable fittings.
- K. Install conductors with a minimum of 12 inches (300 mm) of slack at each outlet.
- L. Where conductors are installed in enclosures for future termination by others, provide a minimum of 5 feet (1.5 m) of slack.
- M. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.
- N. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.
- O. Make wiring connections using specified wiring connectors.

1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
  2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
  3. Do not remove conductor strands to facilitate insertion into connector.
  4. Clean contact surfaces on conductors and connectors to suitably remove corrosion, oxides, and other contaminants. Do not use wire brush on plated connector surfaces.
  5. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
  6. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- P. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.
1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
    - a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of vinyl insulating electrical tape.
    - b. For taped connections likely to require re-entering, including motor leads, first apply varnished cambric electrical tape, followed by adequate amount of rubber splicing electrical tape, followed by outer covering of vinyl insulating electrical tape.
  2. Damp Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
    - a. For connections with insulating covers, apply outer covering of moisture sealing electrical tape.
    - b. For taped connections, follow same procedure as for dry locations but apply outer covering of moisture sealing electrical tape.
  3. Wet Locations: Use heat shrink tubing.
- Q. Insulate ends of spare conductors using vinyl insulating electrical tape.
- R. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.
- S. Identify conductors and cables in accordance with Section 260553.
- T. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.
- U. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

### **3.04 FIELD QUALITY CONTROL**

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. prior to energization, test cable and wire for continuity of circuitry, and also for short circuits.
- C. Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.
  1. Disconnect surge protective devices (SPDs) prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPDs connected.
- D. Correct deficiencies and replace damaged or defective conductors and cables.

### **END OF SECTION**

**SECTION 260526**  
**GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Grounding and bonding requirements.
- B. Conductors for grounding and bonding.

**1.02 RELATED REQUIREMENTS**

- A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.
  - 1. Includes oxide inhibiting compound.
- B. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

**1.03 REFERENCE STANDARDS**

- A. IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System 2012.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- C. NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings 2017.
- D. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems 2017.
- E. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. UL 467 - Grounding and Bonding Equipment Current Edition, Including All Revisions.

**1.04 SUBMITTALS**

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.
- B. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- C. Field quality control test reports.
- D. Project Record Documents: Record actual locations of grounding electrode system components and connections.

**1.05 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

## **1.07 DESCRIPTION OF WORK**

- A. The work of this section consist of providing labor, materials, tools, appliances and miscellaneous accessories associated with grounding of the electrical system as required by and as indicated herein and/or on the drawings.
- B. Raceways, motors, panelboards and other electrical equipment shall be effectively and permanently grounded to the grounding electrode system. This electrode shall be the nearest available effectively grounded structural metal member of the structure. Grounding connections and conductor sizes shall be in accordance with the requirements of the National Electrical Code, Article 250, local ordinances, and as described herein.
- C. A separate grounding conductor, sized in accordance with NEC Table 250-122 shall be provided in the conduit with the circuit conductors for all feeder and branch circuits. The grounding conductor may be bare or insulated copper; however, if this conductor is insulated, the insulating covering shall be green in color. Where bare copper grounding conductors are used, mark the conductor ends with green tape. Conduit runs shall be increased in size where necessary to accommodate the grounding conductor in addition to circuit conductors. The electrical continuity of all conduit runs shall be verified and corrected where necessary.
- D. All electrical equipment enclosures and conductor enclosures shall be grounded. This includes but is not limited to metal raceways, outlet boxes, cabinets, switch boxes, work stations, motor frames, transformer cases and metallic enclosure for all electrical equipment.
- E. Under no circumstances shall neutral conductors again be grounded after they have been grounded once at the transformer secondary.
- F. Panelboards shall be equipped with a neutral bar which is insulated from the enclosure, and a grounding bar which is bonded to the enclosure. The grounding bar shall provide for terminating the green equipment grounding conductors in the panelboard or motor control center cabinets. Neutral busses shall be isolated from ground except at the transformer ground connection.
- G. Requirements of this section apply to electrical grounding work specified elsewhere in these specifications.

## **PART 2 PRODUCTS**

### **2.01 GROUNDING AND BONDING REQUIREMENTS**

- A. Do not use products for applications other than as permitted by NFPA 70 and product listing.
- B. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.
- C. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- D. Grounding Electrode System:
  - 1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
    - a. Provide continuous grounding electrode conductors without splice or joint.
    - b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.
- E. Bonding and Equipment Grounding:
  - 1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.



2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.

## **2.02 GROUNDING AND BONDING COMPONENTS**

- A. General Requirements:
  1. Provide products listed, classified, and labeled as suitable for the purpose intended.
  2. Provide products listed and labeled as complying with UL 467 where applicable.
- B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 260526:
  1. Use insulated copper conductors unless otherwise indicated.
    - a. Exceptions:
      - 1) Use bare copper conductors where installed underground in direct contact with earth.
- C. Connectors for Grounding and Bonding:
  1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
  2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
  3. Unless otherwise indicated, use exothermic welded connections for accessible connections.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that work likely to damage grounding and bonding system components has been completed.
- B. Verify that field measurements are as indicated.
- C. Verify that conditions are satisfactory for installation prior to starting work.

### **3.02 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. The neutral shall be grounded to the grounding electrode system at the service entrance only, and shall be kept isolated from the building grounding system throughout the building. The neutral of separately derived systems shall be grounded at one point as specified herein below.
- D. Continuity of the building equipment grounding system shall be maintained throughout the project. Grounding jumpers shall be installed across conduit expansion fittings, all liquid-tight flexible metal and flexible metal conduit, light fixture pigtails in excess of 6' and all other non-electrically continuous raceway fittings.
- E. All main grounding conductors shall be stranded copper conductors, sized as shown and/or required, and run in a suitable raceway. All main grounding conductors shall be continuous without joints or splices over their entire length.
- F. Flexible conduit longer than 6' shall not be considered a ground path.
- G. Grounding of all motors or equipment connected to terminal box with flexible conduit shall be made with a separate grounding conductor between motor frame or equipment cabinet and rigid conduit system. Grounding conductor shall be sized in accordance with table 250-122 of

the NEC.

- H. All grounding conductors shall be amply protected from mechanical injury and shall be supported in an approved manner. Where conductors are located in concrete, they shall be installed in conduit. Where ground conductors enter or emerge from slabs bearing directly on fill or soil, the voids between the conductor and the surrounding conduit shall be filled with compound to provide an effective water seal.
- I. Grounding conductors shall be not smaller than #12 AWG. Conductors shall be high conductivity copper, and sizes larger than #12 shall be stranded.
- J. Install clamp-on connectors only on thoroughly cleaned metal contact surfaces, to ensure electrical conductivity and circuit integrity.
- K. Make grounding and bonding connections using specified connectors.
  - 1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
  - 2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
  - 3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
  - 4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
  - 5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- L. Identify grounding and bonding system components in accordance with Section 260553.

### **3.03 FIELD QUALITY CONTROL**

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.13.
- D. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.
- E. Submit detailed reports indicating inspection and testing results and corrective actions taken.

**END OF SECTION**

**SECTION 260529  
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

**1.02 RELATED REQUIREMENTS**

- A. Section 260533.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.
- B. Section 260533.16 - Boxes for Electrical Systems: Additional support and attachment requirements for boxes.

**1.03 REFERENCE STANDARDS**

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.
- C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel 2019.
- D. MFMA-4 - Metal Framing Standards Publication 2004.
- E. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- F. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. UL 5B - Strut-Type Channel Raceways and Fittings Current Edition, Including All Revisions.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
  - 2. Coordinate the work with other trades to provide additional framing and materials required for installation.
  - 3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
  - 4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
  - 5. Notify Engineer/Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
  - 1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 033000.

**1.05 SUBMITTALS**

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel (strut) framing systems, non-penetrating rooftop supports, and post-installed concrete and masonry anchors.
- B. Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.
- C. Evaluation Reports: For products specified as requiring evaluation and recognition by ICC Evaluation Service, LLC (ICC-ES), provide current ICC-ES evaluation reports upon request.

- D. Installer's Qualification Statement: Include evidence of compliance with specified requirements.
- E. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

#### **1.06 QUALITY ASSURANCE**

- A. Comply with NFPA 70.
- B. Comply with applicable building code.
- C. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- D. Installer Qualifications for Powder-Actuated Fasteners (when specified): Certified by fastener system manufacturer with current operator's license.
- E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURED SUPPORTING DEVICES**

- A. General: Provide supporting devices complying with manufacturer's standard materials, design and construction in accordance with published product information, and as required for a complete installation and as herein specified. Where more than one type of device meets indicated requirements, selection is Installer's option.
- B. Support: Provide supporting devices of types, sizes and materials as required and having the following construction features:
  - 1. Clevis Hangers: For supporting 2" rigid metal conduit, galvanized steel with 1/2" diameter hole for round galvanized or stainless steel rod, approximately 54 pounds per 100 units.
  - 2. Riser Clamps: For supporting 5" rigid metal conduit, galvanized steel with 2 bolts and nuts and 4" ears, approximately 510 pounds per 100 units.
  - 3. Reducing Couplings: Steel rod reducing coupling, 1/2" x 5/8" galvanized or stainless steel approximately 16 pounds per 100.
  - 4. C-Clamps: Malleable iron, 1/2" rod size, approximately 70 pounds per 100 units.
  - 5. I-Beam Clamps: Steel, 1-1/4" x 3/16" stock, 3/8" cross bolt, flange width 2", approximately 52 pounds per 100 units.
  - 6. One-Hole Conduit Straps: For supporting 3/4" rigid metal conduit, galvanized steel, approximately 7 pounds per 100 units. Include with backing plates.
  - 7. Two-Hole Conduit Straps: For supporting 3/4" rigid metal conduit, galvanized steel, 3/4" strap width, and 2-1/8" between center of screw holes.
  - 8. Round Steel Rod: Hot dipped galvanized or Stainless Steel, 1/2" diameter, approximately 67 pounds per 100 feet.
  - 9. Hexagon Nuts: For 1/2" rod size, galvanized steel, approximately 4 pounds per 100 units.
  - 10. Offset Conduit Clamps: For supporting 2" rigid metal conduit, steel approximately 200 pounds per 100 units.
- C. Anchors: Provide anchors of types, sizes and materials as required and having the following construction features:
  - 1. Lead Expansion Anchors: 1/2", approximately 38 pounds over 100 units.
  - 2. Toggle Bolts: Springhead, 3/16" x 4", approximately 5 pounds per 100 units.
  - 3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering anchors which may be incorporated into the work include, but are not limited to

the following:

- a. Abbeon Cal Inc.
- b. Ackerman Johnson Fastening System Inc.
- c. Elcen Metal Products Co.
- d. Ideal Industries, Inc.
- e. Joslyn Mfg. and Supply Co.
- f. McGraw Edison Co.
- g. Rawplug Co. Inc.
- h. Star Expansion Bolt Co.

D. U-Channel Strut System:

1. Provide U-Channel strut system for supporting electrical equipment, 16-gage hot dip galvanized steel or stainless steel, of types and sizes required: construct with 9/16" diameter holes, 8" on center on top surface, and with the following fittings which mate and match with U-channel:
  - a. Fixture Hangers
  - b. Channel Hangers
  - c. End caps
  - d. Beam clamps
  - e. Wiring stud
  - f. Thinwall conduit clamps
  - g. Rigid conduit clamps
  - h. Conduit hangers
  - i. U-bolts
2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering channel system which may be incorporated in the work include, but are not limited to, the following:
  - a. B-Line System, Inc.
  - b. Elcen metal Products Co.
  - c. Greenfield Mfg Co., Inc.
  - d. Midland-Ross Corp.
  - e. Power-Strut Div., Van Huffer Tube Corp.
  - f. Unistrut Div, GTE Products Corp.

E. General Requirements:

1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.
2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
3. Do not use products for applications other than as permitted by NFPA 70 and product listing.
4. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
5. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
  - a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
  - b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.
  - c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
  - d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

F. Outlet Box Supports: Hangers, brackets, etc. suitable for the boxes to be supported.

## **2.02 FABRICATED SUPPORTING DEVICES**

- A. Pipe Sleeves: Provide pipe sleeves of one of the following:
  - 1. Sheet-Metal: Fabricate from galvanized sheet metal round tube closed with snaplock joint, welded spiral seams, or welded longitudinal joint. Fabricate from the following gages: 3" and smaller, 20 gage,; 4" or 6", 16 gage; over 6", 14 gage.
  - 2. Steel-Pipe: Fabricate from Schedule 40 galvanized steel pipe; remove burrs.
  - 3. Iron-Pipe: Fabricate from cast-iron or ductile-iron pipe; remove burrs.
  - 4. Plastic-Pipe: Fabricate from Schedule 80 PVC plastic pipe; remove burrs.
- B. Sleeve Seals: Provide Lead and Oakum sleeve seals, caulked between sleeve and pipe for sleeves located in foundation walls below grade or in exterior walls.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive support and attachment components.
- C. Verify that conditions are satisfactory for installation prior to starting work.

### **3.02 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.
- D. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- E. Unless specifically indicated or approved by Engineer/Architect, do not provide support from suspended ceiling support system or ceiling grid.
- F. Unless specifically indicated or approved by Engineer/Architect, do not provide support from roof deck.
- G. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- H. Equipment Support and Attachment:
  - 1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
  - 2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
  - 3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
  - 4. Unless otherwise indicated, mount floor-mounted equipment on properly sized 3 inch (80 mm) high concrete pad constructed in accordance with Section 033000.
  - 5. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- I. Secure fasteners according to manufacturer's recommended torque settings.
- J. Remove temporary supports.
- K. Tighten sleeve seal nuts until sealing grommets have expanded to form a watertight seal.
- L. Coordinate all conduit penetrations into the building from the exterior with Division 1.

### **3.03 FIELD QUALITY CONTROL**

- A. Inspect support and attachment components for damage and defects.

- B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- C. Correct deficiencies and replace damaged or defective support and attachment components.

**END OF SECTION**

**SECTION 260533.13**  
**CONDUIT FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Galvanized steel rigid metal conduit (RMC).
- B. PVC-coated galvanized steel rigid metal conduit (RMC).
- C. Liquidtight flexible metal conduit (LFMC).
- D. Electrical metallic tubing (EMT).
- E. Rigid nonmetallic conduit
- F. Conduit fittings.
- G. Accessories.

**1.02 RELATED REQUIREMENTS**

- A. Section 078400 - Firestopping.
- B. Section 260526 - Grounding and Bonding for Electrical Systems.
  - 1. Includes additional requirements for fittings for grounding and bonding.
- C. Section 260529 - Hangers and Supports for Electrical Systems.
- D. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

**1.03 REFERENCE STANDARDS**

- A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC) 2015.
- B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S) 2015.
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- D. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT) 2013.
- E. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC) 2017.
- F. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable 2014.
- G. NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit 2018.
- H. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit 2020.
- I. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing 2016.
- J. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- K. UL 1 - Flexible Metal Conduit Current Edition, Including All Revisions.
- L. UL 6 - Electrical Rigid Metal Conduit-Steel Current Edition, Including All Revisions.
- M. UL 360 - Liquid-Tight Flexible Steel Conduit Current Edition, Including All Revisions.
- N. UL 514B - Conduit, Tubing, and Cable Fittings Current Edition, Including All Revisions.
- O. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings Current Edition, Including All Revisions.
- P. UL 797 - Electrical Metallic Tubing-Steel Current Edition, Including All Revisions.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:



1. Coordinate minimum sizes of conduits with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
  2. Coordinate the arrangement of conduits with structural members, ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
  3. Verify exact conduit termination locations required for boxes, enclosures, and equipment installed under other sections or by others.
  4. Coordinate the work with other trades to provide roof penetrations that preserve the integrity of the roofing system and do not void the roof warranty.
  5. Notify Engineer/Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
1. Do not begin installation of conductors and cables until installation of conduit is complete between outlet, junction and splicing points.

#### **1.05 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittals procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.
- C. Shop Drawings:
1. Indicate proposed arrangement for conduits to be installed within structural concrete slabs, where permitted.
  2. Include proposed locations of roof penetrations and proposed methods for sealing.
- D. Project Record Documents: Record actual routing for conduits 2 inch (53 mm) trade size and larger.

#### **1.06 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

### **PART 2 PRODUCTS**

#### **2.01 CONDUIT APPLICATIONS**

- A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70 and product listing.
- B. Unless otherwise indicated and where not otherwise restricted, use the conduit types indicated for the specified applications. Where more than one listed application applies, comply with the most restrictive requirements. Where conduit type for a particular application is not specified, use galvanized steel rigid metal conduit.
- C. Underground:
1. Exterior, Direct-Buried: Use rigid PVC conduit
  2. Exterior, Embedded Within Concrete: Use rigid PVC conduit.
  3. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit or PVC-coated galvanized steel rigid metal conduit prior to emerging from underground. Rigid conduit shall be protected from soil.

4. Where steel conduit is installed in direct contact with earth, use corrosion protection tape to provide supplementary corrosion protection or use PVC-coated galvanized steel rigid metal conduit.
5. Where steel conduit emerges from concrete into soil, use corrosion protection tape to provide supplementary corrosion protection for a minimum of 4 inches (100 mm) on either side of where conduit emerges or use PVC-coated galvanized steel rigid metal conduit.
- D. Concealed Within Masonry Walls: Use electrical metallic tubing (EMT).
- E. Concealed Within Hollow Stud Walls: Use electrical metallic tubing (EMT).
- F. Concealed Above Accessible Ceilings: Use electrical metallic tubing (EMT).
- G. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit.
- H. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit.
- I. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit.
- J. Exposed, Exterior: Use galvanized steel rigid metal conduit.
- K. Connections to Vibrating Equipment:
  1. Dry Locations: Use flexible metal conduit.
  2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit.
  3. Maximum Length: 6 feet (1.8 m) unless otherwise indicated.
  4. Vibrating equipment includes, but is not limited to:
    - a. Motors.

## **2.02 CONDUIT REQUIREMENTS**

- A. Fittings for Grounding and Bonding: Also comply with Section 260526.
- B. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.
- C. Provide products listed, classified, and labeled as suitable for the purpose intended.
- D. Minimum Conduit Size, Unless Otherwise Indicated:
  1. Branch Circuits: 3/4 inch (21 mm) trade size.
  2. Branch Circuit Homeruns: 3/4 inch (21 mm) trade size.
  3. Control Circuits: 3/4 inch (21 mm) trade size.
  4. Flexible Connections to Luminaires: 3/4 inch (21 mm) trade size.
  5. Underground, Exterior: 1 inch (27 mm) trade size.
- E. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- F. Provide pull strings in all empty conduits.

## **2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)**

- A. Manufacturers:
  1. Allied Tube & Conduit: [www.alliedeg.com/#sle](http://www.alliedeg.com/#sle).
  2. Republic Conduit: [www.republic-conduit.com/#sle](http://www.republic-conduit.com/#sle).
  3. Wheatland Tube, a Division of Zekelman Industries: [www.wheatland.com/#sle](http://www.wheatland.com/#sle).
  4. Or Approved Equal.
- B. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.
- C. Fittings:
  1. Manufacturers:
    - a. Bridgeport Fittings Inc: [www.bptfittings.com/#sle](http://www.bptfittings.com/#sle).
    - b. O-Z/Gedney, a brand of Emerson Electric Co: [www.emerson.com/#sle](http://www.emerson.com/#sle).
    - c. Thomas & Betts Corporation: [www.tnb.com/#sle](http://www.tnb.com/#sle).
    - d. Or Approved Equal.

2. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
3. Material: Use steel or malleable iron.
4. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted. Myers hubs required.

#### **2.04 PVC-COATED GALVANIZED STEEL RIGID METAL CONDUIT (RMC)**

- A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit with external polyvinyl chloride (PVC) coating complying with NEMA RN 1 and listed and labeled as complying with UL 6.
- B. Exterior Coating: Polyvinyl chloride (PVC), nominal thickness of 40 mil (1.02 mm).
- C. PVC-Coated Fittings:
  1. Manufacturer: Same as manufacturer of PVC-coated conduit to be installed.
  2. Non-Hazardous Locations: Use fittings listed and labeled as complying with UL 514B.
  3. Material: Use steel or malleable iron.
  4. Exterior Coating: Polyvinyl chloride (PVC), minimum thickness of 40 mil (1.02 mm).
- D. PVC-Coated Supports: Furnish with exterior coating of polyvinyl chloride (PVC), minimum thickness of 15 mil (0.38 mm).

#### **2.05 FLEXIBLE METAL CONDUIT (FMC)**

- A. Description: NFPA 70, Type FMC standard wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems to be used.
- B. Fittings:
  1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  2. Material: Use steel or malleable iron.

#### **2.06 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)**

- A. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.
- B. Fittings:
  1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  2. Material: Use steel or malleable iron.

#### **2.07 ELECTRICAL METALLIC TUBING (EMT)**

- A. Manufacturers:
  1. Allied Tube & Conduit; [\_\_\_\_]: [www.alliedeg.com/#sle](http://www.alliedeg.com/#sle).
  2. Republic Conduit: [www.republic-conduit.com/#sle](http://www.republic-conduit.com/#sle).
  3. Wheatland Tube, a Division of Zekelman Industries; [\_\_\_\_]: [www.wheatland.com/#sle](http://www.wheatland.com/#sle).
- B. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.
- C. Fittings:
  1. Manufacturers:
    - a. Bridgeport Fittings Inc: [www.bptfittings.com/#sle](http://www.bptfittings.com/#sle).
    - b. O-Z/Gedney, a brand of Emerson Electric Co: [www.emerson.com/#sle](http://www.emerson.com/#sle).
    - c. Thomas & Betts Corporation: [www.tnb.com/#sle](http://www.tnb.com/#sle).
    - d. Or Approved Equal.
  2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  3. Material: Use steel or malleable iron.
  4. Connectors and Couplings: Use compression (gland) or set-screw type.

- a. Do not use indenter type connectors and couplings.
- 5. Damp or Wet Locations (where permitted): Use fittings listed for use in wet locations.

## **2.08 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT**

- A. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.
- B. Fittings:
  - 1. Manufacturer: Same as manufacturer of conduit to be connected.
  - 2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

## **2.09 ACCESSORIES**

- A. Corrosion Protection Tape: PVC-based, minimum thickness of 20 mil (0.51 mm).
- B. Conduit Joint Compound: Corrosion-resistant, electrically conductive; suitable for use with the conduit to be installed.
- C. Pull Strings: Use nylon cord with average breaking strength of not less than 200 pound-force (890 N).
- D. Sealing Compound for Sealing Fittings: Listed for use with the particular fittings to be installed.
- E. Modular Seals for Conduit Penetrations: Rated for minimum of 40 psig; Suitable for the conduits to be installed.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive conduits.
- C. Verify that conditions are satisfactory for installation prior to starting work.

### **3.02 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.
- D. Install PVC-coated galvanized steel rigid metal conduit (RMC) using only tools approved by the manufacturer.
- E. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.
- F. Methods of Installation:
  - 1. Cut conduits straight, properly ream, and cut threads for heavy wall conduit deep and clean.
  - 2. Field-bend conduit with benders designed for purpose so as not to distort nor vary internal diameter.
  - 3. Size conduits for fill of 40% or less per Chapter 9 tables of NEC, Minimum conduit size shall be 3/4".
  - 4. Fasten conduit terminations in sheet metal enclosures by 2 locknuts, and terminate with bushing. Install locknuts inside and outside enclosure.
  - 5. For Rigid Conduit terminations into enclosures, contractor shall use watertight bushings
  - 6. Install conduits as not to damage or run through structural members.
  - 7. Test every conduit run installed with ball mandrel. Clear and restore/repair and conduit which rejects ball mandrel.

8. Provide permanent plastic tags at each end of embedded conduit run stating what the conduit is serving and where it is served from including the location.
  9. Label all junction boxes (larger than 6" x 6"); pull boxes, wireways with engraved plastic nameplates.
  10. Run all underground conduit under the slab in the dirt and hung from the slab except for miscellaneous 3/4" conduits which may be run in the slab if the below stated conditions are met. The depth shall vary as required to avoid underground plumbing. Run in slab when turning up. Hang conduit to slab with stainless steel rods looped around conduit with stainless steel washer to keep loop closed on one end; the other end is to have a 90 degree bend set into slab or looped around reinforcing rods. Use 1/4" diameter rod for conduit up to 2", 3/8" diameter for conduit 2 1/2" or greater in diameter. Space supports no greater than 4' apart, or as required by the National Electrical Code and local codes.
  11. Install underground conduits minimum of 24" below finished grade. Use 36" radius long fittings only.
  12. Exposed Conduits:
    - a. Install exposed conduits and extensions from concealed conduit systems neatly, parallel with, or at right angles to walls of the building.
- G. Conduit Routing:
1. Unless dimensioned, conduit routing indicated is diagrammatic.
  2. When conduit destination is indicated without specific routing, determine exact routing required.
  3. Conceal all conduits unless specifically indicated to be exposed.
  4. Conduits in the following areas may be exposed, unless otherwise indicated:
    - a. Electrical rooms.
    - b. Mechanical equipment rooms.
    - c. Within joists in areas with no ceiling.
  5. Arrange conduit to maintain adequate headroom, clearances, and access.
  6. Arrange conduit to provide no more than the equivalent of four 90 degree bends between pull points.
  7. Arrange conduit to provide no more than 150 feet (46 m) between pull points.
  8. Route conduits above water and drain piping where possible.
  9. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
  10. Maintain minimum clearance of 6 inches (150 mm) between conduits and piping for other systems.
  11. Maintain minimum clearance of 12 inches (300 mm) between conduits and hot surfaces. This includes, but is not limited to:
    - a. Heaters.
    - b. Hot water piping.
    - c. Flues.
  12. Group parallel conduits in the same area together on a common rack.
- H. Conduit Support:
1. Secure and support conduits in accordance with NFPA 70 and Section 260529 using suitable supports and methods approved by the authority having jurisdiction.
  2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
  3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
  4. Use conduit strap to support single surface-mounted conduit.
  5. Use of spring steel conduit clips for support of conduits is not permitted.
  6. Use of wire for support of conduits is not permitted.

7. Where conduit support intervals specified in NFPA 70 and NECA standards differ, comply with the most stringent requirements.
- I. Connections and Terminations:
  1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
  2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
  3. Use suitable adapters where required to transition from one type of conduit to another.
  4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
  5. Terminate threaded conduits in boxes and enclosures using myers raintight hubs for all locations.
  6. Where spare conduits stub up through concrete floors and are not terminated in a box or enclosure, provide threaded couplings equipped with threaded plugs set flush with finished floor.
  7. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
  8. Secure joints and connections to provide maximum mechanical strength and electrical continuity.
- J. Penetrations:
  1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
  2. Make penetrations perpendicular to surfaces unless otherwise indicated.
  3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
  4. Conceal bends for conduit risers emerging above ground.
  5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.
  6. Provide suitable modular seal where conduits penetrate exterior wall below grade.
  7. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
  8. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty. Include proposed locations of penetrations and methods for sealing with submittals.
  9. Provide metal escutcheon plates for conduit penetrations exposed to public view.
  10. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.
- K. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
  1. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
  2. Where conduits are routed below buildings that are subject to settlement.
- L. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:
  1. Where conduits pass from outdoors into conditioned interior spaces.
  2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.

- M. Provide grounding and bonding in accordance with Section 260526.

### **3.03 FIELD QUALITY CONTROL**

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- C. Where coating of PVC-coated galvanized steel rigid metal conduit (RMC) contains cuts or abrasions, repair in accordance with manufacturer's instructions.
- D. Correct deficiencies and replace damaged or defective conduits.

### **3.04 CLEANING**

- A. Clean interior of conduits to remove moisture and foreign matter.

### **3.05 PROTECTION**

- A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

**END OF SECTION**

**SECTION 260533.16**  
**BOXES FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Outlet and device boxes up to 100 cubic inches (1,650 cu cm), including those used as junction and pull boxes.
- B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches (1,650 cu cm).

**1.02 RELATED REQUIREMENTS**

- A. Section 078400 - Firestopping.
- B. Section 260526 - Grounding and Bonding for Electrical Systems.
- C. Section 260529 - Hangers and Supports for Electrical Systems.
- D. Section 260533.13 - Conduit for Electrical Systems:
  - 1. Conduit bodies and other fittings.
  - 2. Additional requirements for locating boxes to limit conduit length and/or number of bends between pulling points.
- E. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- F. Section 262726 - Wiring Devices:
  - 1. Wall plates.
  - 2. Additional requirements for locating boxes for wiring devices.

**1.03 REFERENCE STANDARDS**

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- B. NECA 130 - Standard for Installing and Maintaining Wiring Devices 2010.
- C. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable 2014.
- D. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports 2013.
- E. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports 2013 (R2020).
- F. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.
- G. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. SCTE 77 - Specification for Underground Enclosure Integrity 2017.
- I. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations Current Edition, Including All Revisions.
- J. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations Current Edition, Including All Revisions.
- K. UL 508A - Industrial Control Panels Current Edition, Including All Revisions.
- L. UL 514A - Metallic Outlet Boxes Current Edition, Including All Revisions.
- M. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers Current Edition, Including All Revisions.
- N. UL 1203 - Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations Current Edition, Including All Revisions.



#### **1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
  - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
  - 3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
  - 4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
  - 5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
  - 6. Coordinate the work with other trades to preserve insulation integrity.
  - 7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
  - 8. Notify Engineer/Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

#### **1.05 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for junction and pull boxes, cabinets and enclosures, floor boxes, and underground boxes/enclosures.
  - 1. Underground Boxes/Enclosures: Include reports for load testing in accordance with SCTE 77 certified by a professional engineer or an independent testing agency upon request.
- C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- D. Project Record Documents: Record actual locations for outlet and device boxes, pull boxes, cabinets and enclosures, floor boxes, and underground boxes/enclosures.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 016000 - Product Requirements, for additional provisions.
  - 2. Keys for Lockable Enclosures: Two of each different key.

#### **1.06 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

### **PART 2 PRODUCTS**

#### **2.01 BOXES**

- A. General Requirements:
  - 1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.

2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
  3. Provide products listed, classified, and labeled as suitable for the purpose intended.
  4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
  5. Provide grounding terminals within boxes where equipment grounding conductors terminate.
- B. Outlet and Device Boxes Up to 100 cubic inches (1,650 cu cm), Including Those Used as Junction and Pull Boxes:
1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
  2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
  3. Use suitable concrete type boxes where flush-mounted in concrete.
  4. Use suitable masonry type boxes where flush-mounted in masonry walls.
  5. Use raised covers suitable for the type of wall construction and device configuration where required.
  6. Use shallow boxes where required by the type of wall construction.
  7. Do not use "through-wall" boxes designed for access from both sides of wall.
  8. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
  9. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
  10. Nonmetallic Boxes: Comply with NEMA OS 2, and list and label as complying with UL 514C.
  11. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
  12. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
  13. Minimum Box Size, Unless Otherwise Indicated:
    - a. Wiring Devices (Other Than Communications Systems Outlets): 4 inch square by 1-1/2 inch deep (100 by 38 mm) trade size.
  14. Wall Plates: Comply with Section 262726.
  15. Manufacturers:
    - a. Cooper Crouse-Hinds, a division of Eaton Corporation: [www.cooperindustries.com/#sle](http://www.cooperindustries.com/#sle).
    - b. Hubbell Incorporated; Bell Products: [www.hubbell-rtb.com/#sle](http://www.hubbell-rtb.com/#sle).
    - c. Hubbell Incorporated; RACO Products: [www.hubbell-rtb.com/#sle](http://www.hubbell-rtb.com/#sle).
    - d. O-Z/Gedney, a brand of Emerson Electric Co: [www.emerson.com/#sle](http://www.emerson.com/#sle).
    - e. Thomas & Betts Corporation: [www.tnb.com/#sle](http://www.tnb.com/#sle).
    - f. Or Approved Equal.
- C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
  2. NEMA 250 Environment Type, Unless Otherwise Indicated:
    - a. Indoor Clean, Dry Locations: Type 12 painted steel.
    - b. Outdoor Locations: Type 3R, painted steel.
  3. Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
    - a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.
  4. Cabinets and Hinged-Cover Enclosures, Other Than Junction and Pull Boxes:
    - a. Provide lockable hinged covers, all locks keyed alike unless otherwise indicated.

- b. Back Panels: Painted steel, removable.
  - c. Terminal Blocks: Provide voltage/current ratings and terminal quantity suitable for purpose indicated, with 25 percent spare terminal capacity.
- 5. Finish for Painted Steel Enclosures: Manufacturer's standard grey unless otherwise indicated. Match wall color where directed by Architect.
- 6. Manufacturers:
  - a. Cooper B-Line, a division of Eaton Corporation: [www.cooperindustries.com/#sle](http://www.cooperindustries.com/#sle).
  - b. Hoffman, a brand of Pentair Technical Products: [www.hoffmanonline.com/#sle](http://www.hoffmanonline.com/#sle).
  - c. Hubbell Incorporated; Wiegmann Products: [www.hubbell-wiegmann.com/#sle](http://www.hubbell-wiegmann.com/#sle).
- D. Underground Boxes/Enclosures:
  - 1. Description: In-ground, solid bottom boxes furnished with flush, non-skid covers with legend indicating type of service and stainless steel tamper resistant cover bolts.
  - 2. Size: As indicated on drawings.
  - 3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 12 inches (300 mm).
  - 4. Provide logo on cover to indicate type of service. Coordinate exact requirements with Ingalls.
  - 5. Applications:
    - a. Sidewalks and Landscaped Areas Subject Only to Occasional Nondeliberate Vehicular Traffic: Use polymer concrete enclosures, with minimum SCTE 77 Tier 8 load rating.
    - b. Parking Lots, in Areas Subject Only To Occasional Nondeliberate Vehicular Traffic: Use polymer concrete enclosures, with minimum SCTE 77 Tier 22 load rating.
    - c. Do not use polymer concrete enclosures in areas subject to deliberate vehicular traffic.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive boxes.
- C. Verify that conditions are satisfactory for installation prior to starting work.

### **3.02 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide separate boxes for emergency power and normal power systems.
- E. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.
- F. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.
- G. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.
- H. Round boxes are not acceptable where conduit must enter box through side of box.
- I. Provide knockout closures to cap unused knockout holes where blanks have been removed.
- J. Box Locations:
  - 1. Locate boxes to be accessible. Provide access panels in accordance with Section 083100 as required where approved by the Architect.

2. Unless dimensioned, box locations indicated are approximate.
  3. Locate boxes as required for devices installed under other sections or by others.
    - a. Switches, Receptacles, and Other Wiring Devices: Comply with Section 262726.
  4. Locate boxes so that wall plates do not span different building finishes.
  5. Locate boxes so that wall plates do not cross masonry joints.
  6. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
  7. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches (150 mm) horizontal separation unless otherwise indicated.
  8. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.
    - a. Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches (610 mm) separation where wall is constructed with individual noncommunicating stud cavities or protect both boxes with listed putty pads.
    - b. Do not install flush-mounted boxes with area larger than 16 square inches (0.0103 sq m) or such that the total aggregate area of openings exceeds 100 square inches (0.0645 sq m) for any 100 square feet (9.29 sq m) of wall area.
  9. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 260533.13.
- K. Box Supports:
1. Secure and support boxes in accordance with NFPA 70 and Section 260529 using suitable supports and methods approved by the authority having jurisdiction.
  2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
  3. Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling support system.
  4. Use far-side support to secure flush-mounted boxes supported from single stud in hollow stud walls. Repair or replace supports for boxes that permit excessive movement.
- L. Install boxes plumb and level.
- M. Flush-Mounted Boxes:
1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch (6 mm) or does not project beyond finished surface.
  2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
  3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch (3 mm) at the edge of the box.
- N. Install boxes as required to preserve insulation integrity.
- O. Underground Boxes/Enclosures:
1. Install enclosure on gravel base, minimum 6 inches (150 mm) deep.
  2. Install additional bracing inside enclosures in accordance with manufacturer's instructions to minimize box sidewall deflections during backfilling. Backfill with cover bolted in place.
- P. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.
- Q. Close unused box openings.

- R. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.
- S. Provide grounding and bonding in accordance with Section 260526.
- T. Identify boxes in accordance with Section 260553.

**3.03 CLEANING**

- A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

**3.04 PROTECTION**

- A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

**END OF SECTION**

**SECTION 260553**  
**IDENTIFICATION FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Exposed conduit color banding
- B. Cable/Conductor Identification
- C. Equipment/System Identification Signs
- D. Identification nameplates and labels.
- E. Voltage markers.
- F. Underground warning tape.
- G. Floor marking tape.
- H. Warning signs and labels.

**1.02 REFERENCE STANDARDS**

- A. ANSI Z535.2 - American National Standard for Environmental and Facility Safety Signs 2011.
- B. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels 2011.
- C. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. NFPA 70E - Standard for Electrical Safety in the Workplace 2021.
- E. UL 969 - Marking and Labeling Systems Current Edition, Including All Revisions.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.
- B. Sequencing:
  - 1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
  - 2. Do not install identification products until final surface finishes and painting are complete.

**1.04 SUBMITTALS**

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.
- B. Shop Drawings: Provide schedule of items to be identified indicating proposed designations, materials, legends, and formats.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation and installation of product.

**1.05 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70 and NFPA 70E

**1.06 FIELD CONDITIONS**

- A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

## **PART 2 PRODUCTS**

### **2.01 ELECTRICAL IDENTIFICATION MATERIALS**

- A. General: Except as otherwise indicated, 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.
- B. Color-Coded Conduit Markers: Provide manufacturer's standard pre-printed, flexible or semi-rigid, permanent, plastic-sheet conduit markers. Except as otherwise indicated, provide lettering which indicates voltage of conductor(s) in conduit. Unless otherwise indicated or required by governing regulations, provide orange markers with black letters.
- C. Cable/Conductor Identification Bands: Provide manufacturer's standard vinyl-cloth, self-adhesive cable/conductor wire markers or wrap-around type, numbered to show circuit identification.
- D. Self-adhesive Plastic Signs: Provide manufacturer's standard, self-adhesive or pressure-sensitive, pre-printed, flexible vinyl signs for operational instructions or warnings, of sizes suitable for application areas and adequate for visibility. Unless otherwise indicated or required by governing regulations, provide orange signs with black lettering.
- E. Engraved Plastic-Laminate Signs: Provide engraved stock melamine plastic-laminate, complying with FS L-P-387 in sizes and thicknesses indicated.
  - 1. Thickness: 1/16", for units up to 20 sq. in. or 8" length, 1/8" for larger units.
  - 2. Fasteners: Self-tapping stainless steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate substrate.
- F. Manufacturers: Subject to compliance with requirements.

### **2.02 LETTERING AND GRAPHICS**

- A. Coordinate names, abbreviations, and other designations used in electrical identification work with corresponding designations shown or specified for schedule. 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 system and equipment.
- B. Identification for Equipment:
  - 1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
    - a. Panelboards:
      - 1) Identify ampere rating.
      - 2) Identify voltage and phase.
      - 3) Identify Panelboard name.
      - 4) Identify power source and circuit number. Include location when not within sight of equipment.
      - 5) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.
      - 6) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
  - 2. Use identification nameplate to identify equipment utilizing series ratings, where permitted, in accordance with NFPA 70.
- C. Identification for Conductors and Cables:
  - 1. Color Coding for Power Conductors 600 V and Less: Comply with Section 260519.
- D. Identification for Raceways:
  - 1. Use voltage markers to identify highest voltage present for accessible conduits at maximum intervals of 20 feet (6.1 m).

2. Use identification labels, handwritten text using indelible marker, or plastic marker tags to identify spare conduits at each end. Identify purpose and termination location.
3. Use underground warning tape to identify underground raceways.

### **2.03 VOLTAGE MARKERS**

- A. Markers for Conduits: Use factory pre-printed self-adhesive vinyl, self-adhesive vinyl cloth, or vinyl snap-around type markers.
- B. Minimum Size:
  1. Markers for Equipment: 1 1/8 by 4 1/2 inches (29 by 110 mm).
  2. Markers for Conduits: As recommended by manufacturer for conduit size to be identified.
  3. Markers for Pull Boxes: 1 1/8 by 4 1/2 inches (29 by 110 mm).
  4. Markers for Junction Boxes: 1/2 by 2 1/4 inches (13 by 57 mm).
- C. Legend:
  1. Markers for Voltage Identification: Highest voltage present.
  2. Markers for System Identification:
    - a. Emergency Power System: Text "EMERGENCY".
- D. Color: Black text on orange background unless otherwise indicated.

### **2.04 UNDERGROUND WARNING TAPE**

- A. Materials: Use foil-backed detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.
- B. Foil-backed Detectable Type Tape: 3 inches (76 mm) wide, with minimum thickness of 5 mil (0.1 mm), unless otherwise required for proper detection.
- C. Legend: Type of service, continuously repeated over full length of tape.
- D. Color:
  1. Tape for Buried Power Lines: Black text on red background.

### **2.05 FLOOR MARKING TAPE**

- A. Floor Marking Tape for Equipment Working Clearance Identification: Self-adhesive vinyl or polyester tape with overlamine, 3 inches (76 mm) wide, with alternating black and white stripes.

## **PART 3 EXECUTION**

### **3.01 PREPARATION**

- A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

### **3.02 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. General Installation Requirements:
  1. Coordination: Where identification to be applied to surfaces which require finish, install identification after completion of painting.
  2. Regulations: Comply with governing regulations and requests of governing authorities for identification of electrical work.
- C. Conduit Identification:
  1. General: Apply color-coded identification on electrical conduit in a manner similar to piping identification. Except as otherwise indicated, use a color that matches surroundings as coded color for conduit.
- D. Cable/Conductor Identification:
  1. Apply cable/conductor identification on each box/enclosure/cabinet where wires are present, match identification with marking system used in panelboards, shop drawings, contract documents, and similar previously established identification for project electrical



- work.
2. All conductors shall be clearly and permanently identified, and color coded per NEC.
  3. All control circuit and instrument circuit terminations shall be identified. For conductors #6 and smaller, conductor color-coding shall be color insulation. For conductor color coding of work larger than #6, use self-adhesive wrap around tape markers. Use markers for all panelboards, boxes, outlets, switches, circuit breakers and control centers.
  4. Operational Instructions and Warnings: Wherever reasonably required to ensure safe and efficient operation and maintenance of electrical and other related systems, and equipment, including prevention of misuse of electrical facilities by unauthorized personnel, install self-adhesive plastic signs or similar equivalent identification, instructions or warnings on switches, outlets and other control devices and covers of electrical enclosures.
- E. Equipment/System Identification:
1. Install engraved plastic-laminate sign on each major unit of electrical equipment in the building unless unit is specified with its own self-explanatory identification.
  2. Provide text matching terminology and numbering of the contract documents and shop drawings. Provide signs for the following categories of electrical work:
    - a. Panelboards, electrical cabinets and enclosures
    - b. Disconnect/safety switches

#### **4.01 FIELD QUALITY CONTROL**

- A. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

**END OF SECTION**

## **SECTION 262416 PANELBOARDS**

### **PART 1 GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Power distribution panelboards.
- B. Lighting and appliance panelboards.
- C. Overcurrent protective devices for panelboards.

#### **1.02 RELATED REQUIREMENTS**

- A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.
- B. Section 260526 - Grounding and Bonding for Electrical Systems.
- C. Section 260529 - Hangers and Supports for Electrical Systems.
- D. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

#### **1.03 REFERENCE STANDARDS**

- A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service 2013e (Amended 2017).
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- C. NECA 407 - Standard for Installing and Maintaining Panelboards 2015.
- D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.
- E. NEMA PB 1 - Panelboards 2011.
- F. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less 2013.
- G. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems 2017.
- H. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. UL 67 - Panelboards Current Edition, Including All Revisions.
- J. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures Current Edition, Including All Revisions.

#### **1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
  - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
  - 3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.
  - 4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
  - 5. Notify Engineer/Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

#### **1.05 SUBMITTALS**

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and

accessories.

1. Include characteristic trip curves for each type and rating of overcurrent protective device upon request.
- B. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
  1. Include dimensioned plan and elevation views of panelboards and adjacent equipment with all required clearances indicated.
  2. Include wiring diagrams showing all factory and field connections.
  3. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.
  4. Include documentation of listed series ratings upon request.
- C. Source Quality Control Test Reports: Include reports for tests designated in NEMA PB 1 as routine tests.
- D. Field Quality Control Test Reports.
- E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- F. Project Record Documents: Record actual installed locations of panelboards and actual installed circuiting arrangements.
- G. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.
- H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  1. Panelboard Keys: Two of each different key.

#### **1.06 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.
- B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

#### **1.08 FIELD CONDITIONS**

- A. Maintain ambient temperature within the following limits during and after installation of panelboards:
  1. Panelboards Containing Circuit Breakers: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Schneider Electric; Square D Products: [www.schneider-electric.us/#sle](http://www.schneider-electric.us/#sle). or approved equal.
- B. Source Limitations: Furnish panelboards and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

### **2.02 PANELBOARDS - GENERAL REQUIREMENTS**

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
  - 1. Altitude: Less than 6,600 feet (2,000 m).
  - 2. Ambient Temperature:
    - a. Panelboards Containing Circuit Breakers: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).
- C. Short Circuit Current Rating:
  - 1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
- D. Main Breaker: Configure for top or bottom incoming feed as indicated or as required for the installation.
- E. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.
- F. Bussing: Sized in accordance with UL 67 temperature rise requirements.
  - 1. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.
  - 2. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
- G. Conductor Terminations: Suitable for use with the conductors to be installed.
- H. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
  - 1. Boxes: Galvanized steel unless otherwise indicated.
    - a. Cabinets shall be of such size as to allow a wiring gutter space of at least 6" all around for power panels, and 4" all around for lighting panels.
    - b. Provide painted steel boxes for surface-mounted panelboards where indicated, finish to match fronts.
  - 2. Fronts:
    - a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
    - b. Finish for Painted Steel Fronts: Manufacturer's standard grey unless otherwise indicated.
  - 3. Lockable Doors: All locks keyed alike unless otherwise indicated.
- I. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.
- J. Each Panelboard shall be complete with main tin plated copper bus run up the center and neutral bars where required and all proper sequence phase connections. Polarized panelboards will not be accepted. Capacities of copper busses and connections shall be based on a maximum density of 1000 amps per sq. in. spacing of busses shall not be less than code requirements.
- K. Busses shall be arranged as indicated on the drawings. Busses shall be provided with suitable phase identification.

- L. Directory holder with metal frame shall be furnished and installed upon the door of each cabinet, with complete typewritten circuit schedule inserted.
- M. The inside and outside of panelboard boxes, doors and trims shall be furnished with at least two coats of manufacturer's standard finish paint over a baked-on prime coat.
- N. Provide ground bus. Provide additional isolated ground bus where specified.
- O. Lighting and Appliance Panels: Panels shall be for use on voltage phase, number of wire system, 60 cycle, solid neutral service, with number and size of bolt-on type circuit breaker branches as shown on the drawings. Circuit breaker's interrupting capacity shall be 10,000 RMS symmetrical amperes unless otherwise noted.
- P. Power and Distribution Panels:
  - 1. Power and distribution panels shall be the dead-front type, with hinged doors, with fusible circuit breakers in the branches as indicated on the drawings. The panels shall be suitable for 208/120 volt, 3-Phase, 4-wire or 480/277 volt, 3-phase, 4-wire or 240/120 volt, 3-Phase, 4-wire supply as shown.

### **2.03 POWER DISTRIBUTION PANELBOARDS**

- A. Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.
- B. Conductor Terminations:
  - 1. Main and Neutral Lug Material: Copper suitable for terminating copper conductors only.
  - 2. Main and Neutral Lug Type: Mechanical.
- C. Bussing:
  - 1. Phase and Neutral Bus Material: Copper.
  - 2. Ground Bus Material: Copper.
- D. Circuit Breakers:
  - 1. Provide bolt-on type.
  - 2. Provide thermal magnetic circuit breakers unless otherwise indicated.
  - 3. Provide electronic trip circuit breakers where indicated.
- E. Enclosures:
  - 1. Provide surface-mounted enclosures unless otherwise indicated.
  - 2. NEMA 12/3R outdoor
  - 3. NEMA 1 Indoor

### **2.04 LIGHTING AND APPLIANCE PANELBOARDS**

- A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.
- B. Conductor Terminations:
  - 1. Main and Neutral Lug Material: Copper suitable for terminating copper conductors only.
  - 2. Main and Neutral Lug Type: Mechanical.
- C. Bussing:
  - 1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
  - 2. Phase and Neutral Bus Material: Copper.
  - 3. Ground Bus Material: Copper.
- D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.
- E. Enclosures:
  - 1. Provide surface-mounted or flush-mounted enclosures as indicated.

- F. Provide column-width panelboards with accessory column-width cable trough and pullbox where indicated.

## **2.05 OVERCURRENT PROTECTIVE DEVICES**

- A. Molded Case Circuit Breakers:
  - 1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
  - 2. Interrupting Capacity:
    - a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
      - 1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
      - 2) 14,000 rms symmetrical amperes at 480 VAC.
    - b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
  - 3. Conductor Terminations:
    - a. Provide mechanical lugs unless otherwise indicated.
    - b. Provide compression lugs where indicated.
    - c. Lug Material: Copper suitable for terminating copper conductors only.
  - 4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
  - 5. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.
  - 6. Provide the following circuit breaker types where indicated:
    - a. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.
    - b. Ground Fault Equipment Protection Circuit Breakers: Designed to trip at 30 mA for protection of equipment.
    - c. 100 Percent Rated Circuit Breakers: Listed for application within the panelboard where installed at 100 percent of the continuous current rating.
    - d. Current Limiting Circuit Breakers: Without using fusible elements, designed to limit the let-through energy to a value less than the energy of a one-half cycle wave of the symmetrical prospective current when operating within its current limiting range.
  - 7. Provide listed switching duty rated circuit breakers with SWD marking for all branch circuits serving fluorescent lighting.
  - 8. Provide listed high intensity discharge lighting rated circuit breakers with HID marking for all branch circuits serving HID lighting.
  - 9. Do not use tandem circuit breakers.
  - 10. Do not use handle ties in lieu of multi-pole circuit breakers.
  - 11. Provide multi-pole circuit breakers for multi-wire branch circuits as required by NFPA 70.
  - 12. Provide the following features and accessories where indicated or where required to complete installation:
    - a. Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.
    - b. Handle Pad-Lock Provision: For locking circuit breaker handle in OFF position.

## **2.06 SOURCE QUALITY CONTROL**

- A. Factory test panelboards according to NEMA PB 1.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.

- C. Verify that mounting surfaces are ready to receive panelboards.
- D. Verify that conditions are satisfactory for installation prior to starting work.

### **3.02 INSTALLATION**

- A. Perform work in accordance with NECA 1 (general workmanship).
- B. Install products in accordance with manufacturer's instructions.
- C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.
- D. Secure all panelboards to building structure/walls to comply with tightening torques specified to UL stds. 486A and B.
- E. Panelboard loads shall be balanced between phases.
- F. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- G. Install panelboards plumb.
- H. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches (2000 mm) above the floor or working platform.
- I. Mount floor-mounted power distribution panelboards on properly sized 3 inch (80 mm) high concrete pad constructed in accordance with Section 033000.
- J. Provide grounding and bonding in accordance with Section 260526.
  - 1. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on isolated/insulated ground bus.
- K. Install all field-installed branch devices, components, and accessories.
- L. Multi-Wire Branch Circuits: Group grounded and ungrounded conductors together in the panelboard as required by NFPA 70.
- M. Set field-adjustable circuit breaker tripping function settings as indicated.
- N. Provide filler plates to cover unused spaces in panelboards.
- O. Provide circuit breaker lock-on devices to prevent unauthorized personnel from de-energizing essential loads for the following:
  - 1. Fire detection and alarm circuits.
  - 2. Communications equipment circuits.

### **3.03 FIELD QUALITY CONTROL**

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Test GFCI circuit breakers to verify proper operation.
- D. Test shunt trips to verify proper operation.
- E. Procure services of a qualified manufacturer's representative to observe installation and assist in inspection, testing, and adjusting. Include manufacturer's reports with field quality control submittals.
- F. Correct deficiencies and replace damaged or defective panelboards or associated components.

### **3.04 ADJUSTING**

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.
- B. Adjust alignment of panelboard fronts.
- C. Load Balancing: For each panelboard, rearrange circuits such that the difference between each measured steady state phase load does not exceed 20 percent and adjust circuit

directories accordingly. Maintain proper phasing for multi-wire branch circuits.

**3.05 CLEANING**

- A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

**END OF SECTION**



# **APPENDIX A – FEDERALLY FUNDED PROJECT REQUIREMENTS & ASSOCIATED DOCUMENTS**

# EMPLOYEE RIGHTS

## UNDER THE DAVIS-BACON ACT

### FOR LABORERS AND MECHANICS EMPLOYED ON FEDERAL OR FEDERALLY ASSISTED CONSTRUCTION PROJECTS

**PREVAILING  
WAGES**

You must be paid not less than the wage rate listed in the Davis-Bacon Wage Decision posted with this Notice for the work you perform.

**OVERTIME**

You must be paid not less than one and one-half times your basic rate of pay for all hours worked over 40 in a work week. There are few exceptions.

**ENFORCEMENT**

Contract payments can be withheld to ensure workers receive wages and overtime pay due, and liquidated damages may apply if overtime pay requirements are not met. Davis-Bacon contract clauses allow contract termination and debarment of contractors from future federal contracts for up to three years. A contractor who falsifies certified payroll records or induces wage kickbacks may be subject to civil or criminal prosecution, fines and/or imprisonment.

**APPRENTICES**

Apprentice rates apply only to apprentices properly registered under approved Federal or State apprenticeship programs.

**PROPER PAY**

If you do not receive proper pay, or require further information on the applicable wages, contact the Contracting Officer listed below:

or contact the U.S. Department of Labor’s Wage and Hour Division.



WAGE AND HOUR DIVISION  
UNITED STATES DEPARTMENT OF LABOR

1-866-487-9243  
TTY: 1-877-889-5627  
[www.dol.gov/whd](http://www.dol.gov/whd)



## Fact Sheet #21: Recordkeeping Requirements under the Fair Labor Standards Act (FLSA)

This fact sheet provides a summary of the FLSA's recordkeeping regulations, [29 CFR Part 516](#).

### Records To Be Kept By Employers

Highlights: The [FLSA](#) sets [minimum wage](#), [overtime pay](#), recordkeeping, and [youth employment standards](#) for employment subject to its provisions. Unless exempt, covered employees must be paid at least the [minimum wage](#) and not less than one and one-half times their regular rates of pay for [overtime](#) hours worked.

Posting: Employers must display an official poster outlining the provisions of the Act, available at no cost from local offices of the Wage and Hour Division and toll-free, by calling 1-866-4USWage (1-866-487-9243). This poster is also available electronically for downloading and printing at <http://www.dol.gov/osbp/sbrefa/poster/main.htm>.

What Records Are Required: Every covered employer must keep certain records for each non-exempt worker. The Act requires no particular form for the records, but does require that the records include certain identifying information about the employee and data about the hours worked and the wages earned. The law requires this information to be accurate. The following is a listing of the basic records that an employer must maintain:

1. Employee's full name and social security number.
2. Address, including zip code.
3. Birth date, if younger than 19.
4. Sex and occupation.
5. Time and day of week when employee's workweek begins.
6. Hours worked each day.
7. Total hours worked each workweek.
8. Basis on which employee's wages are paid (e.g., "\$9 per hour", "\$440 a week", "piecework")
9. Regular hourly pay rate.
10. Total daily or weekly straight-time earnings.
11. Total overtime earnings for the workweek.
12. All additions to or deductions from the employee's wages.
13. Total wages paid each pay period.
14. Date of payment and the pay period covered by the payment.

How Long Should Records Be Retained: Each employer shall preserve for at least three years payroll records, collective bargaining agreements, sales and purchase records. Records on which wage computations are based should be retained for two years, i.e., time cards and piece work tickets, wage rate tables, work and time schedules, and records of additions to or deductions from wages. These records must be open for inspection by the Division's representatives, who may ask the employer to make extensions, computations, or transcriptions. The records may be kept at the place of employment or in a central records office.

What About Timekeeping: Employers may use any timekeeping method they choose. For example, they may use a time clock, have a timekeeper keep track of employee's work hours, or tell their workers to write their own times on the records. Any timekeeping plan is acceptable as long as it is complete and accurate.

The following is a sample timekeeping format employers may follow but are not required to do so:

DAY	DATE	IN	OUT	TOTAL HOURS
Sunday	6/3/07	-----	-----	-----
Monday	6/4/07	8:00am	12:02pm	
		1:00pm	5:03pm	8
Tuesday	6/5/07	7:57am	11:58am	
		1:00pm	5:00pm	8
Wednesday	6/6/07	8:02am	12:10pm	
		1:06pm	5:05pm	8
Thursday	6/7/07	-----	-----	-----
Friday	6/8/07	-----	-----	-----
Saturday	6/9/07	-----	-----	-----
<b>Total Workweek Hours:</b>				<b>24</b>

Employees on Fixed Schedules: Many employees work on a fixed schedule from which they seldom vary. The employer may keep a record showing the exact schedule of daily and weekly hours and merely indicate that the worker did follow the schedule. When a worker is on a job for a longer or shorter period of time than the schedule shows, the employer must record the number of hours the worker actually worked, on an exception basis.

#### Where to Obtain Additional Information

For additional information, visit our Wage and Hour Division Website: <http://www.wagehour.dol.gov> and/or call our toll-free information and helpline, available 8 a.m. to 5 p.m. in your time zone, 1-866-4USWAGE (1-866-487-9243).

This publication is for general information and is not to be considered in the same light as official statements of position contained in the regulations.

**U.S. Department of Labor**  
Frances Perkins Building  
200 Constitution Avenue, NW  
Washington, DC 20210

**1-866-4-USWAGE**  
TTY: 1-866-487-9243  
[Contact Us](#)

Wage and Hour Division

## PAYROLL

**(For Contractor's Optional Use; See Instructions at [www.dol.gov/whd/forms/wh347instr.htm](http://www.dol.gov/whd/forms/wh347instr.htm))**

*Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number.*



Rev. Dec. 2008

OMB No.:1235-0008  
Expires: 07/31/2024

NAME OF CONTRACTOR						OR SUBCONTRACTOR						ADDRESS								OMB No.:1235-0008 Expires: 07/31/2024			
PAYROLL NO.				FOR WEEK ENDING						PROJECT AND LOCATION						PROJECT OR CONTRACT NO.							
(1)	(2)	(3)	OT: OR ST:	(4) DAY AND DATE							(5)	(6)	(7)	(8) DEDUCTIONS						(9)			
NAME AND INDIVIDUAL IDENTIFYING NUMBER (e.g., LAST FOUR DIGITS OF SOCIAL SECURITY NUMBER) OF WORKER	NO. OF WITHHOLDING EXEMPTIONS	WORK CLASSIFICATION									TOTAL HOURS	RATE OF PAY	GROSS AMOUNT EARNED	FICA	WITH- HOLDING TAX			OTHER	TOTAL DEDUCTIONS	NET WAGES PAID FOR WEEK			
				HOURS WORKED EACH DAY																			
			O									/											
			S									/											
			O									/											
			S									/											
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While completion of Form WH-347 is optional, it is mandatory for covered contractors and subcontractors performing work on Federally financed or assisted construction contracts to respond to the information collection contained in 29 C.F.R. §§ 3.3, 5.5(a). The Copeland Act (40 U.S.C. § 3145) requires contractors and subcontractors performing work on Federally financed or assisted construction contracts to "furnish weekly a statement with respect to the wages paid each employee during the preceding week." U.S. Department of Labor (DOL) regulations at 29 C.F.R. § 5.5(a)(3)(ii) require contractors to submit weekly a copy of all payrolls to the Federal agency contracting for or financing the construction project, accompanied by a signed "Statement of Compliance" indicating that the payrolls are correct and complete and that each laborer or mechanic has been paid not less than the proper Davis-Bacon prevailing wage rate for the work performed. DOL and federal contracting agencies receiving this information review the information to determine that employees have received legally required wages and fringe benefits.

### Public Burden Statement

We estimate that it will take an average of 55 minutes to complete this collection, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. If you have any comments regarding these estimates or any other aspect of this collection, including suggestions for reducing this burden, send them to the Administrator, Wage and Hour Division, U.S. Department of Labor, Room S3502, 200 Constitution Avenue, N.W. Washington, D.C. 20210

(over)

Date \_\_\_\_\_

I, \_\_\_\_\_  
(Name of Signatory Party) (Title)

do hereby state:

(1) That I pay or supervise the payment of the persons employed by \_\_\_\_\_ on the \_\_\_\_\_  
(Contractor or Subcontractor)  
\_\_\_\_\_ ; that during the payroll period commencing on the \_\_\_\_\_  
(Building or Work)  
\_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_, and ending the \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_,  
all persons employed on said project have been paid the full weekly wages earned, that no rebates have  
been or will be made either directly or indirectly to or on behalf of said  
\_\_\_\_\_ from the full  
(Contractor or Subcontractor)

weekly wages earned by any person and that no deductions have been made either directly or indirectly  
from the full wages earned by any person, other than permissible deductions as defined in Regulations, Part  
3 (29 C.F.R. Subtitle A), issued by the Secretary of Labor under the Copeland Act, as amended (48 Stat. 948,  
63 Stat. 108, 72 Stat. 967; 76 Stat. 357; 40 U.S.C. § 3145), and described below:

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

(2) That any payrolls otherwise under this contract required to be submitted for the above period are  
correct and complete; that the wage rates for laborers or mechanics contained therein are not less than the  
applicable wage rates contained in any wage determination incorporated into the contract; that the classifications  
set forth therein for each laborer or mechanic conform with the work he performed.

(3) That any apprentices employed in the above period are duly registered in a bona fide apprenticeship  
program registered with a State apprenticeship agency recognized by the Bureau of Apprenticeship and  
Training, United States Department of Labor, or if no such recognized agency exists in a State, are registered  
with the Bureau of Apprenticeship and Training, United States Department of Labor.

(4) That:  
(a) WHERE FRINGE BENEFITS ARE PAID TO APPROVED PLANS, FUNDS, OR PROGRAMS

- in addition to the basic hourly wage rates paid to each laborer or mechanic listed in  
the above referenced payroll, payments of fringe benefits as listed in the contract  
have been or will be made to appropriate programs for the benefit of such employees,  
except as noted in section 4(c) below.

(b) WHERE FRINGE BENEFITS ARE PAID IN CASH

- Each laborer or mechanic listed in the above referenced payroll has been paid,  
as indicated on the payroll, an amount not less than the sum of the applicable  
basic hourly wage rate plus the amount of the required fringe benefits as listed  
in the contract, except as noted in section 4(c) below.

(c) EXCEPTIONS

EXCEPTION (CRAFT)	EXPLANATION

REMARKS:

NAME AND TITLE	SIGNATURE

THE WILLFUL FALSIFICATION OF ANY OF THE ABOVE STATEMENTS MAY SUBJECT THE CONTRACTOR OR  
SUBCONTRACTOR TO CIVIL OR CRIMINAL PROSECUTION. SEE SECTION 1001 OF TITLE 18 AND SECTION 3729 OF  
TITLE 31 OF THE UNITED STATES CODE.

Request For Wage Determination And  
Response To Request

(Davis Bacon Act as Amended and Related Statutes)

U.S. Department of Labor

Employment Standards Administration  
Wage and Hour Division



FOR DEPARTMENT OF LABOR USE		Mail Your Request To:		CHECK OR LIST CRAFTS NEEDED (Attach continuation sheet if <i>needed</i> )
Response To Request		<b>U.S. Department of Labor</b> <b>Employment Standards Administration</b> <b>Wage and Hour Division</b> <b>Branch of Construction Contract Wage Determinations</b> <b>Washington, D.C. 20210</b>		
<input type="checkbox"/> Use area determination issued for this area		Requesting Officer (Typed name <i>and signature</i> )		
_____		Department, Agency, or Bureau		
_____		Phone Number		
<input type="checkbox"/> The attached decision noted below is applicable to this project		Date of Request	Estimated Advertising Date	
		Estimated Bid Opening Date		
		Prior Decision Number (If any)	Estimated \$ Value of Contract	
		Type of Work		
Decision Number		Address to which wage determination should be mailed. (Print or type)		
Date of Decision				
Expires				
Supersedes Decision Number				
Approved		Location of Project ( <i>City, County, State, Zip Code</i> )		
		Description of Work ( <i>Be specific</i> ) ( <i>Print or type</i> )		

☐ Under 1/2 Mil

☐ 1 to 5 Mil

☐ Bldg.

☐ Highway

☐ 1/2 to 1 Mil

☐ Over 5 Mil

☐ Resid.

☐ Heavy

Asbestos workers

Boilermakers

Bricklayers

Carpenters

Cement masons

Electricians

Glaziers

Ironworkers

Laborers (Specify classes)

Lathers

Marble & tile setters. terrazzo workers

Painters

Piledrivemen

Plasterers

Plumbers

Roofers

Sheet metal workers

Soft floor layers

Stearnfitters

Welders-rate for craft

Truck drivers

Power equipment operators

(Specify types)

Other Crafts