

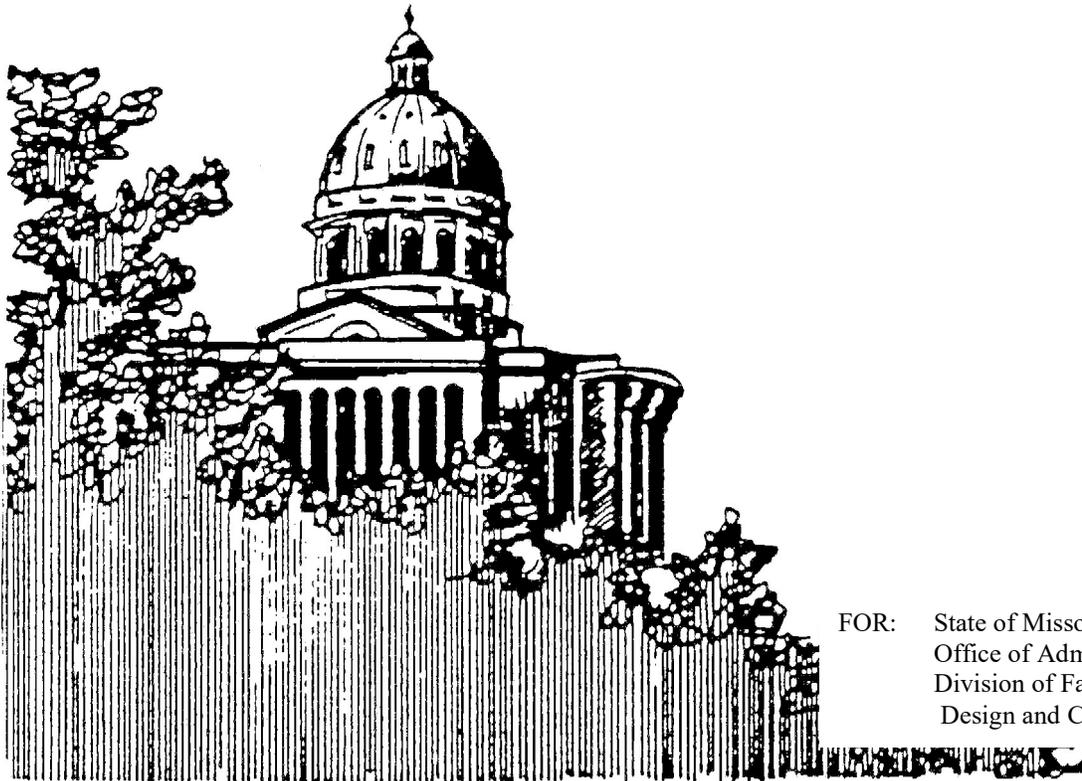
# PROJECT MANUAL

## Cooling Tower Replacement Fletcher Daniels State Office Building Kansas City, Missouri

DESIGNED BY: TI Sys-Tek, LLP  
255 NW Blue Pkwy, Ste 101  
Lee's Summit, MO 64063

DATE ISSUED: 9/9/2019

PROJECT NO.: O1917-01

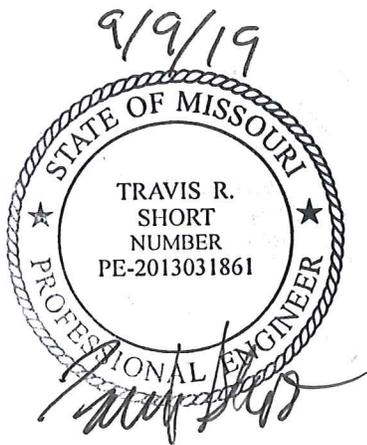


FOR: State of Missouri  
Office of Administration  
Division of Facilities Management,  
Design and Construction

**SECTION 00 01 07 - PROFESSIONAL SEALS AND CERTIFICATIONS**

**PROJECT NUMBER: O1917-01**

**THE FOLLOWING DESIGN PROFESSIONALS HAVE SIGNED AND SEALED THE ORIGINAL PLANS AND SPECIFICATIONS FOR THIS PROJECT, WHICH ARE ON FILE WITH THE DIVISION OF FACILITIES MANAGEMENT, DESIGN AND CONSTRUCTION:**



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**\*\*The following documents may be found on MissouriBUYS at <https://missouribuys.mo.gov/>\*\***

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## SECTION 00 01 15 – LIST OF DRAWING SHEETS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. This Section provides a comprehensive list of the drawings that comprise the bid documents for this project:

### PART 2 - PRODUCTS (NOT APPLICABLE)

### PART 3 - EXECUTION

#### 3.1 LIST OF DRAWINGS

- A. The following list of drawings, is a part of the Bid Documents:

	<u>TITLE</u>	<u>SHEET #</u>	<u>DATE</u>	<u>CADD #</u>
1.	Cover Sheet	Sheet G-001	09/09/19	G-001
2.	Symbols Legend	Sheet G-002	09/09/19	G-002
3.	Roof Plan Phase I Mech Demo	Sheet M-101	09/09/19	M-101
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7.	Condenser Water P&ID New Work	Sheet M-401	09/09/19	M-401
8.	Mechanical Schedules & Details	Sheet M-601	09/09/19	M-601
9.	Sequence of Operations	Sheet M-801	09/09/19	M-801
10.	Roof Plan Phase I Elec Demo	Sheet E-101	09/09/19	E-101
11.	Roof Plan Phase III Elec New Work	Sheet E-102	09/09/19	E-102
12.	Electrical Schedules & Details	Sheet E-601	09/09/19	E-601

**END OF SECTION 00 01 15**

## SECTION 001116 - INVITATION FOR BID

### 1.0 OWNER:

- A. The State of Missouri  
Office of Administration,  
Division of Facilities Management, Design and Construction  
Jefferson City, Missouri

### 2.0 PROJECT TITLE AND NUMBER:

- A. Cooling Tower Replacement  
Fletcher Daniels State Office Building  
Kansas City, Missouri  
**Project No.: O1917-01**

### 3.0 BIDS WILL BE RECEIVED:

- A. Until: 1:30 PM, Thursday, October 31, 2019
- B. **Only electronic bids on MissouriBUYS shall be accepted: <https://missouribuys.mo.gov>. Bidder must be registered to bid.**

### 4.0 DESCRIPTION:

- A. Scope: The project includes refurbishing the existing (3) Cell Cooling Tower, addition of Water Level Controller, & Centrifugal Separator. New VFD's shall be provided for the cooling tower cells. New DDC programming and minimal hardware shall be provided.
- B. Estimate: \$201,500.00 to \$277,000.00
- C. MBE/WBE/SDVE Goals: MBE 10.00%, WBE 10.00%, & SDVE 3.00%. **NOTE: Only MBE/WBE firms certified by a State of Missouri public entity as of the date of bid opening, or SDVE(s) meeting the requirements of Section 34.074, RSMo and 1 CSR 30-5.010, can be used to satisfy the MBE/WBE/SDVE participation goals for this project.**
- D. **\*\*NOTE:** Bidders are provided new Good Faith Effort (GFE) forms on MissouriBUYS.

### 5.0 PRE-BID MEETING:

- A. Place/Time: 01:30 PM; Tuesday, October 22, 2019; Fletcher Daniels State Office Building, 615 E13th St, Kansas City, Missouri 64106.
- B. Access to State of Missouri property requires presentation of a photo ID by all persons

### 6.0 HOW TO GET PLANS & SPECIFICATIONS:

- A. Request: View Only Electronic bid sets are available at no cost or paper bid sets for a deposit of \$30 from American Document Solutions (ADS). MAKE CHECKS PAYABLE TO: American Document Solutions. Mail to: American Document Solutions, 1400 Forum Blvd., Suite 7A, Columbia, Missouri 65203. Phone 573-446-7768, Fax 573-355-5433, <https://www.adsplanroom.net>. NOTE: Prime contractors will be allowed a maximum of two bid sets at the deposit rate shown above. Other requesters will be allowed only one bid set at this rate. Additional bid sets or parts thereof may be obtained by any bidder at the cost of printing and shipping by request to American Document Solutions at the address shown above. **Bidder must secure at least one bid set to become a planholder.**
- B. **Refunds: Return plans and specifications in unmarked condition within 15 working days of bid opening to American Document Solutions, 1400 Forum Blvd., Suite 7A, Columbia, Missouri 65203. Phone 573-446-7768, Fax 573-355-5433. Deposits for plans not returned within 15 working days shall be forfeited.**
- C. Information for upcoming bids, including downloadable plans, specifications, Invitation for Bid, bid tabulation, award, addenda, and access to the ADS planholders list, is available on the Division of Facilities Management, Design and Construction's web site: <https://oa.mo.gov/facilities/bid-opportunities/bid-listing-electronic-plans>.

### 7.0 POINT OF CONTACT:

- A. Designer: TI Sys-Tek, LLP, Travis Short, phone # 816-229-9009, fax # 816-224-9377
- B. Project Manager: Jared Cook, phone # 573-690-6733, fax # 573-751-7277

### 8.0 GENERAL INFORMATION:

- A. The State reserves the right to reject any and all bids and to waive all informalities in bids. No bid may be withdrawn for a period of 20 working days subsequent to the specified bid opening time. The contractor shall pay not less than the prevailing hourly rate of wages for work of a similar character in the locality in which the work is performed, as determined by the Missouri Department of Labor and Industrial Relations and as set out in the detailed plans and specifications.
- B. Bid results will be available at <https://oa.mo.gov/facilities/bid-opportunities/bid-listing-electronic-plans> after it is verified that at least one bid is awardable and affordable.

## **SECTION 002113 – INSTRUCTIONS TO BIDDERS**

### **1.0 - SPECIAL NOTICE TO BIDDERS**

- A. If awarded a contract, the Bidder's employees, and the employees of all subcontractors, who perform the work on the project, will be required to undergo a fingerprint background check and obtain a State of Missouri identification badge prior to beginning work on site. The Bidder should review the information regarding this requirement in Section 013513 – Site Security and Health Requirements prior to submitting a bid.

### **2.0 - BID DOCUMENTS**

- A. The number of sets obtainable by any one (1) party may be limited in accordance with available supply.
- B. For the convenience of contractors, sub-contractors and suppliers, copies of construction documents are on file at the office of the Director, Division of Facilities Management, Design and Construction and on the Division's web site - <http://oa.mo.gov/facilities/project-management>.

### **3.0 - BIDDERS' OBLIGATIONS**

- A. Bidders must carefully examine the entire site of the work and shall make all reasonable and necessary investigations to inform themselves thoroughly as to the facilities available as well as to all the difficulties involved in the completion of all work in accordance with the specifications and the plans. Bidders are also required to examine all maps, plans and data mentioned in the specifications. No plea of ignorance concerning observable existing conditions or difficulties that may be encountered in the execution of the work under this contract will be accepted as an excuse for any failure or omission on the part of the contractor to fulfill in every detail all of the requirements of the contract, nor accepted as a basis for any claims for extra compensation.
- B. Under no circumstances will contractors give their plans and specifications to another contractor. Any bid received from a contractor whose name does not appear on the list of plan holders will be subject to rejection.

### **4.0 - INTERPRETATIONS**

- A. No bidder shall be entitled to rely on oral interpretations as to the meaning of the plans and specifications or the acceptability of alternate products, materials, form or type of construction. Every request for interpretation shall be made in writing and submitted with all supporting documents not less than five (5) working days before opening of bids. Every interpretation made to a bidder will be in the form of an addendum and will be sent as promptly as is practicable to all persons to whom plans and specifications have been issued. All such addenda shall become part of the contract documents.
- B. Approval for an "acceptable substitution" issued in the form of an addendum as per Paragraph 4A above, and as per Article 3.1 of the General Conditions; ACCEPTABLE SUBSTITUTIONS shall constitute approval for use in the project of the product.
- C. An "acceptable substitution" requested after the award of bid shall be approved if proven to the satisfaction of the Owner and the Designer as per Article 3.1, that the product is acceptable in design, strength, durability, usefulness, and convenience for the purpose intended. Approval of the substitution after award is at the sole discretion of the Owner.
- D. A request for "Acceptable Substitutions" shall be made on the Section 006325 Substitution Request Form. The request shall be sent directly to the project Designer. A copy of said request should also be mailed to the Owner, Division of Facilities Management, Design and Construction, Post Office Box 809, Jefferson City, Missouri 65102.

### **5.0 - BIDS AND BIDDING PROCEDURE**

- A. Bidders shall submit all submission forms and accompanying documents listed in SECTION 004113 – BID FORM, Article 5.0, ATTACHMENTS TO BID by the stated time or their bid will be rejected for being non-responsive.

Depending on the specific project requirements, **the following is a GENERIC list** of all possible bid forms that may be due with bid submittals and times when they may be due. Please check for specific project

requirements on the proposal form (Section 004113). *Not all of the following bid forms may be required to be submitted.*

**Bid Submittal – due before stated date and time of bid opening (see IFB):**

004113	Bid Form (all pages are always required)
004322	Unit Prices Form
004336	Proposed Subcontractors Form
004337	MBE/WBE/SDVE Compliance Evaluation Form
004338	MBE/WBE/SDVE Eligibility Determination for Joint Ventures
004339	MBE/WBE/SDVE GFE Determination
004340	SDVE Business Form
004541	Affidavit of Work Authorization

(NOTE: See Article 7.D below for submittal restrictions.)

- B. All bids shall be submitted without additional terms and conditions, modification or reservation on the bid forms with each space properly filled. Bids not on these forms will be rejected.
- C. All bids shall be accompanied by a bid bond executed by the bidder and a duly authorized surety company, certified check, cashier's check or bank draft made payable to the Division of Facilities Management, Design and Construction, State of Missouri, in the amount indicated on the bid form, Section 004113. Failure of the contractor to submit the full amount required shall be sufficient cause to reject his bid. The bidder agrees that the proceeds of the check, draft or bond shall become the property of the State of Missouri, if for any reason the bidder withdraws his bid after closing, or if on notification of award refuses or is unable to execute tendered contract, provide an acceptable performance and payment bond, provide evidence of required insurance coverage and/or provide required copies of affirmative action plans within ten (10) working days after such tender.
- D. The check or draft submitted by the successful bidder will be returned after the receipt of an acceptable performance and payment bond and execution of the formal contract. Checks or drafts of all other bidders will be returned within a reasonable time after it is determined that the bid represented by same will receive no further consideration by the State of Missouri. Bid bonds will only be returned upon request.

**6.0 - SIGNING OF BIDS**

- A. Bids from an individual shall be signed as noted on the Bid Form.
- B. Bids from a partnership or joint venture shall require only one signature of a partner, an officer of the joint venture authorized to bind the venture or an attorney-in-fact. If the bid is signed by an officer of a joint venture or an attorney-in-fact, a document evidencing the individual's authority to execute contracts should be included with the bid form.
- C. Bids from a corporation shall have the correct corporate name thereon and the signature of an authorized officer of the corporation manually written. Title of office held by the person signing for the corporation shall appear, along with typed name of said individual. Corporate license number shall be provided and, if a corporation organized in a state other than Missouri, a Certificate of Authority to do business in the State of Missouri shall be attached. In addition, for corporate proposals, the President or Vice-President should sign as the bidder. If the signator is other than the corporate president or vice president, the bidder must provide satisfactory evidence that the signator has the legal authority to bind the corporation.

**7.0 - RECEIVING BID SUBMITTALS: Only bids submitted on MissouriBUYS shall be accepted; no hard copy bids shall be accepted.**

- A. It is the bidder's sole responsibility to assure receipt by Owner of bid submittals by the date and time specified in the Invitation for Bid.
- B. Submittals will be received as shown in and required by the Bid Form. Submittals will be completed so as to include insertion of all amounts for alternate bids, unit prices and cost accounting data, etc. Failure to complete all required information may be cause for rejection of bid.
- C. No Contractor shall stipulate in his bid any conditions not contained in the specifications or standard bid form contained in the contract documents. To do so may subject the Contractor's bid to rejection.

- D. Bidders prices shall include all city, state and federal sales, excise and similar taxes which may be lawfully assessed in connection with his performance of work and purchase of materials to be incorporated in the work. THIS PROJECT IS NOT TAX EXEMPT.
- E. The completed forms shall be without interlineations, alterations or erasures.
- F. The Owner reserves the right to waive informalities in bid submittals and to reject any or all bids.

#### **8.0 - MODIFICATION AND WITHDRAWAL OF BIDS**

- A. Bidder may withdraw his bid at any time prior to scheduled closing time for receipt of bids, but no bidder may withdraw his bid for a period of twenty (20) working days after the scheduled closing time for receipt of bids.
- B. The Bidder shall modify his or her original bid by submitting a revised bid on MissouriBUYS.

#### **9.0 - AWARD OF CONTRACT**

- A. The Owner reserves the right to reject any and/or all bids and further to waive all informalities in bidding when deemed in the best interest of the State of Missouri.
- B. The Owner reserves the right to let other contracts in connection with the work, including but not by way of limitation, contracts for the furnishing and installation of furniture, equipment, machines, appliances and other apparatus.
- C. In awarding the contract the Owner may take into consideration the bidder's skill, facilities, capacity, experience, responsibility, previous work record, financial standing and the necessity of prompt and efficient completion of work herein described. Inability of any bidder to meet the requirements mentioned above may be cause for rejection of his bid. However, no contract will be awarded to any individual, partnership or corporation, who has had a contract with the State of Missouri declared in default within the preceding twelve months.
- D. Award of alternates, if any, will be made in numerical order unless all bids received are such that the order of acceptance of alternates does not affect the determination of the low bidder.
- E. No bid shall be considered binding upon the Owner until the written contract has been properly executed, a satisfactory bond has been furnished, evidence of required insurance coverage, submittal of executed Section 004541, Affidavit of Work Authorization form, documentation evidencing enrollment and participation in a federal work authorization program has been received and an affirmative action plan submitted. Failure to execute and return the contract and associated documents within the prescribed period of time shall be treated, at the option of the Owner, as a breach of bidder's obligation and the Owner shall be under no further obligation to bidder.
- F. If the successful bidder is doing business in the State of Missouri under a fictitious name, he shall furnish to Owner, attached to the Bid Form, a properly certified copy of the certificate of Registration of Fictitious Name from the State of Missouri, and such certificate shall remain on file with the Owner.
- G. Any successful bidder which is a corporation organized in a state other than Missouri shall furnish to the Owner, attached to the Bid Form, a properly certified copy of its current Certificate of Authority to do business in the State of Missouri, such certificate to remain on file with the Owner. No contract will be awarded by the Owner unless such certificate is furnished by the bidder.
- H. Any successful bidder which is a corporation organized in the State of Missouri shall furnish at its own cost to the Owner, if requested, a Certificate of Good Standing issued by the Secretary of State, such certificate to remain on file with the Owner.
- I. Transient employers subject to Sections 285.230 and 285.234, RSMo, (out-of-state employers who temporarily transact any business in the State of Missouri) may be required to file a bond with the Missouri Department of Revenue. No contract will be awarded by the Owner unless the successful bidder certifies that he has complied with all applicable provisions of Section 285.230-234.
- J. Sections 285.525 and 285.530, RSMo, require business entities to enroll and participate in a federal work authorization program in order to be eligible to receive award of any state contract in excess of \$5,000. Bidders should submit with their bid an Affidavit of Work Authorization (Section 004541) along with appropriate documentation evidencing such enrollment and participation. Section-004541, Affidavit of Work Authorization is located at – <http://oa.mo.gov/facilities/vendor-links/contractor-forms> .

Information regarding a Memorandum of Understanding which is one form of appropriate documentation located at <https://www.uscis.gov/e-verify/> . Submittal of this form and appropriate documentation is required before the award of any contract. In addition the contractor shall be responsible for compliance of these requirements by all subcontractors and suppliers at any tier associated with this contract.

#### **10.0 – SERVICE-DISABLED VETERANS**

- A. For the purposes of these instructions, the terms “service-disabled veteran” and “service-disabled veteran business” have the same meanings as set forth in section 34.074, RSMo.
- B. The State of Missouri has a goal of awarding three percent of all construction projects to service-disabled veterans. Furthermore, service-disabled veteran businesses doing business as Missouri firms, corporations, or individuals, or which maintain Missouri offices or places of business shall receive a three-point bonus preference in the contract award evaluation process. The bonus preference will be calculated and applied by reducing any service-disabled veteran business’s bid amount(s) by three percent of the lowest bid amount(s). This reduction is for evaluation purposes only, and will have no impact on the actual amount(s) of the bid or the amount(s) of any contract awarded.
- C. Any bidder who is qualified as a Missouri service-disabled veteran pursuant to Section 34.074, RSMo, must complete and submit with the bid the MISSOURI SERVICE DISABLED VETERAN BUSINESS form and provide the specified documentation in accordance with the instructions provided therein. This form can be obtained at: <http://oa.mo.gov/facilities/vendor-links/contractor-forms> .

#### **11.0 - CONTRACT SECURITY**

- A. The successful bidder shall furnish a performance/payment bond as set forth in General Conditions Article 6.1 on a condition prior to the State executing the contract and issuing a notice to proceed.

#### **12.0 - LIST OF SUBCONTRACTORS**

- A. If required by “Section 004113 – Bid Form,” each bidder must submit as part of their bid a list of subcontractors to be used in performing the work (Section 004336). The list must specify the name of the single designated subcontractor, for each category of work listed in “Section 004336 - Proposed Subcontractors Form.” If work within a category will be performed by more than one subcontractor, the bidder must provide the name of each subcontractor and specify the exact portion of the work to be done by each. Failure to list the Bidder’s firm, or a subcontractor for each category of work identified on the Bid Form or the listing of more than one subcontractor for any category without designating the portion of work to be performed by each shall be cause for rejection of the bid. If the bidder intends to perform any of the designated subcontract work with the use of his own employees, the bidder shall make that fact clear, by listing his own firm for the subject category. **If any category of work is left vacant, the bid shall be rejected.**

#### **13.0 - WORKING DAYS**

- A. Contract duration time is stated in working days and will use the following definition in determining the actual calendar date for contract completion:
  - 1. Working days are defined as all calendar days except Saturdays, Sundays and the following State of Missouri observed holidays: New Year’s Day, Martin Luther King, Jr. Day, Lincoln Day, Washington’s Birthday, Truman Day, Memorial Day, Independence Day, Labor Day, Columbus Day, Veterans Day, Thanksgiving Day and Christmas Day.

## SECTION 002213—SUPPLEMENTARY INSTRUCTIONS TO BIDDERS – MBE/WBE/SDVE INSTRUCTIONS

### 1.0 DEFINITIONS

1. **"MBE"**: Minority Business Enterprise.
2. **"MINORITY"**:
  - a. "Black Americans," which includes persons having origins in any of the black racial groups of Africa;
  - b. "Hispanic Americans," which includes persons of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish culture or origin regardless of race;
  - c. "Native Americans," which includes persons who are American Indians, Eskimos, Aleuts, or Native Hawaiians;
  - d. "Asian-Pacific Americans," which includes persons whose origins are from Japan, China, Taiwan, Korea, Vietnam, Laos, Cambodia, the Philippines, Samoa, Guam, the U.S. Trust Territories of the Pacific, or the Northern Marianas; or
  - e. "Asian-Indian Americans," which includes persons whose origins are from India, Pakistan or Bangladesh.
3. **"MINORITY BUSINESS ENTERPRISE"**: A business concern which is at least fifty-one percent (51%) owned by one (1) or more minority as defined in 2. "MINORITY" above or in the case of any publicly-owned business, fifty-one percent (51%) of the stock of which is owned by one (1) or more minority as defined in 2. "MINORITY" above AND whose management and daily business operations are controlled by one (1) or more minority as defined herein.
4. **"WBE"**: Women Business Enterprise.
5. **"WOMEN BUSINESS ENTERPRISE"**: A business concern which is at least fifty-one percent (51%) owned by one (1) or more women or in the case of any publicly-owned business at least fifty-one percent (51%) of the stock of which is owned by one (1) or more women AND whose management and daily business operations are controlled by one (1) or more women.
6. **"SDVE"**: A Service-Disabled Veterans Enterprise.
7. **"SERVICE-DISABLED VETERAN"**: Any individual who is service disabled as certified by the appropriate federal agency responsible for the administration of veterans' affairs.
8. **"SERVICE-DISABLED VETERANS ENTERPRISE"**: A service disabled veteran business as defined by Section 34.074, RSMo, meaning a business concern which is at least fifty-one percent (51%) owned by one (1) or more service-disabled veterans or in the case of any publicly-owned business at least fifty-one percent (51%) of the stock of which is owned by one (1) or more service-disabled veterans AND whose management and daily business operations are controlled by one (1) or more service disabled veterans.

### 2.0 MBE/WBE/SDVE PROGRAM REQUIREMENTS

- A. For bids where MBE, WBE and or SDVE goals are greater than zero percent (0%) as noted in the "Invitation for Bid," the following provisions shall apply
  1. MBE/WBE/SDVE Percentage Goals:
    - a. The bidder shall have as a goal subcontracting not less than the percentages stated on the Bid Form for MBE, WBE and SDVE firms.
  2. Computation of MBE/WBE/SDVE Percent Goal Participation:
    - a. The total dollar value of the work granted to the MBE, WBE or SDVE by the successful bidder shall be counted towards the applicable goal of the entire contract.
    - b. A bidder may count toward the MBE/WBE/SDVE goals only expenditures to certified MBE's, WBE's, or SDVE's that perform a commercially useful function in the work of a contract. A MBE, WBE, or SDVE is considered to perform a commercially useful function when it is responsible for executing a distinct element of the work contract and carrying out its responsibilities by actually performing, managing and supervising the work or providing supplies or manufactured materials. A bidder who is a MBE, WBE or SDVE may count 100% of the contract towards the MBE, WBE or

SDVE goal. (NOTE: MBE firms who bid as general contractors are expected to obtain WBE and SDVE participation; WBE firms who bid as general contractors are expected to obtain MBE and SDVE participation; and SDVE firms who bid as general contractors are expected to obtain MBE and WBE participation to meet the project's separate goals.)

- c. Bidder may count toward its MBE/WBE/SDVE goals expenditures for materials and supplies obtained from certified MBE, WBE, or SDVE suppliers and manufacturers, provided that the MBE, WBE, or SDVE assumes the actual and contractual responsibility for the provision of the materials and supplies.
  - d. A bidder may count towards the MBE/WBE/SDVE goals that portion of the total dollar value of the work granted to a second or subsequent tier subcontractor or a supplier to any subcontractor at any tier, provided that the MBE, WBE, or SDVE properly assumes responsibility for the work as outlined in 2.A.2.b and 2.A.2.c above.
  - e. A bidder may count towards the MBE/WBE/SDVE goals that portion of the total dollar value granted to a certified joint venture equal to the percentage of the ownership and control of the MBE, WBE, or SDVE partner in the joint venture.
3. Certification by bidder of MBE/WBE/SDVE Subcontractors:
- a. The bidder shall submit with his bid the information requested in the MBE/WBE/SDVE Compliance Evaluation Form for every MBE, WBE, or SDVE subcontractor or material supplier the bidder intends to use on the contract work.
  - b. The bidder may determine the status of certification of a proposed MBE or WBE subcontractor or supplier by referring to the Office of Equal Opportunity (OEO) MBE/WBE directory (<https://apps1.mo.gov/MWBCertifiedFirms/>); and the eligibility of a SDVE subcontractor or supplier by referring to the Division of Purchasing and Materials Management SDVE directory (<http://oa.mo.gov/purchasing/vendor-information/missouri-service-disabled-veteran-business-enterprise-sdve-information>) or the Department of Veterans Affairs directory (<https://www.vip.vetbiz.gov/>). Additional information, clarifications, etc., regarding the listings in the Directory may be obtained by calling the Division at (573) 751-3339 and asking to speak to the Contract Specialist of record as shown in Section 007300, Supplementary Conditions.
  - c. If the proposed subcontractor is certified as a MBE/WBE firm by any other State of Missouri agency or any Missouri city or county government agency, the bidder shall so note and provide particulars. Other known State of Missouri entities providing certification are:

Mountain Plains Minority Supplier Development Council	816-221-4200
Human Relations Department, KCMO	816-274-1432
Lambert International Airport	314-551-5000
Metro (formerly Bi-State Development Agency)	314-982-1457
St. Louis Development Corporation	314-622-3400 Ext. 362
St. Louis Minority Business Council	314-241-1073
SBA 8/St. Louis, MO	314-539-6600
Missouri Department of Transportation	573-751-2859
National Women Business Owners Corp.	561-848-5066

(Missouri firms only)

4. Waiver of MBE/WBE/SDVE Participation:
- a. The bidder is required to make a good faith effort to locate and contract with MBE's, WBE's and SDVE's. If a bidder has made a good faith effort to secure the required MBE's, WBE's and SDVE's and has failed, he may submit with his bid the information requested in "MBE/WBE/SDVE Good

Faith Effort (GFE) Determination.” The Director will review the bidder’s actions as set forth in the bidder’s Application for Waiver, the ability or success of other bidders to obtain MBE, WBE, or SDVE participation in their bids, and any other factors deemed relevant by the Director, to determine if a good faith effort has been made to meet the applicable percentage goals. If the bidder is judged not to have made a good faith effort, the bid shall be rejected as being nonresponsive to the bid requirements. Bidders who demonstrate that they have made a good faith effort to include MBE, WBE, and SDVE participation will be determined to be responsive to the MBE/WBE/SDVE participation goals of the contract regardless of the percent of MBE/WBE/SDVE participation, provided the bid is otherwise acceptable.

- b. In reaching a determination of good faith, the Director may evaluate, but is not limited to, the following factors:
  - 1. How subcontractors were contacted initially, the specific project information provided and the documentation to support that contact;
  - 2. How project plans and specifications were provided to MBE/WBE/SDVE subcontractors;
  - 3. The names, addresses, phone numbers, and dates of contact for MBE/WBE/SDVE firms contacted for specific categories of work;
  - 4. Attempts to follow-up with MBE, WBE or SDVE subcontractors prior to bid to negotiate price, scope of work, or make other adjustments or clarifications;
  - 5. Amount of bids received from any of these subcontractors;
  - 6. Bid accepted from one of these subcontractors or reasons for rejecting bids;
  - 7. The MBE, WBE, or SDVE suppliers contacted, date of contact, material or equipment, amounts of quotes;
  - 8. The ability or success of other bidders to obtain the MBE/WBE/SDVE participation in their bids.
- c. If MBE/WBE/SDVE goals have been identified on Section 004113-BID FORM, **ALL** bidders are required to submit all appropriate MBE/WBE/SDVE documentation before the stated time and date set forth in the “Invitation for Bid”. Failure to provide this information by the specified date and time will be grounds for rejecting the bid.

MBE/WBE/SDVE forms may be accessed at <https://oa.mo.gov/facilities/vendor-links/contractor-forms>. It is the bidder’s sole responsibility to assure receipt by Owner of bid submittals by the date and time specified in the “Invitation for Bid.”

- d. The Director reserves the right to provide bidders the opportunity to correct or amplify the documented information received concerning MBE/WBE/SDVE goals. The additional information will be transmitted to Facilities Management Design and Construction within two (2) working days of a phone or facsimile or email request from the Director’s representative.

### **3.0 CONTRACTOR REQUIREMENTS**

For contracts where there are MBE/WBE/SDVE participation goals as noted in the “Invitation for Bid,” the following provisions shall apply:

- A. The Contractor is bound to subcontracting or obtaining materials in amounts not less than the dollar amount indicated in the awarded contract to MBE/WBE/SDVE (s) unless that amount is revised in writing by the Owner’s representative.
- B. If the Contractor fails to meet or maintain the participation requirements contained in the Contractor’s bid, he must satisfactorily explain to the Director or his Designee why the requirement cannot be achieved and why meeting the requirement was beyond the Contractor’s control.
- C. If the Director finds the Contractor’s explanation unsatisfactory, the Director may take any appropriate action including, but not limited to:

1. Declaring the Contractor ineligible to participate in any Facilities Management, Design and Construction contracts for a period not to exceed twelve (12) months; and
  2. Directing that the Contractor be declared non-responsive to the “Invitation for Bid,” or in breach of this contract.
- D. If a MBE, WBE, or SDVE is replaced during the course of this contract, the Contractor shall replace it with a similar MBE, WBE, or SDVE OR make a good faith effort to replace it with another MBE, WBE, or SDVE. All substitutions shall be approved by the Owners Representative.
- E. The Contractor shall provide the Owner with regular reports on its progress in meeting its MBE/WBE/SDVE obligations. As a minimum, the dollar-value of work completed by each MBE, WBE, or SDVE subcontractor during the preceding month and as a cumulative total shall be reported with each monthly application for payment. A final report shall include the total dollar-value of work completed by each MBE, WBE, and SDVE subcontractor during the total contract.

**STATE OF MISSOURI**  
**DIVISION OF FACILITIES MANAGEMENT,**  
**DESIGN AND CONSTRUCTION**  
***MBE/WBE/SDVE DIRECTORY***

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The MBE/WBE Directory for goods and services is maintained by the Office of Equal Opportunity (OEO). The current Directory can be accessed at the following web address:

<https://apps1.mo.gov/MWBCertifiedFirms/>

Please note that you may search by MBE, WBE, or both as well as by region, location of the business by city or state, as well as by commodity or service.

The SERVICE DISABLED VETERAN ENTERPRISE (SDVE) Directory (s) may be accessed at the following web addresses:

<https://oa.mo.gov/sites/default/files/sdvelisting.pdf>

<https://www.vip.vetbiz.va.gov>



**ARTICLE 4. CONTRACT SUM**

The Owner shall pay the Contractor for the prompt, faithful and efficient performance of the conditions and undertakings of this contract, subject to additions, and deductions as provided herein, in current funds the sum of:

Base Bid: \$

DELETE THE ALTERNATE INFORMATION IF NOT USED

The Owner accepts the following Alternate Bids:

Alternate One: \$

**TOTAL CONTRACT AMOUNT: (\$CONTRACT AMOUNT)**

**ARTICLE 5. PREVAILING WAGE RATE**

It is understood and agreed by and between the parties that not less than the prevailing hourly rate of wages shall be paid for work of a similar character in the locality in which the work is performed, and not less than the prevailing hourly rate of wages for legal holiday and overtime work in the locality in which the work is performed, both as determined by the Department of Labor and Industrial Relations or as determined by the court on appeal, to all workmen employed by or on behalf of the Contractor or any subcontractor, exclusive of maintenance work. Only such workmen as are directly employed by the Contractor or his subcontractors, in actual construction work on the site shall be deemed to be employed.

When the hauling of materials or equipment includes some phase of the construction other than the mere transportation to the site of the construction, workmen engaged in this dual capacity shall be deemed to be employed directly on the project and entitled to the prevailing wage.

**ARTICLE 6. MINORITY/WOMEN/SERVICE DISABLED VETERAN BUSINESS ENTERPRISE PARTICIPATION**

The Contractor has been granted a waiver of the 10% MBE and 10% WBE and 3% SDVE participation goals. The Contractor agrees to secure the MBE/WBE/SDVE participation amounts for this project as follows: (OR)

The Contractor has met the MBE/WBE/SDVE participation goals and agrees to secure the MBE/WBE/SDVE participation amounts for this project as follows:

MBE/WBE/SDVE Firm:	Subcontract Amt:\$	
MBE/WBE/SDVE Firm:	Subcontract Amt:\$	
MBE/WBE/SDVE Firm:	Subcontract Amt:\$	
		Total \$

MBE/WBE/SDVE assignments identified above shall not be changed without a Contract Change signed by the Owner.

The Director of the Division of Facilities Management, Design and Construction or his Designee shall be the final authority to resolve disputes and disagreements between the Contractor and the MBE/WBE/SDVE firms listed above when such disputes impact the subcontract amounts shown above.

**ARTICLE 7. CONTRACT DOCUMENTS**

Contract documents shall consist of the following component parts:

- 1. Division 0, with executed forms
- 2. Division 1
- 3. Executed Construction Contract Form
- 4. The Drawings
- 5. The Technical Specifications
- 6. Addenda
- 7. Contractor's Proposal as accepted by the Owner

By signature below, the parties hereby execute this contract document.

**APPROVED:**

\_\_\_\_\_  
 Mark Hill, P.E., Acting Director  
 Division of Facilities Management,  
 Design and Construction

\_\_\_\_\_  
 Contractor's Authorized Signature

**DELETE IF PRIVATE OR PARTNERSHIP**

I, Corporate Secretary, certify that I am Secretary of the corporation named above and that (CONTRACTOR NAME), who signed said contract on behalf of the corporation, was then (TITLE) of said corporation and that said contract was duly signed for and in behalf of the corporation by authority of its governing body, and is within the scope of its corporate powers.

\_\_\_\_\_  
*Corporate Secretary*



STATE OF MISSOURI  
 OFFICE OF ADMINISTRATION  
 DIVISION OF FACILITIES MANAGEMENT, DESIGN AND CONSTRUCTION  
**AFFIDAVIT FOR AFFIRMATIVE ACTION**

PROJECT NUMBER
----------------

NAME
------

First being duly sworn on oath states: that

he/she is the  sole proprietor  partner  officer or  manager or managing member of

NAME
------

a  sole proprietorship  partnership  
 limited liability company (LLC)

or  corporation, and as such, said proprietor, partner, or officer is duly authorized to make this

affidavit on behalf of said sole proprietorship, partnership, or corporation; that under the contract known as

PROJECT TITLE
---------------

Less than 50 persons in the aggregate will be employed and therefore, the applicable Affirmative Action requirements as set forth in Article 1.4 of the General Conditions of the State of Missouri have been met.

PRINT NAME & SIGNATURE
------------------------

DATE
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**NOTARY INFORMATION**

NOTARY PUBLIC EMBOSSER SEAL	STATE OF	COUNTY (OR CITY OF ST. LOUIS)	USE RUBBER STAMP IN CLEAR AREA BELOW
	SUBSCRIBED AND SWORN BEFORE ME, THIS		
	DAY OF	YEAR	
	NOTARY PUBLIC SIGNATURE	MY COMMISSION EXPIRES	
NOTARY PUBLIC NAME (TYPED OR PRINTED)			

**SECTION 006113 - PERFORMANCE AND PAYMENT BOND FORM**

KNOW ALL MEN BY THESE PRESENTS, THAT we \_\_\_\_\_

as principal, and \_\_\_\_\_

\_\_\_\_\_ as Surety, are held and firmly bound unto the

STATE OF MISSOURI. in the sum of \_\_\_\_\_ Dollars (\$ \_\_\_\_\_ )

for payment whereof the Principal and Surety bind themselves, their heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

WHEREAS, the Principal has, by means of a written agreement dated the \_\_\_\_\_

day of \_\_\_\_\_, 20\_\_\_\_\_, enter into a contract with the State of Missouri for

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

(Insert Project Title and Number)

NOW, THEREFORE, if the Principal shall faithfully perform and fulfill all the undertakings, covenants, terms, conditions and agreements of said contract during the original term of said contract and any extensions thereof that may be granted by the State of Missouri, with or without notice to the Surety and during the life of any guaranty required under the contract; and shall also faithfully perform and fulfill all undertakings, covenants, terms, conditions and agreements of any and all duly authorized modifications of said contract that may hereafter be made with or without notice to the Surety; and shall also promptly make payment for materials incorporated, consumed or used in connection with the work set forth in the contract referred to above, and all insurance premiums, both compensation and all other kinds of insurance, on said work, and for all labor performed on such work, whether by subcontractor or otherwise, at not less than the prevailing hourly rate of wages for work of a similar character (exclusive of maintenance work) in the locality in which the work is performed and not less than the prevailing hourly rate of wages for legal holiday and overtime work (exclusive of maintenance work) in the locality in which the work is performed both as determined by the Department of Labor and Industrial Relations or determined by the Court of Appeal, as provided for in said contract and in any and all duly authorized modifications of said contract that may be hereafter made, with or without notice to the Surety, then, this obligation shall be void and of no effect, but it is expressly understood that if the Principal should make default in or should fail to strictly, faithfully and efficiently do, perform and comply with any or more of the covenants, agreements, stipulations, conditions, requirements or undertakings, as specified in or by the terms of said contract, and with the time therein named, then this obligation shall be valid and binding upon each of the parties hereto and this bond shall remain in full force and effect; and the same may be sued on at the instance of any material man, laborer, mechanic, subcontractor, individual, or otherwise to whom such payment is due, in the name of the State of Missouri, to the use of any such person.

AND, IT IS FURTHER specifically provided that any modifications which may hereinafter be made in the terms of the contract or in the work to be done under it or the giving by the Owner of any extension of the time for the performance of the contract or any other forbearance on the part of either the Owner or the Principal to the other, shall not in any way release the Principal and the Surety, or either or any of them, their heirs, executors, administrators and successors, from their liability hereunder, notice to the Surety of any such extension, modifications or forbearance being hereby waived.

IN WITNESS WHEREOF, the above bounden parties have executed the within instrument this \_\_\_\_\_ day of \_\_\_\_\_, 20 \_\_\_\_.

**AS APPLICABLE:**

**AN INDIVIDUAL**

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

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

**A PARTNERSHIP**

Name of Partner: \_\_\_\_\_

Signature of Partner: \_\_\_\_\_

Name of Partner: \_\_\_\_\_

Signature of Partner: \_\_\_\_\_

**CORPORATION**

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

Signature of President: \_\_\_\_\_

**SURETY**

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

Attorney-in-Fact: \_\_\_\_\_

Address of Attorney-in-Fact: \_\_\_\_\_

Telephone Number of Attorney-in-Fact: \_\_\_\_\_

Signature Attorney-in-Fact: \_\_\_\_\_

**NOTE:** Surety shall attach Power of Attorney



**REASON FOR SUBSTITUTION**

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**DOES PROPOSED SUBSTITUTION AFFECT OTHER PARTS OF WORK?**

YES     NO

IF YES, EXPLAIN

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**SUBSTITUTION REQUIRES DIMENSIONAL REVISION OR REDESIGN OF STRUCTURE OR A/E WORK**

YES     NO

**BIDDER'S/CONTRACTOR'S STATEMENT OF CONFORMANCE OF PROPOSED SUBSTITUTION TO CONTRACT REQUIREMENT:**

We have investigated the proposed substitution. We believe that it is equal or superior in all respects to specified product, except as stated above; that it will provide the same Warranty as specified product; that we have included complete implications of the substitution; that we will pay redesign and other costs caused by the substitution which subsequently become apparent; and that we will pay costs to modify other parts of the Work as may be needed, to make all parts of the Work complete and functioning as a result of the substitution.

BIDDER/CONTRACTOR

DATE

**REVIEW AND ACTION**

Resubmit Substitution Request with the following additional information:

---

Substitution is accepted.

Substitution is accepted with the following comments:

---

Substitution is not accepted.

ARCHITECT/ENGINEER

DATE



PROJECT NUMBER

KNOW ALL MEN BY THESE PRESENT THAT:                    hereinafter called "Subcontractor" who heretofore entered into an agreement with                    hereinafter called "Contractor", for the performance of work and/or furnishing of material for the construction of the project entitled

(PROJECT TITLE, PROJECT LOCATION, AND PROJECT NUMBER)

at

(ADDRESS OF PROJECT)

for the State of Missouri (Owner) which said subcontract is by this reference incorporated herein, in consideration of such final payment by Contractor.

DOES HEREBY:

1. ACKNOWLEDGE that they have been **PAID IN FULL** all sums due for work and materials contracted or done by their Subcontractors, Material Vendors, Equipment and Fixture Suppliers, Agents and Employees, or otherwise in the performance of the Work called for by the aforesaid Contract and all modifications or extras or additions thereto, for the construction of said project or otherwise.
2. RELEASE and fully, finally, and forever discharge the Owner from any and all suits, actions, claims, and demands for payment for work performed or materials supplied by Subcontractor in accordance with the requirements of the above referenced Contract.
1. REPRESENT that all of their Employees, Subcontractors, Material Vendors, Equipment and Fixture Suppliers, and everyone else has been **paid in full** all sums due them, or any of them, in connection with performance of said Work, or anything done or omitted by them, or any of them in connection with the construction of said improvements, or otherwise.

DATED this                    day of                    , 20                    .

NAME OF SUBCONTRACTOR

BY (TYPED OR PRINTED NAME)

SIGNATURE

TITLE

ORIGINAL: FILE/Closeout Documents



STATE OF MISSOURI  
 OFFICE OF ADMINISTRATION  
 DIVISION OF FACILITIES MANAGEMENT, DESIGN AND CONSTRUCTION  
**MBE/WBE/SDVE PROGRESS REPORT**  
 SUBMIT WITH **ALL** INVOICES: (PLEASE CHECK APPROPRIATE BOX BELOW)  
CONSULTANT      CONSTRUCTION

INVOICE NO.	PROJECT NUMBER
CHECK IF FINAL <input type="checkbox"/> <b>FINAL</b>	DATE

PROJECT TITLE
PROJECT LOCATION
FIRM
TOTAL CONTRACT AMOUNT \$

THE PERCENTAGE AND DOLLAR AMOUNT OF THIS PROJECT THAT ARE TO BE MBE/WBE/SDVE AS INDICATED IN THE ORIGINAL CONTRACT:      % and \$ .

<b>CHECK</b> MBE WBE SDVE	ITEM OF WORK	TOTAL AMOUNT OF SUBCONTRACT	\$ AMOUNT & % COMPLETE (PAID-TO-DATE)	CONSULTANT/SUBCONSULTANT OR CONTRACTOR/SUBCONTRACTOR/SUPPLIER NAME, ADDRESS, CONTACT, AND PHONE NUMBER
MBE <input type="checkbox"/> WBE <input type="checkbox"/> SDVE <input type="checkbox"/>		\$	\$  %	- -
MBE <input type="checkbox"/> WBE <input type="checkbox"/> SDVE <input type="checkbox"/>		\$	\$  %	- -
MBE <input type="checkbox"/> WBE <input type="checkbox"/> SDVE <input type="checkbox"/>		\$	\$  %	- -
MBE <input type="checkbox"/> WBE <input type="checkbox"/> SDVE <input type="checkbox"/>		\$	\$  %	- -
MBE <input type="checkbox"/> WBE <input type="checkbox"/> SDVE <input type="checkbox"/>		\$	\$  %	- -

ORIGINAL: Attach to ALL Progress and Final Payments



STATE OF MISSOURI  
 OFFICE OF ADMINISTRATION  
 DIVISION OF FACILITIES MANAGEMENT, DESIGN AND CONSTRUCTION  
**AFFIDAVIT – COMPLIANCE WITH PREVAILING WAGE LAW**

PROJECT NUMBER
----------------

Before me, the undersigned Notary Public, in and for the County of \_\_\_\_\_

State of \_\_\_\_\_ personally came and appeared \_\_\_\_\_

(NAME)

\_\_\_\_\_ of the \_\_\_\_\_

(POSITION) (NAME OF THE COMPANY)

(a corporation) (a partnership) (a proprietorship) and after being duly sworn did depose and say that all provisions and requirements set out in Chapter 290, Sections 290.210 through and including 290.340, Missouri Revised Statutes, pertaining to the payment of wages to workmen employed on public works project have been fully satisfied and there has been no exception to the full and completed compliance with said provisions and requirements and with Wage Determination No: \_\_\_\_\_ issued by the Department of Labor and Industrial Relations, State of Missouri on the \_\_\_\_\_ day of \_\_\_\_\_ 20 \_\_\_\_\_ in carrying out the contract and working in connection with \_\_\_\_\_

(NAME OF PROJECT)

Located at \_\_\_\_\_ in \_\_\_\_\_ County

(NAME OF THE INSTITUTION)

Missouri, and completed on the \_\_\_\_\_ day of \_\_\_\_\_ 20 \_\_\_\_\_

SIGNATURE

**NOTARY INFORMATION**

NOTARY PUBLIC EMBOSSEER OR BLACK INK RUBBER STAMP SEAL	STATE	COUNTY (OR CITY OF ST. LOUIS)
	SUBSCRIBED AND SWORN BEFORE ME, THIS	
	DAY OF	YEAR
	NOTARY PUBLIC SIGNATURE	MY COMMISSION EXPIRES
NOTARY PUBLIC NAME (TYPED OR PRINTED)		<b>USE RUBBER STAMP IN CLEAR AREA BELOW</b>

FILE: Closeout Documents

# GENERAL CONDITIONS

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## SECTION 007213 - GENERAL CONDITIONS

- A. These General Conditions apply to each section of these specifications. The Contractor is subject to the provisions contained herein.
- B. The General Conditions are intended to define the relationship of the Owner, the Designer and the Contractor thereby establishing certain rules and provisions governing the operation and performance of the work so that the work may be performed in a safe, orderly, expeditious and workmanlike manner.

## ARTICLE 1 – GENERAL PROVISIONS

### ARTICLE 1.1 - DEFINITIONS

- A. As used in these contract documents, the following terms shall have the meanings and refer to the parties designated in these definitions.
  - 1. **"COMMISSIONER"**: The Commissioner of the Office of Administration.
  - 2. **"CONSTRUCTION DOCUMENTS"**: The "Construction Documents" shall consist of the Project Manual, Drawings and Addenda.
  - 3. **"CONSTRUCTION REPRESENTATIVE:"** Whenever the term "Construction Representative" is used, it shall mean the Owner's Representative at the work site.
  - 4. **"CONTRACTOR"**: Party or parties who have entered into a contract with the Owner to furnish work under these specifications and drawings.
  - 5. **"DESIGNER"**: When the term "Designer" is used herein, it shall refer to the Architect, Engineer, or Consultant of Record specified and defined in Paragraph 2.0 of the Supplemental Conditions, or his duly authorized representative. The Designer may be either a consultant or state employee.
  - 6. **"DIRECTOR"**: Whenever the term "Director" is used, it shall mean the Director of the Division of Facilities Management, Design and Construction or his Designee, representing the Office of Administration, State of Missouri. The Director is the agent of the Owner.
  - 7. **"DIVISION"**: Shall mean the Division of Facilities Management, Design and Construction, State of Missouri.

- 8. **"INCIDENTAL JOB BURDENS"**: Shall mean those expenses relating to the cost of work, incurred either in the home office or on the job-site, which are necessary in the course of doing business but are incidental to the job. Such costs include office supplies and equipment, postage, courier services, telephone expenses including long distance, water and ice and other similar expenses.
- 9. **"JOINT VENTURE"**: An association of two (2) or more businesses to carry out a single business enterprise for profit for which purpose they combine their property, capital, efforts, skills and knowledge.
- 10. **"OWNER"**: Whenever the term "Owner" is used, it shall mean the State of Missouri.
- 11. **"PROJECT"**: Wherever the term "Project" is used, it shall mean the work required to be completed by the construction contract.
- 12. **"PROJECT MANUAL"**: The "Project Manual" shall consist of Introductory Information, Invitation for Bid, Instructions to Bidders, Bid Documents, Additional Information, Standard Forms, General Conditions, Supplemental General Conditions, General Requirements and Technical Specifications.
- 13. **"SUBCONTRACTOR"**: Party or parties who contract under, or for the performance of part or this entire Contract between the Owner and Contractor. The subcontract may or may not be direct with the Contractor.
- 14. **"WORK"**: Labor, material, supplies, plant and equipment required to perform and complete the service agreed to by the Contractor in a safe, expeditious, orderly and workmanlike manner so that the project shall be complete and finished in the best manner known to each respective trade.
- 15. **"WORKING DAYS"**: are all calendar days except Saturdays, Sundays and the following holidays: New Year's Day, Martin Luther King, Jr. Day, Lincoln Day, Washington's Birthday (observed), Truman Day, Memorial Day, Independence Day, Labor Day, Columbus Day, Veterans Day (observed), Thanksgiving Day, Christmas Day.

### ARTICLE 1.2 DRAWINGS AND SPECIFICATIONS

- A. In case of discrepancy between drawings and specifications, specifications shall govern. Should discrepancies in architectural drawings, structural drawings and mechanical drawings occur, architectural drawings shall govern and, in case of

conflict between structural and mechanical drawings, structural drawings shall govern.

- B. Specifications are separated into titled divisions for convenience of reference only and to facilitate letting of contracts and subcontracts. The Contractor is responsible for establishing the scope of work for subcontractors, which may cross titled divisions. Neither the Owner nor Designer will establish limits and jurisdiction of subcontracts.
- C. Figured dimensions take precedence over scaled measurements and details over smaller scale general drawings. In the event of conflict between any of the documents contained within the contract, the documents shall take precedence and be controlling in the following sequence: addenda, supplementary general conditions, general conditions, division 1 specifications, technical division specifications, drawings, bid form and instructions to bidders.
- D. Anything shown on drawings and not mentioned in these specifications or vice versa, as well as any incidental work which is obviously necessary to complete the project within the limits established by the drawings and specifications, although not shown on or described therein, shall be performed by the Contractor at no additional cost as a part of his contract.
- E. Upon encountering conditions differing materially from those indicated in the contract documents, the Contractor shall promptly notify the Designer and Construction Representative in writing before such conditions are disturbed. The Designer shall promptly investigate said conditions and report to the Owner, with a recommended course of action. If conditions do materially differ and cause an increase or decrease in contract cost or time required for completion of any portion of the work, a contract change will be initiated as outlined in Article 4 of these General Conditions.
- E. Only work included in the contract documents is authorized, and the Contractor shall do no work other than that described therein or in accordance with appropriately authorized and approved contract changes.

### **ARTICLE 1.3 - COMPLIANCE WITH LAWS, PERMITS, REGULATIONS AND INSPECTIONS**

- A. Since the Owner is the State of Missouri, municipal or political subdivisions, zoning ordinances, construction codes (other than licensing of trades), and other like ordinances are not applicable to construction on Owner's property, and Contractor will not be required to submit drawings and specifications to any municipal or political subdivision, authority, obtain construction permits or any other licenses (other

than licensing of trades) or permits from or submit to inspections by any municipality or political subdivision relating to the construction for this project. All permits or licenses required by municipality or political subdivision for operation on property not belonging to Owner shall be obtained by and paid for by Contractor. Each Contractor shall comply with all applicable laws, ordinances, rules and regulations that pertain to the work of this contract.

- B. Contractors, subcontractors and their employees engaged in the businesses of electrical, mechanical, plumbing, carpentry, sprinkler system work, and other construction related trades shall be licensed to perform such work by the municipal or political subdivision where the project is located, if such licensure is required by local code. Local codes shall dictate the level (master, journeyman, and apprentice) and the number, type and ratio of licensed tradesmen required for this project within the jurisdiction of such municipal or political subdivision.
- C. Equipment and controls manufacturers and their authorized service and installation technicians that do not maintain an office within the jurisdiction of the municipal or political subdivision but are a listed or specified contractor or subcontractor on this project are exempt from Paragraph 1.3 B above.
- D. The Contractor shall post a copy of the wage determination issued for the project and included as a part of the contract documents, in a prominent and easily accessible location at the site of construction for the duration of the project.
- E. Any contractor or subcontractor to such contractor at any tier signing a contract to work on this project shall provide a ten-hour Occupational Safety and Health Administration (OSHA) construction safety program for their on-site employees which includes a course in construction safety and health approved by OSHA or a similar program approved by the Department of Labor and Industrial Relations which is at least as stringent as an approved OSHA program. The contractor shall forfeit as a penalty to the public body on whose behalf the contract is made or awarded, two thousand five hundred dollars plus one hundred dollars for each employee employed by the contractor or subcontractor, for each calendar day, or portion thereof, such employee is employed without the required training.

### **ARTICLE 1.4 - NONDISCRIMINATION IN EMPLOYMENT**

- A. The Contractor and his subcontractors will not discriminate against individuals based on race, color, religion, national origin, sex, disability, or

age, but may use restrictions which relate to bona fide occupational qualifications. Specifically, the Contractor and his subcontractors shall not discriminate:

1. Against recipients of service on the basis of race, color, religion, national origin, sex, disability or age.
2. Against any employee or applicant, for employment on the basis of race, color, religion, national origin, sex or otherwise qualified disability status.
3. Against any applicant for employment or employee on the basis of age, where such applicant or employee is between ages 40 and 70 and where such Contractor employs at least 20 persons.
4. Against any applicant for employment or employee on the basis of that person's status as a disabled or Vietnam-era veteran.

The Contractor and his Subcontractors will take affirmative action to insure applicants for employment and employees are treated equally without regard to race, color, religion, national origin, sex, disability, or age. Such action shall include, but not be limited to, the following: employment, upgrading, demotion and transfer; recruitment or recruitment advertising; and selection for training, including apprenticeship. The Contractor and his Subcontractors will give written notice of their commitments under this clause to any labor union with which they have bargaining or other agreements.

- B. The Contractor and his Subcontractors shall develop, implement, maintain and submit in writing to the Owner an affirmative action program if at least fifty (50) persons in the aggregate are employed under this contract. If less than fifty (50) persons in the aggregate are to be employed under this contract, the Contractor shall submit, in lieu of the written affirmative action program, a properly executed Affidavit for Affirmative Action in the form included in the contract specifications. For the purpose of this section, an "affirmative action program" means positive action to influence all employment practices (including, but not limited to, recruiting, hiring, promoting and training) in providing equal employment opportunity regardless of race, color, sex, national origin, religion, age (where the person affected is between age 40 and 70), disabled and Vietnam-era veteran status, and disability. Such "affirmative action program" shall include:

1. A written policy statement committing the total organization to affirmative action and

assigning management responsibilities and procedures for evaluation and dissemination;

2. The identification of a person designated to handle affirmative action;
3. The establishment of non-discriminatory selection standards, objective measures to analyze recruitment, an upward mobility system, a wage and salary structure, and standards applicable to lay-off, recall, discharge, demotion and discipline;
4. The exclusion of discrimination from all collective bargaining agreements; and
5. Performance of an internal audit of the reporting system to monitor execution and to provide for future planning.

In the enforcement of this non-discrimination clause, the Owner may use any reasonable procedures available, including, but not limited to: requests, reports, site visits and inspection of relevant documents of contractors and subcontractors.

- C. In the event of the Contractor's or his subcontractor's noncompliance with any provisions of this Article of the Contract, the Owner may cancel this contract in whole or in part or require the Contractor to terminate his contract with the subcontractor.

#### **ARTICLE 1.5 - ANTI-KICKBACK**

- A. No employee of the division, shall have or acquire any pecuniary interest, whether direct or indirect, in this contract or in any part hereof. No officer, employee, designer, attorney, or administrator of or for the Owner who is authorized in such capacity and on behalf of the Owner to exercise any legislative, executive, supervisory or other similar functions in connection with the construction of the project, shall have or acquire any pecuniary interest, whether direct or indirect, in this contract, any material supply contract, subcontract, insurance contract, or any other contract pertaining to the project.

#### **ARTICLE 1.6 - PATENTS AND ROYALTIES**

- A. The Contractor shall hold and save the Owner and its officers, agents, servants and employees harmless from liabilities of any nature or kind, including cost and expenses, for, or on account of, any patented or unpatented invention, process, article or appliance manufactured or used in the performance of this contract, including its use by the Owner, unless otherwise specifically stipulated in the contract documents.
- B. If the Contractor uses any design, device or materials covered by letters, patent or copyright,

the Contractor shall provide for such use by suitable agreement with the Owner of such patented or copyrighted design, device or material. It is mutually agreed and understood, without exception, that the contract prices shall include all royalties or costs arising from the use of such design, device or materials, in any way involved in the work. The Contractor and/or his sureties shall indemnify and save harmless the Owner of the project from any and all claims for infringement by reason of the use of such patented or copyrighted design, device or materials or any trademark or copyright in connection with work agreed to be performed under this contract and shall indemnify the Owner for any cost, expense or damage it may be obliged to pay by reason of such infringement at any time during the prosecution of the work or after completion of the work.

#### **ARTICLE 1.7 - PREFERENCE FOR AMERICAN AND MISSOURI PRODUCTS AND SERVICES**

- A. By virtue of statutory authority a preference will be given to Missouri labor and to products of mines, forests and quarries of the state of Missouri when they are found in marketable quantities in the state, and all such materials shall be of the best quality and suitable character that can be obtained at reasonable market prices, all as provided for in Section 8.280, Missouri Revised Statutes and Cumulative Supplements.
- B. Furthermore, pursuant to Section 34.076 Missouri Revised Statutes and Cumulative Supplements, a preference shall be given to those persons doing business as Missouri firms, corporations, or individuals, or which maintain Missouri offices or places of business, when the quality of performance promised is equal or better and the price quoted is the same or less. In addition, in order for a non-domiciliary bidder to be successful, his bid must be that same percentage lower than a domiciliary Missouri bidder's bid, as would be required for a Missouri bidder to successfully bid in the non-domiciliary state.
- C. In accordance with the Missouri Domestic Products Procurement Act Section 34.350 RSMo and Cumulative Supplements any manufactured goods or commodities used or supplied in the performance of this contract or any subcontract thereto shall be manufactured, assembled or produced in the United States, unless the specified products are not manufactured, assembled or produced in the United States in sufficient quantities to meet the agency's requirements or cannot be manufactured, assembled or produced in the United States within the necessary time in sufficient quantities to meet the contract requirements, or if obtaining the specified products manufactured, assembled or produced in the

United States would increase the cost of this contract for purchase of the product by more than ten percent.

#### **ARTICLE 1.8 - COMMUNICATIONS**

- A. All notices, requests, instructions, approvals and claims must be in writing and shall be delivered to the Designer and copied to the Construction Representative for the project except as required by Article 1.12 Disputes and Disagreements, or as otherwise specified by the Owner in writing as stated in Section 012600. Any such notice shall be deemed to have been given as of the time of actual receipt.
- B. The Contractor shall attend on-site progress and coordination meetings, as scheduled by the Construction Representative, no less than once a month.
- C. The Contractor shall ensure that major subcontractors and suppliers shall attend monthly progress meetings as necessary to coordinate the work, and as specifically requested by the Construction Representative.

#### **ARTICLE 1.9 - SEPARATE CONTRACTS AND COOPERATION**

- A. The Owner reserves the right to let other contracts in connection with this work. The Contractor shall afford other contractors reasonable opportunity for the introduction and storage of their materials and the execution of their work and shall properly connect and coordinate his work with theirs.
- B. The Contractor shall consult the drawings for all other contractors in connection with this work. Any work conflicting with the above shall be brought to the attention of the Owner's Representative before the work is performed. If the Contractor fails to do this, and constructs any work which interferes with the work of another contractor, the Contractor shall remove any part so conflicting and rebuild same, as directed by the Owner's Representative at no additional cost to the Owner.
- C. Each contractor shall be required to coordinate his work with other contractors so as to afford others reasonable opportunity for execution of their work. No contractor shall delay any other contractor by neglecting to perform contract work at the proper time. If any contractor causes delay to another, they shall be liable directly to that contractor for such delay in addition to any liquidated damages which might be due the Owner.
- D. Should the Contractor or project associated subcontractors refuse to cooperate with the instructions and reasonable requests of other Contractors or other subcontractors in the overall

coordinating of the work, the Owner may take such appropriate action and issue directions, as required, to avoid unnecessary and unwarranted delays.

- E. Each Contractor shall be responsible for damage done to Owner's or other Contractor's property by him/her or workers in his employ through their fault or negligence.
- F. Should a Contractor sustain any damage through any act or omission of any other Contractor having a contract with the Owner, the Contractor so damaged shall have no claim or cause of action against the Owner for such damage, but shall have a claim or cause of action against the other Contractor to recover any and all damages sustained by reason of the acts or omissions of such Contractor. The phrase "acts or omissions" as used in this section shall be defined to include, but not be limited to, any unreasonable delay on the part of any such contractors.

#### **ARTICLE 1.10 - ASSIGNMENT OF CONTRACT**

- A. No assignment by Contractor of any amount or any part of this contract or of the funds to be received there under will be recognized unless such assignment has had the written approval of the Director and the surety has been given due notice of such assignment and has furnished written consent thereto. In addition to the usual recitals in assignment contracts, the following language must be set forth: "It is agreed that the funds to be paid to the assignee under this assignment are subject to performance by the Contractor of this contract and to claims or liens for services rendered or materials supplied for the performance of the work called for in said contract in favor of all persons, firms or corporations rendering such services or supplying such materials."

#### **ARTICLE 1.11 - INDEMNIFICATION**

- A. Contractor agrees to indemnify and save harmless Owner and its respective commissioners, officers, officials, agents, consultants and employees and Designer, their agents, servants and employees, from and against any and all liability for damage arising from injuries to persons or damage to property occasioned by any acts or omissions of Contractor, any subcontractors, agents, servants or employees, including any and all expense, legal or otherwise, which may be incurred by Owner or Designer, its agents, servants or employees, in defense of any claim, action or suit.
- B. The obligations of the Contractor under this paragraph shall not extend to the liability of the Designer, his agents or employees, arising out of (1) the preparation or approval of maps, drawings, opinions, reports, surveys, contract changes, design or specifications, or (2) giving of or the failure to

give directions or instructions by the Designer, his agents or employees as required by this contract documents provided such giving or failure to give is the primary cause of the injury or damage.

#### **ARTICLE 1.12 - DISPUTES AND DISAGREEMENTS**

- A. It is hereby expressly agreed and understood that in case any controversy or difference of opinion arises during construction, best efforts will be given to resolution at the field level. Should those efforts be unsuccessful, the Contractor has the right to appeal in writing, the decision of the Director's Designee to the Director at Room 730 Truman Building, P.O. Box 809, Jefferson City, Missouri 65102. The decision of the Director shall be final and binding on all parties.

#### **ARTICLE 2 -- OWNER/DESIGNER RESPONSIBILITIES**

- A. The Owner shall give all orders and directions contemplated under this contract relative to the execution of the work. During progress of work the Owner will be represented at the project site by the Construction Representative and/or Designer, whose responsibilities are to see that this contract is properly fulfilled.
- B. The Owner shall at all times have access to the work whenever it is in preparation or progress. The Contractors shall provide proper facilities for such access and for inspection and supervision.
- C. All materials and workmanship used in the work shall be subject to the inspection of the Designer and Construction Representative, and any work which is deemed defective shall be removed, rebuilt or made good immediately upon notice. The cost of such correction shall be borne by the Contractor. Contractor shall not be entitled to an extension of the contract completion date in order to remedy defective work. All rejected materials shall be immediately removed from the site of the work.
- D. If the Contractor fails to proceed at once with the correction of rejected defective materials or workmanship, the Owner may, by separate contract or otherwise, have the defects remedied or rejected. Materials removed from the site and charge the cost of the same against any monies which may be due the Contractor, without prejudice to any other rights or remedies of the Owner.
- E. Failure or neglect on the part of Owner to observe faulty work, or work done which is not in accordance with the drawings and specifications shall not relieve the Contractor from responsibility

for correcting such work without additional compensation.

- F. The Owner shall have the right to direct the Contractor to uncover any completed work.
  - 1. If the Contractor fails to adequately notify the Construction Representative and/or Designer of an inspection as required by the Contract Documents, the Contractor shall, upon written request, uncover the work. The Contractor shall bear all costs associated with uncovering and again covering the work exposed.
  - 2. If the Contractor is directed to uncover work, which was not otherwise required by the Contract Documents to be inspected, and the work is found to be defective in any respect, no compensation shall be allowed for this work. If, however, such work is found to meet the requirements of this contract, the actual cost of labor and material necessarily involved in the examination and replacement plus 10% shall be allowed the Contractor.
- G. The Designer shall give all orders and directions contemplated under this contract relative to the scope of the work and shall give the initial interpretation of the contract documents.
- H. The Owner may file a written notice to the Contractor to dismiss immediately any subcontractors, project managers, superintendents, foremen, workers, watchmen or other employees whom the Owner may deem incompetent, careless or a hindrance to proper or timely execution of the work. The Contractor shall comply with such notice as promptly as practicable without detriment to the work or its progress.
- I. If in the Owner's judgment it becomes necessary at any time to accelerate work, when ordered by the Owner in writing, the Contractor shall redirect resources to such work items and execute such portions of the work as may be required to complete the work within the current approved contract schedule.

### **ARTICLE 3 -- CONTRACTOR RESPONSIBILITIES**

#### **ARTICLE 3.1 -- ACCEPTABLE SUBSTITUTIONS**

- A. The Contractor may request use of any article, device, product, material, fixture, form or type of construction which in the judgment of the Owner and Designer is equal in all respects to that named. Standard products of manufacturers other than those specified will be accepted when, prior to the ordering or use thereof, it is proven to the satisfaction of the Owner and Designer that they are equal in design, strength, durability, usefulness and convenience for the purpose intended.

- B. Any changes required in the details and dimensions indicated on the drawings for the substitution of products other than those specified shall be properly made at the expense of the Contractor requesting the substitution or change.
- C. The Contractor shall submit a request for such substitutions in writing to the Owner and Designer within twenty (20) working days after the date of the "Notice to Proceed." Thereafter no consideration will be given to alternate forms of accomplishing the work. This Article does not preclude the Owner from exercising the provisions of Article 4 hereof.
- D. Any request for substitution by the Contractor shall be submitted in accordance with SECTION 002113 - INSTRUCTIONS TO BIDDERS.
- E. When a material has been approved, no change in brand or make will be permitted unless:
  - 1. Written verification is received from the manufacturer stating they cannot make delivery on the date previously agreed, or
  - 2. Material delivered fails to comply with contract requirements.

#### **ARTICLE 3.2 -- SUBMITTALS**

- A. The Contractor's submittals must be submitted with such promptness as to allow for review and approval so as not to cause delay in the work. The Contractor shall coordinate preparation and processing of submittals with performance of construction activities.

Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

Submit four (4) copies to the Designer and additional copies as required for the subcontractors and material suppliers. Also provide copies to meet the requirements for maintenance manuals.
- B. All subcontractors' shop drawings and schedules shall be submitted by the Contractor and shall bear evidence that Contractor has received, reviewed, and approved them. Any shop drawings and schedules submitted without this evidence will be returned to the Contractor for resubmission.
- C. The Contractor shall include with the shop drawing, a letter indicating any and all deviations from the drawings and/or specifications. Failure to notify the Designer of such deviations will be grounds for subsequent rejection of the related work or materials. If, in the opinion of the Designer, the deviations are not acceptable, the Contractor will be required to furnish the item as specified and indicated on the drawings.

- D. The Designer shall check shop drawings and schedules with reasonable promptness and approve them only if they conform to the design concept of the project and comply with the information given in the contract documents. The approval shall not relieve the Contractor from the responsibility to comply with the drawings and specifications, unless the Contractor has called the Designer's attention to the deviation, in writing, at the time of submission and the Designer has knowingly approved thereof. An approval of any such modification will be given only under the following conditions:
1. It is in the best interest of the Owner
  2. It does not increase the contract sum and/or completion time
  3. It does not deviate from the design intent
  4. It is without prejudice to any and all rights under the surety bond.
- E. No extension of time will be granted because of the Contractor's failure to submit shop drawings and schedules in ample time to allow for review, possible resubmission, and approval. Fabrication of work shall not commence until the Contractor has received approval. The Contractor shall furnish prints of approved shop drawings and schedules to all subcontractors whose work is in any way related to the work under this contract. Only prints bearing this approval will be allowed on the site of construction
- F. The Contractor shall maintain a complete file on-site of approved shop drawings available for use by the Construction Representative.

**ARTICLE 3.3 – AS-BUILT DRAWINGS**

- A. The Contractor shall update a complete set of the construction drawings, shop drawings and schedules of all work monthly by marking changes, and at the completion of their work (prior to submission of request for final payment) note all changes and turn the set over to the Construction Representative. The updates shall show all addenda, all field changes that were made to adapt to field conditions, changes resulting from contract changes or supplemental instructions, and all locations of structures, buried installations of piping, conduit, and utility services. All buried and concealed items both inside and outside shall be accurately located as to depth and referenced to permanent features such as interior or exterior wall faces and dimensions shall be given in a neat and legible manner in a contrasting colored pencil or ink. If approved by the Designer, an electronic file format may be provided.

**ARTICLE 3.4 – GUARANTY AND WARRANTIES**

A. General Guaranty

1. Neither the final certificate of payment nor any provision in the contract documents nor partial use or occupancy of the premises by the Owner shall constitute an acceptance of work not done in accordance with contract requirements.
2. The Contractor or surety shall remedy any defects in the work and pay for any damage to property resulting there from which shall appear within a period of one (1) year from the date of substantial completion unless a longer period is otherwise specified or a differing guaranty period has been established in the substantial completion certificate. The Owner will give notice of observed defects with reasonable promptness.
3. In case of default on the part of the Contractor in fulfilling this part of this contract, the Owner may correct the work or repair the damage and the cost and expense incurred in such event shall be paid by or recoverable from the Contractor or surety.
4. The work will be free from defects not inherent in the quality required or permitted, and that the Work will conform to the requirements of the Contract Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. The Contractor's guaranty excludes remedy for damage or defect caused by abuse, modifications not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear under normal usage. If required by the Owner, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment

B. Extended Warranty

Manufacturer's certificates of warranty shall be obtained for all major equipment. Warranty shall be obtained for at least one year. Where a longer period is offered at no additional cost or called for in the specific equipment specifications, the longer period shall govern.

**ARTICLE 3.5 -- OPERATION AND MAINTENANCE MANUALS**

- A. Immediately after equipment submittals are approved and no later than ten (10) working days prior to the substantial completion inspection, the Contractor shall provide to the Designer three (3)

copies of operating instructions and service manuals, containing the following:

1. Start-up and Shut-down Procedures: Provide a step-by-step write up of all major equipment. When manufacturer's printed start-up, trouble shooting and shut-down procedures are available; they may be incorporated into the operating manual for reference.
  2. Operating Instructions: Written operating instructions shall be included for the efficient and safe operation of all equipment.
  3. Equipment List: List of all major equipment as installed shall be prepared to include model number, capacities, flow rate, name plate data, shop drawings and air and water balance reports.
  4. Service Instructions: Provide the following information for all pieces of equipment.
    - a. Recommended spare parts including catalog number and name of local supplier or factory representative.
    - b. Belt sizes, types, and lengths.
    - c. Wiring diagrams.
  5. Manufacturer's Certificate of Warranty as described in Article 3.4.
  6. Prior to the final payment, furnish to the Designer three (4) copies of parts catalogs for each piece of equipment furnished by him/her on the project with the components identified by number for replacement ordering.
- B. Submission of operating instructions shall be done in the following manner.
1. Manuals shall be in quadruplicate, and all materials shall be bound into volumes of standard 8½" x 11" hard binders. Large drawings too bulky to be folded into 8½" x 11" shall be separately bound or folded and in envelopes, cross referenced and indexed with the manuals.
  2. The manuals shall identify project name, project number, and include the name and address of the Contractor, subcontractors and manufacturers who were involved with the activity described in that particular manual.
  3. Internally subdivide the binder contents with permanent page dividers, logically organized with tab titles clearly printed under reinforced laminated plastic tabs.
  4. Contents: Prepare a Table of Contents for each volume, with each product or system description identified.

### **ARTICLE 3.6 – OTHER CONTRACTOR RESPONSIBILITIES**

- A. The Contractor shall keep on site, during progress of the work, a competent superintendent satisfactory to the Construction Representative. The superintendent shall represent the Contractor and all agreements made by the superintendent shall be binding. The superintendent shall carefully study and compare all drawings, specifications and other instructions and shall promptly notify the Construction Representative and Designer, in writing, any error, inconsistency or omission which may be discovered. The superintendent shall coordinate all work on the project. Any change of the superintendent shall be approved by the Construction Representative.
- B. Contractor shall, at all times, enforce strict discipline and good order among his employees, and shall not employ on the work any unfit person or anyone not skilled in the work assigned to him/her.
- C. The Contractor shall supply sufficient labor, material, plant and equipment and pay when due any laborer, subcontractor or supplier for supplies furnished and otherwise prosecute the work with diligence to prevent work stoppage and insure completion thereof within the time specified.
- D. The Contractor and each of his subcontractors shall submit to the Construction Representative, through the Designer such schedules of quantities and costs, progress schedules, payrolls, reports, estimates, records and other data as the Owner may request concerning work performed or to be performed under this contract.
- E. The Contractor, subcontractors, and material suppliers shall upon written request, give the Owner access to all time cards, material invoices, payrolls, estimates, profit and loss statements, and all other direct or indirect costs related to this work.
- F. The Contractor shall be responsible for laying out all contract work such as layout of architectural, structural, mechanical and electrical work, which shall be coordinated with layouts of subcontractors for general construction work. The Contractor is also responsible for unloading, uncrating and handling of all materials and equipment to be erected or placed by him/her, whether furnished by Contractor or others. No extra charges or compensation will be allowed as a result of failure to verify dimensions before ordering materials or fabricating items.
- G. The Contractor must notify the Construction Representative at least one working day before

placing concrete or burying underground utilities, pipelines, etc.

- H. Contractors shall prearrange time with the Construction Representative for the interruption of any facility operation. Unless otherwise specified in these documents, all connections, alterations or relocations as well as all other portions of the work will be performed during normal working hours.
- I. The Contractor shall coordinate all work so there will not be prolonged interruptions of existing equipment operation. Any existing plumbing, heating, ventilating, air conditioning or electrical disconnections necessary for the project, which affect portions of this construction or building or any other building must be scheduled with the Construction Representative to minimize or avoid any disruption of facility operations. In no case, unless previously approved in writing by the Construction Representative, shall utilities be left disconnected at the end of a work day or over a weekend. Any interruption of utilities either intentionally or accidentally shall not relieve the Contractor responsible for the interruption from the responsibility to repair and restore the utility to normal service. Repairs and restoration shall be made before the workers responsible for the repair and restoration leave the job.
- J. Contractors shall limit operations and storage of materials to the area within the project, except as necessary to connect to existing utilities, and shall not encroach on neighboring property. The Contractor shall be responsible for repair of their damage to property on or off the project site occurring during construction of project. All such repairs shall be made to the satisfaction of the property owner.
- K. Unless otherwise permitted, all materials shall be new and both workmanship and materials shall be of the best quality.
- L. Unless otherwise provided and stipulated within these specifications, the Contractor shall furnish, construct, and/or install and pay for materials, devices, mechanisms, equipment, all necessary personnel, utilities including, but not limited to water, heat, light and electric power, transportation services, applicable taxes of every nature, and all other facilities necessary for the proper execution and completion of the work.
- M. Contractor shall carefully examine the plans and drawings and shall be responsible for the proper fitting of his material, equipment and apparatus into the building.
- N. The Contractor or subcontractors shall not overload, or permit others to overload, any part of

any structure during the performance of this contract.

- O. All temporary shoring, bracing, etc., required for the removal of existing work and/or for the installation of new work shall be included in this contract. The Contractor shall make good, at no cost to the Owner, any damage caused by improper support or failure of shoring in any respect. Each Contractor shall be responsible for shoring required to protect his work or adjacent property and improvements of Owner and shall be responsible for shoring or for giving written notice to adjacent property owners. Shoring shall be removed only after completion of permanent supports.
- P. The Contractor shall provide at the proper time such material as is required for support of the work. If openings are required, whether shown on drawings or not, the Contractor shall see that they are properly constructed.
- Q. During the performance of work the Contractor shall be responsible for providing and maintaining warning signs, lights, signal devices, barricades, guard rails, fences and other devices appropriately located on site which will give proper and understandable warning to all persons of danger of entry onto land, structure or equipment.
- R. The Contractor shall be responsible for protection, including weather protection, and proper maintenance of all equipment and materials.
- S. The Contractor shall be responsible for care of the finished work and shall protect same from damage or defacement until substantial completion by the Owner. If the work is damaged by any cause, the Contractor shall immediately begin to make repairs in accordance with the drawings and specifications. Contractor shall be liable for all damage or loss unless attributable to the acts or omissions of the Owner or Designer. Any claim for reimbursement shall be submitted in accordance with Article 4. After substantial completion the Contractor will only be responsible for damage resulting from acts or omissions of the Contractor or subcontractors through final warranty.
- T. In the event the Contractor encounters an unforeseen hazardous material, the Contractor shall immediately stop work in the area affected and report the condition to the Owner and Designer in writing. The Contractor shall not be required, pursuant to Article 4, to perform, any work relating to hazardous materials.
- U. In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury or loss. Additional compensation

or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 4.

- V. Before commencing work, Contractors shall confer with the Construction Representative and facility representative and review any facility rules and regulations which may affect the conduct of the work.
- W. Project signs will only be erected on major projects and only as described in the specifications. If no sign is specified, none shall be erected.

### **ARTICLE 3.7 -- SUBCONTRACTS**

- A. Subcontractor assignments as identified in the bid form shall not be changed without written approval of the Owner. The Owner will not approve changes of a listed subcontractor unless the Contractor documents, to the satisfaction of the Owner that the subcontractor cannot or will not perform the work as specified.
- B. The Contractor is fully responsible to the Owner for the acts and omissions of all subcontractors and of persons either directly or indirectly employed by them.
- C. Every subcontractor shall be bound by the applicable terms and provisions of these contract documents, but no contractual relationship shall exist between any subcontractor and the Owner unless the right of the Contractor to proceed with the work is suspended or this contract is terminated as herein provided, and the Owner in writing elects to assume the subcontract.
- D. The Contractor shall upon receipt of "Notice to Proceed" and prior to submission of the first payment request, notify the Designer and Construction Representative in writing of the names of any subcontractors to be used in addition to those identified in the bid form and all major material suppliers proposed for all parts of the work.

### **ARTICLE 4 -- CHANGES IN THE WORK**

#### **4.1 CHANGES IN THE WORK**

- A. The Construction Representative, without giving notice to the surety and without invalidating this contract, may order extra work or make changes by altering, adding to or deducting from the work, this contract sum being adjusted accordingly. All such work shall be executed under the conditions of the original contract. A claim for extension of time caused by any change must be adjusted at the time of ordering such change. No future request for time will be considered.
- B. Each Contract Change shall include all costs required to perform the work including all labor,

material, equipment, overheads and profit, delay, disruptions, or other miscellaneous expenses. No subsequent requests for additional compensation including claims for delay, disruption, or reduced efficiency as a result of each change will be considered. Values from the Schedule of Values will not be binding as a basis for additions to or deductions from the contract price.

- C. The amount of any adjustment in this contract price for authorized changes shall be agreed upon before such changes become effective and shall be determined, through submission of a request for proposal, as follows:

1. By an acceptable fixed price proposal from the Contractor. Breakdowns shall include all takeoff sheets of each Contractor and subcontractor. Breakdown shall include a listing of each item of material with unit prices and number of hours of labor for each task. Labor costs per hour shall be included with labor burden identified, which shall be not less than the prevailing wage rate, etc. Overhead and profit shall be shown separately for each subcontractor and the Contractor.
2. By a cost-plus-fixed-fee (time and material) basis with maximum price, total cost not to exceed said maximum. Breakdown shall include a listing of each item of material with unit prices and number of hours of labor for each task. Labor costs per hour shall be included with labor burden identified, which shall be not less than the prevailing wage rate, etc. Overhead and profit shall be shown separately for each subcontractor and the Contractor.
3. By unit prices contained in Contractor's original bid form and incorporated in the construction contract.

- D. Overhead and Profit on Contract Changes shall be applied as follows:

1. The overhead and profit charge by the Contractor and all subcontractors shall be considered to include, but is not limited to: incidental job burdens, small truck (under 1 ton) expense, mileage, small hand tools, warranty costs, company benefits and general office overhead. Project supervision including field supervision and job site office expense shall be considered a part of overhead and profit unless a compensable time extension is granted.
2. The percentages for overhead and profit charged on Contract Changes shall be negotiated, and may vary according to the nature, extent, and complexity of the work

involved. However, the overhead and profit for the Contractor or subcontractor actually performing the work shall not exceed 14%. When one or more tiers of subcontractors are used, in no event shall any Contractor or subcontractor receive as overhead and profit more than 3% of the cost of the work performed by any of his subcontractors. In no case shall the total overhead and profit paid by the Owner on any Contract Changes exceed twenty percent (20%) of the cost of materials, labor and equipment (exclusive of Contractor or any Subcontractor overhead and profit) necessary to put the contract change work in place.

3. The Contractor will be allowed to add the cost of bonding and insurance to their cost of work. This bonding and insurance cost shall not exceed 2% and shall be allowed on the total cost of the added work, including overhead and profit.
  4. On proposals covering both increases and decreases in the amount of this contract, the application of overhead and profit shall be on the net change in the cost of the work.
  5. The percentage for overhead and profit to be credited to the Owner on Contract Changes that are solely decreases in the quantity of work or materials shall be negotiated, and may vary according to the nature, extent and complexity of the work involved, but in no case shall be less than ten percent (10%). If the percentage for overhead and profit charged for work added by Contract Changes for this contract has been negotiated to less than 10%, the negotiated rate shall then apply to credits as well.
- E. No claim for an addition to this contract sum shall be valid unless authorized as aforesaid in writing by the Owner. In the event that none of the foregoing methods are agreed upon, the Owner may order the Contractor to perform work on a time and material basis. The cost of such work shall be determined by the Contractor's actual labor and material cost to perform the work plus overhead and profit as outlined herein. The Designer and Construction Representative shall approve the Contractor's daily time and material invoices for the work involved.
- F. If the Contractor claims that any instructions involve extra cost under this contract, the Contractor shall give the Owner's Representative written notice thereof within a reasonable time after the receipt of such instructions, and in any event before proceeding to execute the work. No

such claim shall be valid unless so made and authorized by the Owner, in writing.

- G. In an emergency affecting the safety of life or of the structure or of adjoining property, the Contractor, without special instruction or authorization from the Construction Representative, is hereby permitted to act at their discretion to prevent such threatened loss or injury. The Contractor shall submit a claim for compensation for such emergency work in writing to the Owner's Representative.

#### **ARTICLE 4.2 – CHANGES IN COMPLETION TIME**

- A. Extension of the number of work days stipulated in the Contract for completion of the work with compensation may be made when:
1. The contractor documents that proposed Changes in the work, as provided in Article 4.1, extends construction activities critical to contract completion date, OR
  2. The Owner suspends all work for convenience of the Owner as provided in Article 7.3, OR
  3. An Owner caused delay extends construction activities critical to contract completion (except as provided elsewhere in these General Conditions). The Contractor is to review the work activities yet to begin and evaluate the possibility of rescheduling the work to minimize the overall project delay.
- B. Extension of the number of work days stipulated in the Contract for completion of the work without compensation may be made when:
1. Weather-related delays occur, subject to provisions for the inclusion of a specified number of "bad weather" days when provided for in Section 012100-Allowances, OR
  2. Labor strikes or acts of God occur, OR
  3. The work of the Contractor is delayed on account of conditions which were beyond the control of the Contractor, subcontractors or suppliers, and were not the result of their fault or negligence.
- C. No time extension or compensation will be provided for delays caused by or within the control of the Contractor, subcontractors or suppliers and for concurrent delays caused by the Owner.
- D. The Contractor shall notify the Owner promptly of any occurrence or conditions which in the Contractor's opinion results in a need for an extension of time. The notice shall be in writing and shall include all necessary supporting materials with details of any resultant costs and be submitted in time to permit full investigation and

evaluation of the Contractor's claim. The Owner shall promptly acknowledge the Contractor's notice and, after recommendation from the Owner's Representative and/or Designer, shall provide a decision to the Contractor. Failure on the part of the Contractor to provide such notice and to detail the costs shall constitute a waiver by the Contractor of any claim. Requests for extensions of time shall be for working days only.

## **ARTICLE 5 - CONSTRUCTION AND COMPLETION**

### **ARTICLE 5.1 – CONSTRUCTION COMMENCEMENT**

- A. Upon receipt of the "Intent to Award" letter, the Contractor must submit the following properly executed instruments to the Owner:
1. Contract;
  2. Performance/payment bond as described in Article 6.1;
  3. Certificates of Insurance, or the actual policies themselves, showing that the Contractor has obtained the insurance coverage required by Article 6.2.
  4. Written Affirmative Action Plans as required in Article 1.4.

Above referenced items must be received by the Owner within ten (10) working days after the effective date of the contract. If not received, the Owner may treat the failure to timely submit them as a refusal by the Contractor to accept a contract for this work and may retain as liquidated damages the Contractor's bid bond, cashier's check or certified check as provided in the Instructions to Bidders. Upon receipt the Owner will issue a "Notice to Proceed" with the work to the Contractor.

- B. Within the time frame noted in Section 013200 - Schedules, following receipt of the "Notice to Proceed", the Contractor shall submit to the Owner a progress schedule and schedule of values, showing activities through the end of the contract period. Should the Contractor not receive written notification from the Owner of the disapproval of the schedule of values within fifteen (15) working days, the Contractor may consider it approved for purpose of determining when the first monthly Application and Certification for Payment may be submitted.
- C. The Contractor may commence work upon receipt of the Division of Facilities Management, Design and Construction's "Notice to Proceed" letter. Contractor shall prosecute the work with faithfulness and energy, and shall complete the

entire work on or before the completion time stated in the contract documents or pay to the Owner the damages resulting from the failure to timely complete the work as set out within Article 5.4.

### **ARTICLE 5.2 -- PROJECT CONSTRUCTION**

- A. Each Contractor shall submit for the Owner's approval, in reproducible form, a progress schedule showing the rate of progress and the order of the work proposed to carry on various phases of the project. The schedule shall be in conformance with the requirements outlined in Section 013200 – Schedules.
- B. Contractor shall employ and supply a sufficient force of workers, material, and equipment and shall pay when due, any worker, subcontractor or supplier and otherwise prosecute the work with such diligence so as to maintain the rate of progress indicated on the progress schedule, prevent work stoppage, and insure completion of the project within the time specified.

### **ARTICLE 5.3 -- PROJECT COMPLETION**

- A. Substantial Completion. A Project is substantially complete when construction is essentially complete and work items remaining to be completed can be done without interfering with the Owner's ability to use the Project for its intended purpose.
1. Once the Contractor has reached what they believe is Substantial Completion, the Contractor shall notify the Designer and the Construction Representative of the following:
    - a. That work is essentially complete with the exception of certain listed work items. The list shall be referred to as the "Contractor's Punch."
    - b. That all Operation and Maintenance Manuals have been assembled and submitted in accordance with Article 3.5A.
    - c. That the Work is ready for inspection by the Designer and Construction Representative. The Owner shall be entitled to a minimum of ten working days notice before the inspection shall be performed.
  2. If the work is acceptable, the Owner shall issue a Certificate of Substantial Completion, which shall set forth the responsibilities of the Owner and the Contractor for utilities, security, maintenance, damage to the work and risk of loss. The Certificate shall also identify those remaining items of work to be

performed by the Contractor. All such work items shall be complete within 30 working days of the date of the Certificate, unless the Certificate specifies a different time. If the Contractor shall be required to perform tests that must be delayed due to climatic conditions, it is understood that such tests and affected equipment will be identified on the Certificate and shall be accomplished by the Contractor at the earliest possible date.

Performance of the tests may not be required before Substantial Completion can be issued. The date of the issuance of the Certificate of Substantial Completion shall determine whether or not the work was completed within the contract time and whether or not Liquidated Damages are due.

3. If the work is not acceptable, and the Owner does not issue a Certificate of Substantial Completion, the Owner shall be entitled to charge the Contractor with the Designer's and Owner's costs of re-inspection, including time and travel.
- B. Partial Occupancy. Contractor agrees that the Owner shall be permitted to occupy and use any completed or partially completed portions of the Project, when such occupancy and use is in the Owner's best interest. Owner shall notify Contractor of its desire and intention to take Partial Occupancy as soon as possible but at least ten (10) working days before the Owner intends to occupy. If the Contractor believes that the portion of the work the Owner intends to occupy is not ready for occupancy, the Contractor shall notify the Owner immediately. The Designer shall inspect the work in accordance with the procedures above. If the Contractor claims increased cost of the project or delay in completion as a result of the occupancy, he shall notify the Owner immediately but in all cases before occupancy occurs.
- C. Final Completion. The Project is finally complete when the Certificate of Substantial Completion has been issued and all work items identified therein as incomplete have been completed, and when all administrative items required by the contract have been completed. Final Completion entitles the Contractor to payment of the outstanding balance of the contract amount including all change orders and retainage. Within five (5) working days of the date of the Certificate of Substantial Completion, the Contractor shall identify the cost to complete any outstanding items of work. The Designer shall review the Contractor's estimate and either approve it or provide an independent estimate for all such items. If the Contractor fails to complete the remaining items within the time specified in the Certificate, the Owner may terminate the

contract and go to the surety for project completion in accordance with Article 7.2 or release the contract balance to the Contractor less 150% of the approved estimate to complete the outstanding items. Upon completion of the outstanding items, when a final cost has been established, any monies remaining shall be paid to the Contractor. Failure to complete items of work does not relieve the Contractor from the obligation to complete the administrative requirements of the contract, such as the provisions of Article 5.3 FAILURE TO COMPLETE ALL ITEMS OF WORK UNDER THE CONTRACT SHALL BE CONSIDERED A DEFAULT AND BE GROUNDS FOR CONTRACT TERMINATION AND DEBARMENT.

- D. Liquidated Damages. Contractor agrees that the Owner may deduct from the contract price and retain as liquidated damages, and not as penalty or forfeiture, the sum stipulated in this contract for each work day after the Contract Completion Day on which work is not Substantially Complete. Assessment of Liquidated Damages shall not relieve the Contractor or the surety of any responsibility or obligation under the Contract. In addition, the Owner may, without prejudice to any other rights, claims, or remedies the Owner may have including the right to Liquidated Damages, charge the Contractor for all additional expenses incurred by the Owner and/or Designer as the result of the extended contract period through Final Completion. Additional Expenses shall include but not be limited to the costs of additional inspections.
- E. Early Completion. The Contractor has the right to finish the work before the contract completion date; however, the Owner assumes no liability for any hindrances to the Contractor unless Owner caused delays result in a time extension to the contract completion date. The Contractor shall not be entitled to any claims for lost efficiencies or for delay if a Certificate of Substantial Completion is given on or before the Contract Completion Date.

#### **ARTICLE 5.4 -- PAYMENT TO CONTRACTOR**

- A. Payments on account of this contract will be made monthly in proportion to the work which has been completed. Request for payment must be submitted on the Owner's forms. No other pay request will be processed. Supporting breakdowns must be in the same format as Owner's forms and must provide the same level of detail. The Designer will, within 5 working days from receipt of the contractor's request for payment either issue a Certificate for Payment to the Owner, for such amount as the Designer determines is properly due, or notify the Contractor in writing of reasons for withholding a Certificate. The Owner shall make

payment within 30 calendar days after the "Application and Certification for Payment" has been received and certified by the Designer. The following items are to be attached to the contractor's pay request:

1. Updated construction schedule
  2. Certified payrolls consisting of name, occupation and craft, number of hours worked and actual wages paid for each individual employee, of the Contractor and all subcontractors working on the project
- B. The Owner shall retain 5 percent of the amount of each such payment application, except as allowed by Article 5.4, until final completion and acceptance of all work covered by this contract.
- C. Each payment made to Contractor shall be on account of the total amount payable to Contractor and all material and work covered by paid partial payment shall thereupon become the sole property of Owner. This provision shall not be construed as relieving Contractor from sole responsibility for care and protection of materials and work upon which payments have been made or restoration of any damaged work or as a waiver of the right of Owner to require fulfillment of all terms of this contract.
- D. Materials delivered to the work site and not incorporated in the work will be allowed in the Application and Certification for Payment on the basis of one hundred (100%) percent of value, subject to the 5% retainage providing that they are suitably stored on the site or in an approved warehouse in accordance with the following requirements:
1. Material has previously been approved through submittal and acceptance of shop drawings conforming to requirements of Article 3.2 of General Conditions.
  2. Delivery is made in accordance with the time frame on the approved schedule.
  3. Materials, equipment, etc., are properly stored and protected from damage and deterioration and remain so - if not, previously approved amounts will be deleted from subsequent pay applications.
  4. The payment request is accompanied by a breakdown identifying the material equipment, etc. in sufficient detail to establish quantity and value.
- E. The Contractor shall be allowed to include in the Application and Certification for Payment, one hundred (100%) of the value, subject to retainage, of major equipment and material stored off the site if all of the following conditions are met:

1. The request for consideration of payment for materials stored off site is made at least 15 working days prior to submittal of the Application for Payment including such material. Only materials inspected will be considered for inclusion on Application for Payment requests.
  2. Materials stored in one location off site are valued in excess of \$25,000.
  3. That a Certificate of Insurance is provided indicating adequate protection from loss, theft conversion or damage for materials stored off site. This Certificate shall show the State of Missouri as an additional insured for this loss.
  4. The materials are stored in a facility approved and inspected, by the Construction Representative.
  5. Contractor shall be responsible for, Owner costs to inspect out of state facilities, and any delays in the completion of the work caused by damage to the material or for any other failure of the Contractor to have access to this material for the execution of the work.
- F. The Owner shall determine the amount, quality and acceptability of the work and materials which are to be paid for under this contract. In the event any questions shall arise between the parties, relative to this contract or specifications, determination or decision of the Owner or the Construction Representative and the Designer shall be a condition precedent to the right of the Contractor to receive any money or payment for work under this contract affected in any manner or to any extent by such question.
- G. Payments Withheld: The Owner may withhold or nullify in whole or part any certificate to such extent as may be necessary to protect the Owner from loss on account of:
1. Defective work not remedied. When a notice of noncompliance is issued on an item or items, corrective action shall be undertaken immediately. Until corrective action is completed, no monies will be paid and no additional time will be allowed for the item or items. The cost of corrective action(s) shall be borne by the Contractor.
  2. A reasonable doubt that this contract can be completed for the unpaid balance.
  3. Failure of the Contractor to update as-built drawings monthly for review by the Construction Representative.
  4. Failure of the Contractor to update the construction schedule.

When the Construction Representative is satisfied the Contractor has remedied above deficiencies, payment shall be released.

- H. Final Payment: Upon receipt of written notice from the Contractor to the Designer and Project Representative that the work is ready for final inspection and acceptance, the Designer and Project Representative, with the Contractor, shall promptly make such inspection. If the work is acceptable and the contract fully performed, the Construction Representative shall complete a final acceptance report and the Contractor will be directed to submit a final Application and Certification for Payment. If the Owner approves the same, the entire balance shall be due and payable, with the exception of deductions as provided for under Article 5.4.
1. Where the specifications provide for the performance by the Contractor of (certain tests for the purpose of balancing and checking the air conditioning and heating equipment and the Contractor shall have furnished and installed all such equipment in accordance with the specifications, but said test cannot then be made because of climatic conditions, such test shall may be considered as required under the provisions of the specifications, Section 013300 and this contract may be substantial Full payment will not be made until the tests have been made and the equipment and system is finally accepted. If the tests are not completed when scheduled, the Owner may deduct 150% of the value of the tests from the final payment.
  2. The final payment shall not become due until the Contractor delivers to the Construction Representative:
    - a) A complete file of releases, on the standard form included in the contract documents as "Final Receipt of Payment and Release Form", from subcontractors and material suppliers evidencing payment in full for services, equipment and materials, as the case may require, if the Owner approves, or a consent from the Surety to final payment accepting liability for any unpaid amounts.
    - b) An Affidavit of Compliance with Prevailing Wage Law, in the form as included in this contract specifications, properly executed by each subcontractor, and the Contractor
    - c) Certified copies of all payrolls
    - d) As-built drawings

3. If any claim remains unsatisfied after all payments are made, the Contractor shall refund to the Owner all monies that the latter may be compelled to pay in discharging such a claim including all costs and a reasonable attorney's fee.
4. Missouri statute requires prompt payment from the Owner to the Contractor within thirty calendar days and from the Contractor to his subcontractors within fifteen calendar days. Failure to make payments within the required time frame entitles the receiving party to charge interest at the rate of one and one half percent per month calculated from the expiration of the statutory time period until paid.
5. The value of all unused unit price allowances and/or 150% of the value of the outstanding work items, and/or liquidated damages may be deducted from the final pay request without executing a Contract Change. Any unit price items which exceed the number of units in the contract may be added by Contract Change.

## **ARTICLE 6 -- INSURANCE AND BONDS**

### **ARTICLE 6.1 -- BOND**

- A. Contractor shall furnish a performance/payment bond in an amount equal to 100% of the contract price to guarantee faithful performance of the contract and 100% of the contract price to guarantee the payment of all persons performing labor on the project and furnishing materials in connection therewith under this contract as set forth in the standard form of performance and payment bond included in the contract documents. The surety on such bond shall be issued by a surety company authorized by the Missouri Department of Insurance to do business in the state of Missouri.
- B. All Performance/Payment Bonds furnished in response to this provision shall be provided by a bonding company with a rating of B+ or higher as established by A.M. Best Company, Inc. in their most recent publication.

### **ARTICLE 6.2 – INSURANCE**

- A. The successful Contractor shall procure and maintain for the duration of the contract issued a policy or policies of insurance for the protection of both the Contractor and the Owner and their respective officers, officials, agents, consultants and employees. The Owner requires certification of insurance coverage from the Contractor prior to commencing work.
- B. Minimum Scope and Extent of Coverage

1. General Liability

Commercial General Liability, ISO coverage form number or equivalent CG 00 01 ("occurrence" basis), or I-SO coverage form number CG 00 02, or ISO equivalent.

If ISO equivalent or manuscript general liability coverage forms are used, minimum coverage will be as follows: Premises/Operations;Independent Contractors; Products/Completed Operations; personal Injury; Broad Form Property Damage including Completed Operations; Broad Form Contractual Liability Coverage to include Contractor's obligations under Article 1.11 Indemnification and any other Special Hazards required by the work of the contract.

2. Automobile Liability

Business Automobile Liability Insurance, ISO Coverage form number or equivalent CA 00 01 covering automobile liability, code 1 "ANY AUTO".

3. Workers' Compensation and Employer's Liability

Statutory Workers' Compensation Insurance for Missouri and standard Employer's Liability Insurance, or the authorization to self-insure for such liability from the Missouri Division of Workers' Compensation.

4. Builder's Risk or Installation Floater Insurance

Insurance upon the work and all materials, equipment, supplies, temporary structures and similar items which may be incident to the performance of the work and located at or adjacent to the site, against loss or damage from fire and such other casualties as are included in extended coverage in broad "All Risk" form, including coverage for Flood and Earthquake, in an amount not less than the replacement cost of the work or this contract price, whichever is greater, with loss payable to Contractor and Owner as their respective interests may appear.

Contractor shall maintain sufficient insurance to cover the full value of the work and materials as the work progresses, and shall furnish Owner copies of all endorsements. If Builder's Risk Reporting- Form of Endorsement is used, Contractor shall make all reports as required therein so as to keep in force an amount of insurance which will equal the replacement cost of the work, materials, equipment, supplies, temporary structures, and other property covered thereby; and if, as a result of Contractor's failure to make any such

report, the amount of insurance so recoverable shall be less than such replacement cost, Contractor's interest in the proceeds of such insurance, if any, shall be subordinated to Owner's interest to the end that Owner may receive full reimbursement for its loss.

C. Minimum Limits of Insurance

1. General Liability

Contractor

\$2,000,000 combined single limit per occurrence for bodily injury, personal injury, and property damage

\$2,000,000 annual aggregate

2. Automobile Liability

\$2,000,000 combined single limit per occurrence for bodily injury and property damage

3. Workers' Compensation and Employers Liability

Workers' Compensation limits as required by applicable State Statutes (generally unlimited) and minimum of \$1,000,000 limit per accident for Employer's Liability.

General Liability and Automobile Liability insurance may be arranged under individual policies for the full limits required or by a combination of underlying policies with the balance provided by a form-following Excess or Umbrella Liability policy.

D. Deductibles and Self-Insured Retentions

All deductibles, co-payment clauses, and self-insured retentions must be declared to and approved by the Owner. The Owner reserves the right to request the reduction or elimination of unacceptable deductibles or self-insured retentions, as they would apply to the Owner, and their respective officers, officials, agents, consultants and employees. Alternatively, the Owner may request Contractor to procure a bond guaranteeing payment of losses and related investigations, claims administration, and defense expenses.

E. Other Insurance Provisions and Requirements

The respective insurance policies and coverage, as specified below, must contain, or be endorsed to contain the following conditions or provisions:

1. General Liability

The Owner, and its respective commissioners, officers, officials, agents, consultants and employees shall be endorsed as additional insured's by ISO form CG 20 26 Additional

Insured - Designated Person or Organization. As additional insured's, they shall be covered as to work performed by or on behalf of the Contractor or as to liability which arises out of Contractor's activities or resulting from the performance of services or the delivery of goods called for by the Contract.

Contractor's insurance coverage shall be primary with respect to all additional insured's. Insurance of self-insurance programs maintained by the designated additional -insured's shall be excess of the Contractor's insurance and shall not contribute with it.

Additionally, the Contractor and Contractor's general liability insurer shall agree to waive all rights of subrogation against the Owner and any of their respective officers, officials, agents, consultants or employees for claims, losses, or expenses which arise out of Contractor's activities or result from the performance of services or the delivery of goods called for by the Contract.

Contractor's failure to comply with the terms and conditions of these insurance policies shall not affect or abridge coverage for the Owner, or for any of their officers, officials, agents, consultants or employees.

## 2. Automobile Insurance

The Owner, and their respective officers, officials, agents, consultants and employees shall be endorsed as additional insured's by ISO form CG 20 26 - Additional Insured Designated Person or Organization. As additional insured's, they shall be covered as to work performed by or on behalf of the Contractor or as to liability which arises out of Contractor's activities or resulting from the performance of services or the delivery of goods called for by the Contract.

Contractor's insurance coverage shall be primary with respect to all additional insured's. Insurance or self-insurance programs maintained by the designated additional insured's shall be in excess of the Contractor's insurance and shall not contribute with it.

Additionally, the Contractor and Contractor's automobile insurer shall agree to waive all rights of subrogation against the Owner and any of their respective officers, officials, agents, consultants or employees for claims, losses, or expenses which arise out of Contractor's activities or result from the

performance of services or the delivery of goods called for by the Contract.

Contractor's failure to comply with the terms and conditions of these insurance policies shall not affect or abridge coverage for the Owner or for any of its officers, officials, agents, consultants or employees.

## 3. Workers' Compensation/Employer's Liability

Contractor's workers' compensation insurance shall be endorsed with NCCI form WC 00 03 01 A - Alternative Employer Endorsement. The Alternative Employer Endorsement shall designate the Owner as "alternate employers."

## 4. All Coverages

Each insurance policy required by this section of the Contract shall contain a stipulation, endorsed if necessary, that the Owner will receive a minimum of a thirty (30) calendar day advance notice of any policy cancellation. Ten (10) calendar days advance notice is required for policy cancellation due to non-payment of premium.

## F. Insurer Qualifications and Acceptability

Insurance required hereunder shall be issued by an A.M. Best, "B+" rated, Class IX insurance company approved to conduct insurance business in the state of Missouri.

## G. Verification of Insurance Coverage

Prior to Owner issuing a Notice to Proceed, the Contractor shall furnish the Owner with Certificate(s) of Insurance and with any applicable original endorsements evidencing the required insurance coverage. The insurance certificates and endorsements are to be signed by a person authorized by that insurer to bind coverage on its behalf. All certificates and endorsements received by the Owner are subject to review and approval by the Owner. The Owner reserves the right to require certified copies of all required policies at any time. If the scope of this contract will exceed one (1) year - or, if any of Contractor's applicable insurance coverage expires prior to completion of the work or services required under this contract - the Contractor will provide a renewal or replacement certificate before continuing work or services hereunder. If the Contractor fails to provide documentation of required insurance coverage, the Owner may issue a stop work order and no additional contract completion time and/or compensation shall be granted as a result thereof.

**ARTICLE 7 – SUSPENSION OR TERMINATION OF CONTRACT**

**ARTICLE 7.1 - FOR SITE CONDITIONS**

- A. When conditions at the site of the proposed work are considered by the Owner to be unsatisfactory for prosecution of the work, the Contractor may be ordered in writing to suspend the work or any part thereof until reasonable conditions exist. When such suspension is not due to fault or negligence of the Contractor, time allowed for completion of such suspended work will be extended by a period of time equal to that lost due to delay occasioned by ordered suspension. This will be a no cost time extension.

**ARTICLE 7.2 - FOR CAUSE**

- A. Termination or Suspension for Cause:
  - 1. If the Contractor shall file for bankruptcy, or should make a general assignment for the benefit of the creditors, or if a receiver should be appointed on account of insolvency, or if the contractor should persistently or repeatedly refuse or fail to supply enough properly skilled workers or proper materials, or if the contractor should fail to make prompt payment to subcontractors or for material or labor, or persistently disregard laws, ordinances or the instructions of the Owner, or otherwise be guilty of a substantial violation of any provision of this contract, then the Owner may serve notice on the Contractor and the surety setting forth the violations and demanding compliance with this contract. Unless within ten (10) consecutive calendar days after serving such notice, such violations shall cease and satisfactory arrangements for correction be made, the Owner may suspend the Contractor's right to proceed with the work or terminate this contract.
  - 2. In the event the Owner suspends Contractor's right to proceed with the work or terminates the contract, the Owner may demand that the Contractor's surety take over and complete the work on this contract, after the surety submits a written proposal to the Owner and receives written approval and upon the surety's failure or refusal to do so within ten (10) consecutive calendar days after demand therefore, the Owner may take over the work and prosecute the same to completion by bid or negotiated contract, or the Owner may elect to take possession of and utilize in completing the work such materials, supplies, appliances and plant as may be on the site of the work, and all subcontractors, if the Owner elects, shall be bound to perform their contracts.

- B. The Contractor and its surety shall be and remain liable to the Owner for any excess cost or damages occasioned to the Owner as a result of the actions above set forth.
- C. The Contractor in the event of such suspension or termination shall not be entitled to receive any further payments under this contract until the work is wholly finished. Then if the unpaid balance under this contract shall exceed all expenses of the Owner as certified by the Director, such excess shall be paid to the Contractor; but, if such expenses shall exceed the unpaid balance as certified by the Director, the Contractor and their surety shall be liable for and shall pay the difference and any damages to the Owner.
- D. In exercising Owner's right to secure completion of the work under any of the provisions hereof, the Director shall have the right to exercise Owner's sole discretion as to the manner, methods and reasonableness of costs of completing the work.
- E. The rights of the Owner to suspend or terminate as herein provided shall be cumulative and not exclusive and shall be in addition to any other remedy provided by law.
- F. The Contractor in the event of such suspension or termination may be declared ineligible for Owner contracts for a minimal period of twelve (12) months. Further, no contract will be awarded to any Contractor who lists in their bid form any subcontractor whose prior performance has contributed, as determined by the Owner, to a breach of a contract. In order to be considered for state-awarded contracts after this period, the Contractor/subcontractor will be required to forward acceptance reports to the Owner regarding successful completion of non-state projects during the intervening twelve (12) months from the date of default. No contracts will be awarded to a subcontractor/Contractor until the ability to perform responsibly in the private sector has been proven to the Owner.

**ARTICLE 7.3 -- FOR CONVENIENCE**

- A. The Owner may terminate or suspend the Contract or any portion of the Work without cause at any time, and at the Owner's convenience. Notification of a termination or suspension shall be in writing and shall be given to the Contractor and their surety. If the Contract is suspended, the notice will contain the anticipated duration of the suspension or the conditions under which work will be permitted to resume. If appropriate, the Contractor will be requested to demobilize and re-mobilize and will be reimbursed time and costs associated with the suspension.
- B. Upon receipt of notification, the Contractor shall:

1. Cease operations when directed.
  2. Take actions to protect the work and any stored materials.
  3. Place no further subcontracts or orders for material, supplies, services or facilities except as may be necessary to complete the portion of the Contract that has not been terminated. No claim for payment of materials or supplies ordered after the termination date shall be considered.
  4. Terminate all existing subcontracts, rentals, material, and equipment orders.
  5. Settle all outstanding liabilities arising from termination with subcontractors and suppliers.
6. Transfer title and deliver to the Owner, work in progress, completed work, supplies and other material produced or acquire for the work terminated, and completed or partially completed plans, drawings information and other property that, if the Contract had been completed, would be required to be furnished to the Owner.
- C. For termination without cause and at the Owner's convenience, in addition to payment for work completed prior to date of termination, the Contractor may be entitled to payment of other documented costs directly associated with the early termination of the contract. Payment for anticipated profit and unapplied overhead will not be allowed.

## **SECTION 007300 - SUPPLEMENTARY CONDITIONS**

### **1.0 GENERAL:**

- A. These Supplementary General Conditions clarify, add, delete, or otherwise modify standard terms and conditions of DIVISION 0, BIDDING AND CONTRACTING REQUIREMENTS.

### **2.0 CONTACTS:**

Designer: Travis Short  
TI Sys-Tek, LLP  
255 NW Blue Pkwy, Ste 101  
Lee's Summit, MO 64063  
Telephone: 816-229-9009  
Email: [travis.short@sys-tek.com](mailto:travis.short@sys-tek.com)

Construction Representative: Ricky Howard  
Division of Facilities Management, Design and Construction  
836 North Scott, Belton MO 64012  
Telephone: 816-728-0385  
Email: [Ricky.Howard@oa.mo.gov](mailto:Ricky.Howard@oa.mo.gov)

Project Manager: Jared Cook  
Division of Facilities Management, Design and Construction  
301 West High Street, Room 730  
Jefferson City, Missouri 65102  
Telephone: 573-690-6733; Fax: 573-751-7277  
Email: [Jared.Cook2@oa.mo.gov](mailto:Jared.Cook2@oa.mo.gov)

Contract Specialist: Kelly Copeland  
Division of Facilities Management, Design and Construction  
301 West High Street, Room 730  
Jefferson City, Missouri 65102  
Telephone: 573-522-2283; Fax: 573-751-7277  
Email: [Kelly.Copeland@oa.mo.gov](mailto:Kelly.Copeland@oa.mo.gov)

### **3.0 NOTICE: ALL BID MATERIALS ARE DUE AT THE TIME OF BID SUBMITTAL. THERE IS NO SECOND SUBMITTAL FOR THIS PROJECT.**

### **4.0 FURNISHING CONSTRUCTION DOCUMENTS:**

- A. The Owner will furnish the Contractor with approximately 10 complete sets of drawings and specifications at no charge.
- B. The Owner will furnish the Contractor with approximately 10 sets of explanatory or change drawings at no charge.
- C. The Contractor may make copies of the documents as needed with no additional cost to the Owner.

### **5.0 ILLEGAL IMMIGRATION REFORM AND IMMIGRANT RESPONSIBILITY ACT**

The Contractor understands and agrees that by signing a contract for this project, they certify the following:

- A. The Contractor shall only utilize personnel authorized to work in the United States in accordance with applicable federal and state laws. This includes but is not limited to the Illegal Immigration Reform and Immigrant Responsibility Act (IIRIRA) and INA Section 274A.
- B. If the Contractor is found to be in violation of this requirement or the applicable laws of the state, federal and local laws and regulations, and if the State of Missouri has reasonable cause to believe that the Contractor has knowingly employed individuals who are not eligible to work in the United States, the state shall have the right to cancel the contract immediately without penalty or recourse and suspend or debar the contractor from doing business with the state.
- C. The Contractor agrees to fully cooperate with any audit or investigation from federal, state or local law enforcement agencies.

### **6.0 SAFETY REQUIREMENTS**

Contractor and subcontractors at any tier shall comply with RSMo 292.675 and Article 1.3, E, of Section 007213, General Conditions.

# Missouri

## Division of Labor Standards

### WAGE AND HOUR SECTION



MICHAEL L. PARSON, Governor

## Annual Wage Order No. 26

Section 048  
**JACKSON COUNTY**

In accordance with Section 290.262 RSMo 2000, within thirty (30) days after a certified copy of this Annual Wage Order has been filed with the Secretary of State as indicated below, any person who may be affected by this Annual Wage Order may object by filing an objection in triplicate with the Labor and Industrial Relations Commission, P.O. Box 599, Jefferson City, MO 65102-0599. Such objections must set forth in writing the specific grounds of objection. Each objection shall certify that a copy has been furnished to the Division of Labor Standards, P.O. Box 449, Jefferson City, MO 65102-0449 pursuant to 8 CSR 20-5.010(1). A certified copy of the Annual Wage Order has been filed with the Secretary of State of Missouri.

Original Signed by

Taylor Burks, Director  
Division of Labor Standards

Filed With Secretary of State: \_\_\_\_\_ **March 8, 2019**

Last Date Objections May Be Filed: **April 8, 2019**

Prepared by Missouri Department of Labor and Industrial Relations

OCCUPATIONAL TITLE	** Date of Increase	Basic Hourly Rates
Asbestos Worker		\$64.53
Boilermaker		\$67.29
Bricklayer		\$55.57
Carpenter		\$55.90
Lather		
Linoleum Layer		
Millwright		
Pile Driver		
Cement Mason		\$50.61
Plasterer		
Communications Technician		\$57.27
Electrician (Inside Wireman)		\$61.61
Electrician Outside Lineman		\$65.19
Lineman Operator		
Lineman - Tree Trimmer		
Groundman		
Groundman - Tree Trimmer		
Elevator Constructor		\$32.01*
Glazier		\$53.47
<b>Ironworker</b>		<b>\$62.72</b>
Laborer		\$44.64
General Laborer		
First Semi-Skilled		
Second Semi-Skilled		
Mason		\$50.06
Marble Mason		
Marble Finisher		
Terrazzo Worker		
Terrazzo Finisher		
Tile Setter		
Tile Finisher		
Operating Engineer		\$56.40
Group I		
Group II		
Group III		
Group III-A		
Group IV		
Group V		
Painter		\$50.36
<b>Plumber</b>		<b>\$67.77</b>
Pipe Fitter		
Roofer		\$51.99
Sheet Metal Worker		\$65.32
Sprinkler Fitter		\$32.01*
Truck Driver		\$46.29
Truck Control Service Driver		
Group I		
Group II		
Group III		
Group IV		

\*The Division of Labor Standards received less than 1,000 reportable hours as required by RSMo 290.257.4(b). Public works contracting minimum wage is established for this occupational title using data provided by Missouri Economic Research and Information Center, in accordance with RSMo 290.257.2.

Heavy Construction Rates for  
JACKSON County

Section 048

OCCUPATIONAL TITLE	** Date of Increase	Basic Hourly Rates
Carpenter		\$57.32
Millwright		
Pile Driver		
Electrician (Outside Lineman)		\$65.19
Lineman Operator		
Lineman - Tree Trimmer		
Groundman		
Groundman - Tree Trimmer		
Laborer		\$46.40
General Laborer		
Skilled Laborer		
Operating Engineer		\$54.73
Group I		
Group II		
Group III		
Group IV		
Truck Driver		\$46.19
Truck Control Service Driver		
Group I		
Group II		
Group III		
Group IV		

Use Heavy Construction Rates on Highway and Heavy construction in accordance with the classifications of construction work established in 8 CSR 30-3.040(3).

Use Building Construction Rates on Building construction in accordance with the classifications of construction work established in 8 CSR 30-3.040(2).

If a worker is performing work on a heavy construction project within an occupational title that is not listed on the Heavy Construction Rate Sheet, use the rate for that occupational title as shown on the Building Construction Rate Sheet.

\*The Division of Labor Standards received less than 1,000 reportable hours as required by RSMo 290.257.4(b). Public works contracting minimum wage is established for this occupational title using data provided by Missouri Economic Research and Information Center, in accordance with RSMo 290.257.2.

# OVERTIME and HOLIDAYS

## OVERTIME

For all work performed on a Sunday or a holiday, not less than twice (2x) the prevailing hourly rate of wages for work of a similar character in the locality in which the work is performed or the public works contracting minimum wage, whichever is applicable, shall be paid to all workers employed by or on behalf of any public body engaged in the construction of public works, exclusive of maintenance work.

For all overtime work performed, not less than one and one-half (1½) the prevailing hourly rate of wages for work of a similar character in the locality in which the work is performed or the public works contracting minimum wage, whichever is applicable, shall be paid to all workers employed by or on behalf of any public body engaged in the construction of public works, exclusive of maintenance work or contractual obligation. For purposes of this subdivision, "**overtime work**" shall include work that exceeds ten hours in one day and work in excess of forty hours in one calendar week; and

A thirty-minute lunch period on each calendar day shall be allowed for each worker on a public works project, provided that such time shall not be considered as time worked.

## HOLIDAYS

January first;  
The last Monday in May;  
July fourth;  
The first Monday in September;  
November eleventh;  
The fourth Thursday in November; and  
December twenty-fifth;

If any holiday falls on a Sunday, the following Monday shall be considered a holiday.

## SECTION 01 11 00 – SUMMARY OF WORK

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Project consists of **Refurbishing the existing cooling tower and adding a separator and variable flow nozzle cups.**

- 1. Project Location: **Fletcher Daniels, Kansas City MO 64106.**
- 2. Owner: State of Missouri, Office of Administration, Division of Facilities Management, Design and Construction, Harry S Truman State Office Building, Post Office Box 809, 301 West High Street, Jefferson City, Missouri 65102.

- B. Contract Documents dated **September 9, 2019** were prepared for the Project by **sys-tek, A Twining Company located at 255 NW Blue Parkway Suite 101, Lee's Summit, MO 64063.**

- C. The Work at Fletcher Daniels State Office Building consists of refurbishing the existing (3) Cell Cooling Tower, addition of Water Level Controller, & Centrifugal Separator. New VFD's shall be provided for the cooling tower cells. New DDC programming and minimal hardware shall be provided.

- 1) Updated DDC programming for the cooling tower. This includes new controls for the new VFD's.
- 2) The Work includes the following:
  - (a) All fees and direct expenses involved in any inspections required for the project.
  - (b) All hoists, scaffolds, staging, runways, and equipment required for the performance of the work.
  - (c) All job measurements and shop layouts required for the proper installation of material and equipment included in the work.
  - (d) The removal from the premises, as it accumulates, of all dirt and refuse resulting from the performance of the work;
  - (e) Any modifications or revisions required to existing plant, facility, or systems necessary to perform work as called for or inferred.
  - (f) Prepare and coordinate the production of all Method of Procedures (MOPS) for all work with the potential to interrupt daily activities in the facility.
  - (g) Contractor to provide sufficient labor for all critical work including runners and other labor who need to watch system to insure the building continues to operate correctly while work is being done.
  - (h) Coordination with Johnson Controls Incorporated Terry Rhoades, phone # 866.298.7696 for new and existing DDC controls additions and modifications.
  - (i) Coordination with Water Louis Chemicals David Dreyer, phone # 913.972.2030 for chemical treatment additions and modifications.
  - (j) Provide and install all equipment and materials detailed in the design drawings including the pumps, piping modifications and all necessary accessories.

- (k) Provide accurate and field verified “AS BUILT” drawings of all of the mechanical modifications.
- (l) Provide labeling and identification for all mechanical equipment in accordance with these specifications. Nowhere in these specifications does it allow a Sharpie to be used for labeling. All equipment that has a Sharpie identification will be removed and replaced by the contractor
- (m) Alterations and additions to existing mechanical systems.

D. The Work will be constructed under a single prime contract.

### **1.3 DESIGNER’S ESTIMATE OF CONSTRUCTION COSTS**

Designer Cost Estimate Range: \$201,500 – \$277,000

### **1.4 WORK UNDER OTHER CONTRACTS**

A. None Anticipated

### **1.5 FUTURE WORK**

A. None Anticipated

### **1.6 WORK SEQUENCE**

- A. The work associated with this project must be closely coordinated with facilities personnel as the work must be complete prior to the end of March 2020.
  - 1. The first priority is submittal, approval, and ordering of the cooling tower refurbishment parts. The Basis of Design Cooling Tower refurbishment parts have a lead time of 4 - 6 weeks. Any cooling tower refurbishment parts submitted must match this lead time or incorporate costs to facilitate expediting.
    - a. Approval and purchase of the other equipment can happen concurrently with the cooling tower or immediately following.
  - 2. While new equipment is on order the existing condenser water system shall be drained down and demolition work shall begin.
  - 3. Upon arrival of refurbishment parts, the cooling tower cells shall be refurbished.
  - 4. New piping and prep work can begin prior to new cooling tower arrival.
  - 5. The month of February shall be used for equipment startup, controls programming and startup.
  - 6. Refurbished condenser water system shall be ready for owner use *March 31 of 2020.*

### **1.7 CONTRACTOR USE OF PREMISES**

- A. Use of the Site: Limit use of the premises to work in areas indicated. Confine operations to areas within contract limits indicated. Do not disturb portions of the site beyond the areas in which the Work is indicated.
  - 1. Owner Occupancy: Allow for Owner occupancy and use by the public.
  - 2. Driveways and Entrances: Keep driveways and entrances serving the premises clear and available to the Owner, the Owner’s employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

- B. Use of the Existing Building: Maintain the existing building in a weathertight condition throughout the construction period. Repair damage cause by construction operations. Take all precautions necessary to protect the building and its occupants during the construction period.

**1.8 OCCUPANCY REQUIREMENTS**

- A. Full Owner Occupancy: The Owner will occupy the site and existing building during the entire construction period. Cooperate with the Owner during construction operations to minimize conflicts and facilitate owner usage. Perform the Work so as not to interfere with the Owner's operations.

**1.9 OWNER-FURNISHED PRODUCTS**

- A. None Anticipated

**PART 2 - PRODUCTS (Not Applicable)**

**PART 3 - EXECUTION**

**END OF SECTION 01 11 00**

## **SECTION 012600 – CONTRACT MODIFICATION PROCEDURES**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. This Section specifies administrative and procedural requirements for handling and processing Contract Modifications.
- B. Related Sections include the following:
  - 1. Division 1, Section 012100 "Allowances" for procedural requirements for handling and processing Allowances.
  - 2. Division 1, Section 012200 "Unit Prices" for administrative requirements for using Unit Prices.
  - 3. Division 0, Section 007213, Article 3.1 "Acceptable Substitutions" for administrative procedures for handling Requests for Substitutions made after Contract award.
  - 4. Division 0, Section 007213, Article 4.0 "Changes in the Work" for Contract Change requirements.

#### **1.3 REQUESTS FOR INFORMATION**

- A. In the event that the Contractor or Subcontractor, at any tier, determines that some portion of the Drawings, Specifications, or other Contract Documents requires clarification or interpretation, the Contractor shall submit a "Request for Information" (RFI) in writing to the Designer. A RFI may only be submitted by the Contractor and shall only be submitted on the RFI forms provided by the Owner. The Contractor shall clearly and concisely set forth the issue for which clarification or interpretation is sought and why a response is needed. In the RFI, the Contractor shall set forth an interpretation or understanding of the requirement along with reasons why such an understanding was reached.
- B. Responses to RFI shall be issued within ten (10) working days of receipt of the Request from the Contractor unless the Designer determines that a longer time is necessary to provide an adequate response. If a longer time is determined necessary by the Designer, the Designer will, within five (5) working days of receipt of the request, notify the Contractor of the anticipated response time. If the Contractor submits a RFI on a time sensitive activity on the current project schedule, the Contractor shall not be entitled to any time extension due to the time it takes the Designer to respond to the request provided that the Designer responds within the ten (10) working days set forth above.
- C. Responses from the Designer will not change any requirement of the Contract Documents. In the event the Contractor believes that a response to a RFI will cause a change to the requirements of the Contract Document, the Contractor shall give written notice to the Designer requesting a Contract Change for the work. Failure to give such written notice within ten (10) working days, shall waive the Contractor's right to seek additional time or cost under Article 4, "Changes in the Work" of the General Conditions.

## 1.4 MINOR CHANGES IN THE WORK

- A. Designer will issue supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract Amount or the Contract Time, on "Designer's Supplemental Instructions" (DSI).

## 1.5 PROPOSAL REQUESTS

- A. The Designer or Owner Representative will issue a detailed description of proposed Changes in the Work that may require adjustment to the Contract Amount or the Contract Time. The proposed Change Description will be issued using the "Request for Proposal" (RFP) form. If necessary, the description will include supplemental or revised Drawings and Specifications.
  - 1. Proposal Requests issued by the Designer or Owner Representative are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
  - 2. Within ten (10) working days after receipt of Proposal Request, submit a proposal for the cost adjustments to the Contract Amount and the Contract Time necessary to execute the Change. The Contractor shall submit his proposal on the appropriate Contract Change Detailed Breakdown form. Subcontractors may use the appropriate Contract Change Detailed Breakdown form or submit their proposal on their letterhead provided the same level of detail is included. All proposals shall include:
    - a. A detailed breakdown of costs per Article 4.1 of the General Conditions.
    - b. If requesting additional time per Article 4.2 of the General Conditions, include an updated Contractor's Construction Schedule that indicates the effect of the Change including, but not limited to, changes in activity duration, start and finish times, and activity relationship.

## 1.6 CONTRACT CHANGE PROCEDURES

- A. On Owner's approval of a Proposal Request, the Designer or Owner Representative will issue a Contract Change for signatures of Owner and Contractor on the "Contract Change" form.

## PART 2 - PRODUCTS (Not Used)

## PART 3 - EXECUTION

### 3.1 REFERENCED FORMS

- A. The following forms can be found on our website at [oa.mo.gov/fmdc/dc/aeforms.htm](http://oa.mo.gov/fmdc/dc/aeforms.htm) or [oa.mo.gov/fmdc/dc/contractorforms.htm](http://oa.mo.gov/fmdc/dc/contractorforms.htm):
  - 1. Request for Information
  - 2. Designer's Supplemental Instructions
  - 3. Request for Proposal
  - 4. Contract Change
  - 5. Contract Change Detailed Breakdown – SAMPLES

6. Contract Change Detailed Breakdown – General Contractor (GC)
7. Contract Change Detailed Breakdown – Subcontractor (SUB)

**END OF SECTION 012600**

## **SECTION 013100 – COORDINATION**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. This Section includes administrative provisions for coordinating construction operations on Projects including, but not limited to, the following:
  - 1. Coordination Drawings.
  - 2. Administrative and supervisory personnel.
  - 3. Project meetings.
- B. Each Contractor shall participate in coordination requirements. Certain areas of responsibility will be assigned to a specific Contractor.
- C. Related Sections include the following:
  - 1. Division 1, Section 013200 "Schedules" for preparing and submitting Contractor's Construction Schedule.
  - 2. Articles 1.8.B and 1.8.C of Section 007213 "General Conditions" for coordinating meetings onsite.
  - 3. Article 5.4.H of Section 007213 "General Conditions" for coordinating Closeout of the Contract.

#### **1.3 COORDINATION**

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included in different Sections, which depend on each other for proper installation, connection, and operation.
- B. Coordination: Each Contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each Contractor shall coordinate its operations with operations included in different Sections that depend on each other for proper installation, connection, and operation.
  - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
  - 2. Coordinate installation of different components with other Contractors to ensure maximum accessibility for required maintenance, service, and repair.
  - 3. Make adequate provisions to accommodate items scheduled for later installation.
  - 4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required

maintenance, service, and repair of all components including mechanical and electrical.

- C. Prepare memoranda for distribution to each party involved outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
  - 1. Prepare similar memoranda for Owner and separate Contractors if coordination of their Work is required.
- D. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other Contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
  - 1. Preparation of Contractor's Construction Schedule.
  - 2. Preparation of the Schedule of Values.
  - 3. Installation and removal of temporary facilities and controls.
  - 4. Delivery and processing of submittals.
  - 5. Progress meetings.
  - 6. Preinstallation conferences.
  - 7. Startup and adjustment of systems.
  - 8. Project Closeout activities.
- E. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.
  - 1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to other Sections for disposition of salvaged materials that are designated as Owner's property.

#### **1.4 SUBMITTALS**

- A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.
- B. Key Personnel Names: Within fifteen (15) work days of starting construction operations, submit a list of key personnel assignments including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.
  - 1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

#### **1.5 PROJECT MEETINGS**

- A. The Owner's Construction Representative will schedule a Pre-Construction Meeting prior to beginning of construction. The date, time, and exact place of this meeting will be determined after Contract Award and notification of all interested parties. The

Contractor shall arrange to have the Job Superintendent and all prime Subcontractors present at the meeting. During the Pre-Construction Meeting, the construction procedures and information necessary for submitting payment requests will be discussed and materials distributed along with any other pertinent information.

1. Minutes: Designer will record and distribute meeting minutes.
- B. Progress Meetings: The Owner's Construction Representative will conduct Monthly Progress Meetings as stated in Articles 1.8.B and 1.8.C of Section 007213 "General Conditions".
1. Minutes: Designer will record and distribute to Contractor the meeting minutes.
- C. Preinstallation Conferences: Contractor shall conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
1. Attendees: Installer and representatives of Manufacturers and Fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Designer and Construction Representative of scheduled meeting dates.
  2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration including requirements for the following:
    - a. Contract Documents
    - b. Options
    - c. Related RFIs
    - d. Related Contract Changes
    - e. Purchases
    - f. Deliveries
    - g. Submittals
    - h. Review of mockups
    - i. Possible conflicts
    - j. Compatibility problems
    - k. Time schedules
    - l. Weather limitations
    - m. Manufacturer's written recommendations
    - n. Warranty requirements
    - o. Compatibility of materials
    - p. Acceptability of substrates
    - q. Temporary facilities and controls
    - r. Space and access limitations
    - s. Regulations of authorities having jurisdiction
    - t. Testing and inspecting requirements

- u. Installation procedures
  - v. Coordination with other Work
  - w. Required performance results
  - x. Protection of adjacent Work
  - y. Protection of construction and personnel
3. Contractor shall record significant conference discussions, agreements, and disagreements including required corrective measures and actions.
  4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
  5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
  6. Revise paragraph below if Project requires holding progress meetings at different intervals. Insert special intervals such as "every third Tuesday" to suit special circumstances.
  7. Project name
  8. Name and address of Contractor
  9. Name and address of Designer
  10. RFI number including RFIs that were dropped and not submitted
  11. RFI description
  12. Date the RFI was submitted
  13. Date Designer's response was received
  14. Identification of related DSI or Proposal Request, as appropriate

**PART 2 - PRODUCTS (Not Used)**

**PART 3 - EXECUTION (Not Used)**

**END OF SECTION 013100**

## **SECTION 013200 – SCHEDULE – BAR CHART**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. This Section includes requirements for a Bar Chart Schedule for the project construction activities, schedule of submittals, and schedule for testing.

### **PART 2 - PRODUCTS – (Not Applicable)**

### **PART 3 - EXECUTION**

#### **3.1 SUBMITTAL PROCEDURES**

- A. The Contractor shall submit to the Designer, within ten (10) working days following the Notice to Proceed, a Progress Schedule including Schedule of Values showing the rate of progress the Contractor agrees to maintain and the order in which he proposed to carry out the various phases of Work. No payments shall be made to the Contractor until the Progress Schedule has been approved by the Owner.
- B. The Contractor shall submit an updated Schedule for presentation at each Monthly Progress Meeting. The Schedule shall be updated by the Contractor as necessary to reflect the current Schedule and its relationship to the original Schedule. The updated Schedule shall reflect any changes in the logic, sequence, durations, or completion date. Payments to the Contractor shall be suspended if the Progress Schedule is not adequately updated to reflect actual conditions.
- C. The Contractor shall submit Progress Schedules to Subcontractors to permit coordinating their Progress Schedules to the general construction Work. The Contractor shall coordinate preparation and processing of Schedules and reports with performance of other construction activities.

#### **3.2 CONSTRUCTION PROGRESS SCHEDULE – BAR CHART SCHEDULE**

- A. Bar-Chart Schedule: The Contractor shall prepare a comprehensive, fully developed, horizontal bar chart-type Contractor's Construction Schedule. The Contractor for general construction shall prepare the Construction Schedule for the entire Project. The Schedule shall show the percentage of work to be completed at any time, anticipated monthly payments by Owner, as well as significant dates (such as completion of excavation, concrete foundation work, underground lines, superstructure, rough-ins, enclosure, hanging of fixtures, etc.) which shall serve as check points to determine compliance with the approved Schedule. The Schedule shall also include an activity for the number of "bad" weather days specified in Section 012100 – Allowances.
  - 1. The Contractor shall provide a separate time bar for each significant construction activity. Provide a continuous vertical line to identify the first working day of each week.

- a. If practical, use the same Schedule of Values breakdown for schedule time bars.
  2. The Contractor shall provide a base activity time bar showing duration for each construction activity. Each bar is to indicate start and completion dates for the activity. The Contractor is to place a contrasting bar below each original schedule activity time for indicating actual progress and planned remaining duration for the activity.
  3. The Contractor shall prepare the Schedule on a minimal number of separate sheets to readily show the data for the entire construction period.
  4. Secure time commitments for performing critical elements of the Work from parties involved. Coordinate each element on schedule with other construction activities. Include minor elements involved in the overall sequence of the Work. Show each activity in proper sequence. Indicate graphically the sequences necessary for completion of related portions of the Work.
  5. Coordinate the Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittal Schedule, progress reports, payment requests, and other required schedules and reports.
  6. Indicate the Intent to Award and the Contract Substantial Completion dates on the schedule.
- B. Phasing: Provide notations on the schedule to show how the sequence of the Work is affected by the following:
1. Requirement for Phased completion
  2. Work by separate Contractors
  3. Work by the Owner
  4. Pre-purchased materials
  5. Coordination with existing construction
  6. Limitations of continued occupancies
  7. Un-interruptible services
  8. Partial Occupancy prior to Substantial Completion
  9. Site restrictions
  10. Provisions for future construction
  11. Seasonal variations
  12. Environmental control
- C. Work Stages: Use crosshatched bars to indicate important stages of construction for each major portion of the Work. Such stages include, but are not necessarily limited to, the following:
1. Subcontract awards
  2. Submittals
  3. Purchases
  4. Mockups
  5. Fabrication

6. Sample testing
  7. Deliveries
  8. Installation
  9. Testing
  10. Adjusting
  11. Curing
  12. Startup and placement into final use and operation
- D. Area Separations: Provide a separate time bar to identify each major area of construction for each major portion of the Work. For the purposes of this Article, a “major area” is a story of construction, a separate building, or a similar significant construction element.
1. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
    - a. Structural completion.
    - b. Permanent space enclosure
    - c. Completion of mechanical installation
    - d. Completion of the electrical portion of the Work
    - e. Substantial Completion

### **3.3 SCHEDULE OF SUBMITTALS**

- A. Upon acceptance of the Construction Progress Schedule, prepare and submit a complete schedule of submittals. Coordinate the submittal schedule with Section 013300 SUBMITTALS, the approved Construction Progress Schedule, list of subcontracts, Schedule of Values and the list of products.
- B. Prepare the schedule in chronological order. Provide the following information
1. Scheduled date for the first submittal
  2. Related Section number
  3. Submittal category
  4. Name of the Subcontractor
  5. Description of the part of the Work covered
  6. Scheduled date for resubmittal
  7. Scheduled date for the Designer’s final release or approval
- C. Distribution: Following the Designer’s response to the initial submittal schedule, print and distribute copies to the Designer, Owner, subcontractors, and other parties required to comply with submittal dates indicated.
1. Post copies in the Project meeting room and temporary field office.
  2. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned part of the Work and are no longer involved in construction activities.

- D. **Schedule Updating:** Revise the schedule after each meeting or other activity where revisions have been recognized or made. Issue the updated schedule concurrently with the report of each meeting.

### **3.4 SCHEDULE OF INSPECTIONS AND TESTS**

- A. Prepare a schedule of inspections, tests, and similar services required by the Contract Documents. Submit the schedule with (15) days of the date established for commencement of the Contract Work. The Contractor is to notify the testing agency at least (5) working days in advance of the required tests unless otherwise specified.
- B. **Form:** This schedule shall be in tabular form and shall include, but not be limited to, the following:
  - 1. Specification Section number
  - 2. Description of the test
  - 3. Identification of applicable standards
  - 4. Identification of test methods
  - 5. Number of tests required
  - 6. Time schedule or time span for tests
  - 7. Entity responsible for performing tests
  - 8. Requirements for taking samples
  - 9. Unique characteristics of each service
- C. **Distribution:** Distribute the schedule to the Owner, Architect, and each party involved in performance of portions of the Work where inspections and tests are required.

**END OF SECTION 013200**

## **SECTION 01 33 00 SUBMITTAL PROCEDURES**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. This Section includes administrative and procedural requirements for submittals required for performance of the Work, including the following:

1. Shop Drawings.
2. Product Data.
3. Quality Assurance Submittals.
4. Operating and Maintenance Manuals.
5. Warranties.

- B. Administrative Submittals: Refer to General and Supplementary Conditions other applicable Division 1 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to, the following:

1. Construction Progress Schedule including Schedule of Values.
2. Performance and Payment Bonds.
3. Insurance certificates.
4. Applications for Payment.
5. Certified Payroll Reports.
6. Partial and Final Receipt of Payment and Release Forms.
7. Affidavit Compliance with Prevailing Wage Law.
8. Record Drawings.
9. Notification, Permits, etc.

- C. The Contractor is obliged and responsible to check all shop drawings and schedules to assure compliance with contract plans and specifications. The Contractor is responsible for the content of the shop drawings and coordination with other contract work. Shop drawings and schedules shall indicate, in detail, all parts of an item or work, including erection and setting instructions and integration with the work of other trades.

- D. The Contractor shall at all times make a copy, of all approved submittals, available on site to the Construction Representative.

#### **1.3 SUBMITTAL PROCEDURES**

- A. The Contractor shall comply with the General and Supplementary Conditions and other applicable sections of the Contract Documents. The Contractor shall submit, with such promptness as to cause no delay in his work or in that of any other contractors, all required submittals indicated in Part 3.1 of this section and elsewhere in the Contract Documents. Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
  2. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination.
    - a. The Designer reserves the right to withhold action on a submittal requiring coordination with other submittals until all related submittals are received.
- B. Each drawing and/or series of drawings submitted must be accompanied by a letter of transmittal giving a list of the titles and numbers of the drawings. Each series shall be numbered consecutively for ready reference and each drawing shall be marked with the following information:
1. Date of Submission
  2. Name of Project
  3. Location
  4. Section Number of Specification
  5. State Project Number
  6. Name of Submitting Contractor
  7. Name of Subcontractor
  8. Indicate if item is submitted as specified or as a substitution

#### **1.4 SHOP DRAWINGS**

- A. Comply with the General Conditions, Article 3.2.
- B. The Contractor shall submit newly prepared information drawn accurately to scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not a Shop Drawing.
- C. Shop Drawings include fabrication and installation drawings, setting diagrams, schedules, patterns, templates and similar drawings. Include the following information.
1. Dimensions.
  2. Identification of products and materials included by sheet and detail number.
  3. Compliance with specified standards.
  4. Notation of coordination requirements.
  5. Notation of dimensions established by field measurement.
  6. Sheet Size: Except for templates, patterns and similar full-size Drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 36 by 48 inches

#### **1.5 PRODUCT DATA**

- A. The Contractor shall comply with the General Conditions, Article 3.2.
- B. The Contractor shall collect Product Data into a single submittal for each element of construction or system. Product Data includes printed information, such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams, and performance curves.

1. Mark each copy to show applicable choices and options. Where printed Product Data includes information on several products that are not required, mark copies to indicate the applicable information. Include the following information:
  - a. Manufacturer's printed recommendations.
  - b. Compliance with trade association standards.
  - c. Compliance with recognized testing agency standards.
  - d. Application of testing agency labels and seals.
  - e. Notation of dimensions verified by field measurement.
  - f. Notation of coordination requirements.
2. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.

## **1.6 SAMPLES**

- A. The Contractor shall comply with the General Conditions, Article 3.2.

## **1.7 QUALITY ASSURANCE DOCUMENTS**

- A. The Contractor shall comply with the General Conditions. Article 3.2
- B. The Contractor shall submit quality-control submittals, including design data, certifications, manufacturer's instructions, manufacturer's field reports, and other quality-control submittals as required under other Sections of the Specifications.
- C. Certifications: Where other Sections of the Specifications require certification that a product, material, or installation complies with specified requirements, submit a notarized certification from the manufacturer certifying compliance with specified requirements.
  1. Signature: Certification shall be signed by an officer of the manufacturer or other individual authorized to contractually bind the company.
- D. Inspection and Test Reports: The Contractor shall submit the required inspection and test reports from independent testing agencies as specified in this section and in other sections of the Contract Documents. Unless specified elsewhere, the Contractor shall pay for all inspections and testing by Owner approved testing laboratories.

## **1.8 OPERATING AND MAINTENANCE MANUALS AND WARRANTIES**

- A. The Contractor shall submit all required manufacturer's operating instructions, maintenance/service manuals and warranties in accordance with the General Conditions Article 3.5 and Supplementary Conditions and this and other sections of the Contract Documents.

## **PART 2 - PRODUCTS (Not Applicable)**

## **PART 3 - EXECUTION**

### **3.1 REQUIRED SUBMITTALS**

- A. Contractor shall submit the following information for materials and equipment to be provided under this contract.

SECTION	DESCRIPTION	TYPE OF SUBMITTAL											
		Shop Drawings	Product Data	Sample	Certifications	Manufacturer's Instructions	Test reports	Inspection Reports	Wiring Diagrams	Record Photographs	Maintenance Data	Operating Instruction	Warranty
013100	Coordination				X								
013200	Schedules – Bar Chart			X									
013513.28	Site Security		X		X								
230519	Meters and Gauges for HVAC Piping	X											
230523	General Duty Valves for HVAC Piping	X											
230524	HVAC Hydronic Specialties	X											
230529	Hangers and Supports for HVAC Piping and Equipment	X											
230548	HVAC Vibration Isolation	X	X										
230553	HVAC Mechanical Identification	X											
230593	Testing, Adjusting, & Balancing			X	X		X						
230923	DDC System for HVAC	X							X	X	X	X	
232100	Hydronic Piping	X											
232123	HVAC Hydronic Pumps	X								X	X	X	
236426	Water Cooled Rotary Chiller	X								X	X	X	
260519	Low Voltage (600v and less) Conductors and Cables	X											
260533	Raceways for Electrical Systems	X											
260534	Electrical Boxes and Fittings	X											
260553	Identification for Electrical Systems	X											
262923	Variable Frequency Drives	X								X	X	X	X

END OF SECTION 01 33 00

## **SECTION 013513.10 – SITE SECURITY AND HEALTH REQUIREMENTS (OA)**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUBMITTALS**

- A. List of required submittals:
  - 1. Materials Safety Data Sheets for all hazardous materials to be brought onsite.
  - 2. Schedule of proposed shutdowns, if applicable.
  - 3. A list of the names of all employees who will submit fingerprints for a background check, and the signed privacy documents identified below for each employee.

### **PART 2 - PRODUCTS (Not Applicable)**

### **PART 3 - EXECUTION**

#### **3.1 ACCESS TO THE SITE**

- A. The Contractor shall arrange with Facility Representatives to establish procedures for the controlled entry of workers and materials into the work areas at the Facility.
- B. The Contractor shall establish regular working hours with Facility Representatives. The Contractor must report changes in working hours or overtime to Facility Representatives and obtain approval twenty-four (24) hours ahead of time. The Contractor shall report emergency overtime to Facility Representatives as soon as it is evident that overtime is needed. The Contractor must obtain approval from Facility Representatives for all work performed after dark.
- C. The Contractor shall provide the name and phone number of the Contractor's employee or agent who is in charge onsite; this individual must be able to be contacted in case of emergency. The Contractor must be able to furnish names and address of all employees upon request.
- D. All construction personnel shall visibly display issued identification cards.

#### **3.2 FIRE PROTECTION, SAFETY, AND HEALTH CONTROLS**

- A. The Contractor shall take all necessary precautions to guard against and eliminate possible fire hazards.
  - 1. Onsite burning is prohibited.
  - 2. The Contractor shall store all flammable or hazardous materials in proper containers located outside the buildings or offsite, if possible.
  - 3. The Contractor shall provide and maintain, in good order, during construction fire extinguishers as required by the National Fire Protection Association. In

areas of flammable liquids, asphalt, or electrical hazards, 15-pound carbon dioxide or 20-pound dry chemical extinguishers shall be provided.

- B. The Contractor shall not obstruct streets or walks without permission from the Owner's Construction Representative and Facility Representatives.
- C. The Contractor's personnel shall not exceed the speed limit of 15 mph while at the Facility unless otherwise posted.
- D. The Contractor shall take all necessary, reasonable measures to reduce air and water pollution by any material or equipment used during construction. The Contractor shall keep volatile wastes in covered containers, and shall not dispose of volatile wastes or oils in storm or sanitary drains.
- E. The Contractor shall keep the project site neat, orderly, and in a safe condition at all times. The Contractor shall immediately remove all hazardous waste, and shall not allow rubbish to accumulate. The Contractor shall provide onsite containers for collection of rubbish and shall dispose of it at frequent intervals during the progress of the Work.
- F. Fire exits, alarm systems, and sprinkler systems shall remain fully operational at all times, unless written approval is received from the Owner's Construction Representative and the appropriate Facility Representative at least twenty-four (24) hours in advance. The Contractor shall submit a written time schedule for any proposed shutdowns.
- G. For all hazardous materials brought onsite, Material Safety Data Sheets shall be on site and readily available upon request at least a day before delivery.
- H. Alcoholic beverages or illegal substances shall not be brought upon the Facility premises. The Contractor's workers shall not be under the influence of any intoxicating substances while on the Facility premises.

### **3.3 SECURITY CLEARANCES AND RESTRICTIONS**

#### **A. FMDC REQUIRED FINGERPRINTING FOR CRIMINAL BACKGROUND AND WARRANTS CHECK**

1. All employees of the Contractor are required to submit fingerprints to the Missouri State Highway Patrol to enable the Office of Administration, Division of Facilities Management, Design and Construction (FMDC) to receive state and national criminal background checks on such employees. FMDC will also check with law enforcement to determine if any of the Contractor's employees has an outstanding warrant for his or her arrest. FMDC reserves the right to prohibit any employee of the Contractor from performing work in or on the premises of any facility owned, operated, or utilized by the State of Missouri for any reason.
2. The Contractor shall ensure all of its employees submit fingerprints to the Missouri State Highway Patrol and pay for the cost of such background checks. The Contractor shall submit to FMDC a list of the names of the Contractor's employees who will be fingerprinted and a signed Missouri Applicant Fingerprint Privacy Notice, Applicant Privacy Rights and Privacy Act Statement for each employee. All employees of the Contractor approved by FMDC to work at a State facility must obtain a contractor ID badge from FMDC prior to beginning work on-site, unless the Director of FMDC, at the Director's discretion, waives the requirement for a contractor ID badge. The Contractor and its employees

must comply with the process for background checks and contractor ID badges found on FMDC's website at: <https://oa.mo.gov/fmdc-contractor-id-badges>.

3. Pursuant to section 43.540, RSMo, FMDC participates in the Missouri Rap Back and National Rap Back programs as of August 28, 2018. This means that the Missouri State Highway Patrol, Central Records Repository, and the Federal Bureau of Investigation will retain the fingerprints submitted by each of the Contractor's employees, and those fingerprints will be searched against other fingerprints on file, including latent fingerprints. While retained, an employee's fingerprints may continue to be compared against other fingerprints submitted or retained by the Federal Bureau of Investigation, including latent fingerprints.
4. As part of the Missouri and National Rap Back programs, FMDC will receive notification if a new arrest is reported for an employee whose fingerprints have been submitted for FMDC after August 28, 2018. If the employee is performing work on a State contract at the time of the arrest notification, FMDC will request and receive the employee's updated criminal history records. If the employee is no longer performing work on a State contract, FMDC will not obtain updated criminal records.
5. Pursuant to section 43.540, RSMo, the Missouri State Highway Patrol will provide the results of the employee's background check directly to FMDC. FMDC may NOT release the results of a background check to the Contractor or provide the Contractor any information obtained from a background check, either verbally or in writing. FMDC will notify the Contractor only whether an employee is approved to work on State property.
6. Each employee who submits fingerprints to the Missouri State Highway Patrol has a right to obtain a copy of the results of his or her background check. The employee may challenge the accuracy and completeness of the information contained in a background check report and obtain a determination from the Missouri State Highway Patrol and/or the FBI regarding the validity of such challenge prior to FMDC making a final decision about his or her eligibility to perform work under a State contract.
7. The Contractor shall notify FMDC if an employee is terminated or resigns from employment with the Contractor. If the Contractor does not anticipate performing work on a State contract in the future, the Contractor may request that FMDC remove its employees from the Rap Back programs. However, if removed from the Rap Back programs, employees will be required to submit new fingerprints should the contractor be awarded another State contract.
8. Upon award of a Contract, the Contractor should contact FMDC to determine if its employees need to provide a new background check. If a Contractor's employee has previously submitted a fingerprint background check to FMDC as part of the Missouri and National Rap Back programs, the employee may not need to submit another fingerprint search for a period of three to six years, depending upon the circumstances. The Contractor understands and agrees that FMDC may require more frequent background checks without providing any explanation to the Contractor. The fact that an additional background check is requested by FMDC does not indicate that the employee has a criminal record.

### **3.4 DISRUPTION OF UTILITIES**

- A. The Contractor shall give a minimum of seventy-two (72) hours written notice to the Construction Representative and the Facility Representative before disconnecting electric, gas, water, fire protection, or sewer service to any building.
- B. The Contractor shall give a minimum of seventy-two (72) hours written notice to the Construction Representative and Facility Representative before closing any access drives, and shall make temporary access available, if possible. The Contractor shall not obstruct streets, walks, or parking.

**END OF SECTION 013513.10**

## **SECTION 015000 – CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. This Section includes requirements for construction facilities and temporary controls including temporary utilities, support facilities, security, and protection.
- B. Temporary utilities include, but are not limited to, the following:
  - 1. Water service and distribution
  - 2. Temporary electric power and light
  - 3. Temporary heat
  - 4. Ventilation
  - 5. Telephone service
  - 6. Sanitary facilities, including drinking water
  - 7. Storm and sanitary sewer
- C. Support facilities include, but are not limited to, the following:
  - 1. Field offices and storage sheds
  - 2. Temporary roads and paving
  - 3. Dewatering facilities and drains
  - 4. Temporary enclosures
  - 5. Hoists and temporary elevator use
  - 6. Temporary project identification signs and bulletin boards
  - 7. Waste disposal services
  - 8. Rodent and pest control
  - 9. Construction aids and miscellaneous services and facilities
- D. Security and protection facilities include, but are not limited to, the following:
  - 1. Temporary fire protection
  - 2. Barricades, warning signs, and lights
  - 3. Sidewalk bridge or enclosure fence for the site
  - 4. Environmental protection

#### **1.3 SUBMITTALS**

- A. Temporary Utilities: Submit reports of tests, inspections, meter readings, and similar procedures performed on temporary utilities.

- B. Implementation and Termination Schedule: Within (15) days of the date established for commencement of the Work, submit a schedule indicating implementation and termination of each temporary utility.

## **1.4 QUALITY ASSURANCE**

- A. Regulations: Comply with industry standards and applicable laws and regulations including, but not limited to, the following:
  - 1. Building code requirements
  - 2. Health and safety regulations
  - 3. Utility company regulations
  - 4. Police, fire department, and rescue squad rules
  - 5. Environmental protection regulations
- B. Standards: Comply with NFPA 241 “Standard for Safeguarding Construction, Alterations, and Demolition Operations”. ANSI A10 Series standards for “Safety Requirements for Construction and Demolition”, and NECA Electrical Design Library “Temporary Electrical Facilities”.
  - 1. Electrical Service: Comply with NEMA, NECA, and UL standards and regulations for temporary electric service. Install service in compliance with NFPA 70 “National Electric Code”.
- C. Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.

## **1.5 PROJECT CONDITIONS**

- A. Temporary Utilities: Prepare a schedule indicating dates for implementation and termination of each temporary utility. At the earliest feasible time, when acceptable to the Owner, change over from use of temporary service to use of permanent service.
- B. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Relocate temporary services and facilities as the Work progresses. Do not overload facilities or permit them to interfere with progress. Take necessary fire-prevention measures. Do not allow hazardous, dangerous, or unsanitary conditions, or public nuisances to develop or persist onsite.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. General: Provide new materials. If acceptable to the Designer, the Contractor may use undamaged, previously used materials in serviceable condition. Provide materials suitable for use intended.
- B. Lumber and Plywood: Comply with requirements in Division 6 Section “Rough Carpentry”.
  - 1. For job-built temporary office, shops, and sheds within the construction area, provide UL-labeled, fire-treated lumber and plywood for framing, sheathing, and siding.

2. For signs and directory boards, provide exterior-type, Grade B-B high-density concrete form overlay plywood of sized and thicknesses indicated.
  3. For fences and vision barriers, provide minimum 3/9" (9.5mm) thick exterior plywood.
  4. For safety barriers, sidewalk bridges, and similar uses, provide minimum 5/8" (16mm) thick exterior plywood.
- C. Gypsum Wallboard: Provide gypsum wallboard on interior walls of temporary offices.
- D. Roofing Materials: Provide UL Class A standard-weight asphalt shingles or UL Class C mineral-surfaced roll roofing on roofs of job-built temporary office, shops, and shed.
- E. Paint: Comply with requirements of Division 9 Section "Painting".
1. For job-built temporary offices, shops, sheds, fences, and other exposed lumber and plywood, provide exterior-grade acrylic-latex emulsion over exterior primer.
  2. For sign panels and applying graphics, provide exterior-grade alkyd gloss enamel over exterior primer.
  3. For interior walls of temporary offices, provide two (2) quarts interior latex-flat wall paint.
- F. Tarpaulins: Provide waterproof, fire-resistant, UL-labeled tarpaulins with flame-spread rating of (15) or less. For temporary enclosures, provide translucent, nylon-reinforced laminated polyethylene or polyvinyl chloride, fire-retardant tarpaulins.
- G. Water: Provide potable water approved by local health authorities.
- H. Open-Mesh Fencing: Provide 0.120" (3mm) thick, galvanized 2" (50mm) chainlink fabric fencing 6' (2m) high with galvanized barbed-wire top strand and galvanized steel pipe posts, 1½" (38mm) ID for line posts and 2½" (64mm) ID for corner posts.

## **2.2 EQUIPMENT**

- A. General: Provide new equipment. If acceptable to the Designer, the Contractor may use undamaged, previously used equipment in serviceable condition. Provide equipment suitable for use intended.
- B. Water Hoses: Provide ¾" (19mm), heavy-duty, abrasion-resistant, flexible rubber hoses 100' (30m) long, with pressure rating greater than the maximum pressure of the water distribution system. Provide adjustable shutoff nozzles at hose discharge.
- C. Electrical Outlets: Provide properly configured, NEMA-polarized outlets to prevent insertion of 110 to 120V plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button, and pilot light for connection of power tools and equipment.
- D. Electrical Power Cords: Provide grounded extension cords. Use hard-service cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage rating.

- E. Lamps and Light Fixtures: Provide general service incandescent lamps of wattage required for adequate illumination. Provide guard cages or tempered-glass enclosures where exposed to breakage. Provide exterior fixture where exposed to moisture.
- F. Heating Units: Provide temporary heating units that have been tested and labeled by UL, FM, or another recognized trade association related to the type of fuel being consumed.
- G. Temporary Offices: Provide prefabricated or mobile units or similar job-built construction with lockable entrances, operable windows, and serviceable finishes. Provide heated and air-conditioned units on foundations adequate for normal loading.
- H. Temporary Toilet Units: Provide self-contained, single-occupant toilet units of the chemical, aerated re-circulation, or combustion type. Provide units properly vented and fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.
- I. Fire Extinguishers: Provide hand-carried, portable, UL-rated, Class A fire extinguishers for temporary offices and similar spaces. In other locations, provide hand-carried, portable, UL-rated, Class ABC, dry-chemical extinguishers, or a combination of extinguishers of NFPA-recommended classes for the exposures.
  - 1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve the Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.
- B. Provide each Facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

### **3.2 TEMPORARY UTILITY INSTALLATION**

- A. General: Engage the appropriate local utility company to install temporary service or connect to existing service. Where company provides only part of the service, provide the remainder with matching, compatible materials and equipment. Comply with company recommendations.
  - 1. Arrange with company and existing users for a time when service can be interrupted, if necessary, to make connections for temporary services.
  - 2. Provide adequate capacity at each stage of construction. Prior to temporary utility availability, provide trucked-in services.
  - 3. Obtain easements to bring temporary utilities to the site where the Owner's easements cannot be used for that purpose.
  - 4. Use Charges: Cost or use charges for temporary facilities are not chargeable to the Owner or Designer. Neither the Owner nor Designer will accept cost or use charges as a basis of claims for Contract Change.

- B. Temporary Water Service: The Owner will provide water for construction purposes from the existing building system. All required temporary extensions shall be provided and removed by the Contractor. Connection points and methods of connection shall be designated and approved by the Construction Representative.
- C. Temporary Electric Power Service: The Owner will provide electric power for construction lighting and power tools. Contractors using such services shall pay all costs of temporary services, circuits, outlet, extensions, etc.
- D. Temporary Lighting: When overhead floor or roof deck has been installed, provide temporary lighting with local switching.
  - 1. Install and operate temporary lighting that will fulfill security and protection requirements without operating the entire system. Provide temporary lighting that will provide adequate illumination for construction operations and traffic conditions.
- E. Temporary Heating: Provide temporary heat required by construction activities for curing or drying of completed installations or for protection of installed construction from adverse effects of low temperatures or high humidity. Select safe equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce the ambient condition required and minimize consumption of energy.
  - 1. Heating Facilities: Except where the Owner authorizes use of the permanent system, provide vented, self-contained, LP gas or fuel-oil heaters with individual space thermostatic control.
  - 2. Use of gasoline-burning space heaters, open flame, or salamander heating units is prohibited.
- F. Temporary Heating and Cooling: The normal heating and/or cooling system of the building shall be maintained in operation during the construction. Should the Contractor find it necessary to interrupt the normal HVAC service to spaces, which have not been vacated for construction, such interruptions shall be pre-scheduled with the Construction Representative.
- G. Temporary Telephones: The Owner will provide telephones within the facility. All construction personnel will be allowed access only to those specific telephones designated by the Construction Representative.
- H. Temporary Toilets: The Owner will provide toilets and associated facilities within the building. All construction personnel will be allowed access only to those specific facilities designated by the Construction Representative.
- I. Wash Facilities: The Owner will provide wash facilities within the building. All construction personnel will be allowed access only to those specific facilities designated by the Construction Representative.
- J. Drinking-Water Facilities: The Owner will provide drinking water facilities within the building. All construction personnel will be allowed access only to those specific facilities designated by the Construction Representative.
- K. Provide earthen embankments and similar barriers in and around excavations and subgrade construction, sufficient to prevent flooding by runoff of storm water from heavy rains.

### 3.3 SUPPORT FACILITIES INSTALLATION

- A. General: Locate field offices, storage sheds, and other temporary construction and support facilities for easy access.
  - 1. Maintain support facilities until near Substantial Completion. Remove prior to Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to the Owner.
- B. Field Offices: Provide insulated, weathertight temporary offices of sufficient size to accommodate required office personnel at the Project site. Keep the office clean and orderly for use for small progress meetings. Furnish and equip office as follows:
  - 1. Furnish with a desk and chairs, a 4-drawer file cabinet, plan table, plan rack, and a 6-shelf bookcase.
  - 2. Equip with a water cooler and private toilet complete with water closet, lavatory, and medicine cabinet unit with a mirror.
- C. Storage Facilities: Limited areas for storage of building materials are available onsite. Available storage areas are shown on the drawings. The Contractor shall provide his own security. Specific locations for storage and craning operations will be discussed at the Pre-Bid Meeting and the Pre-Construction Meeting.
- D. Temporary Paving: Construct and maintain temporary roads and paving to support the indicated loading adequately and to withstand exposure to traffic during the construction period. Locate temporary paving for roads, storage areas, and parking where the same permanent facilities will be located. Review proposed modifications to permanent paving with the Designer.
  - 1. Paving: Comply with Division 2 Section “Hot-Mixed Asphalt Paving” for construction and maintenance of temporary paving.
  - 2. Coordinate temporary paving development with subgrade grading, compaction, installation and stabilization of subbase, and installation of base and finish courses of permanent paving.
  - 3. Install temporary paving to minimize the need to rework the installations and to result in permanent roads and paved areas without damage or deterioration when occupied by the Owner.
  - 4. Delay installation of the final course of permanent asphalt concrete paving until immediately before Substantial Completion. Coordinate with weather conditions to avoid unsatisfactory results.
  - 5. Extend temporary paving in and around the construction area as necessary to accommodate delivery and storage of materials, equipment usage, administration, and supervision.
- E. Construction Parking: Parking at the site will be provided in the areas designated at the Pre-Construction Meeting.
- F. Dewatering Facilities and Drains: For temporary drainage and dewatering facilities and operations not directly associated with construction activities included under individual Sections, comply with dewatering requirements of applicable Division 2 Sections. Where feasible, utilize the same facilities. Maintain the site, excavations, and construction free of water.

- G. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities.
1. Where heat is needed and the permanent building enclosure is not complete, provide temporary enclosures where there is no other provision for containment of heat. Coordinate enclosure with ventilating and materials drying or curing requirements to avoid dangerous conditions and effects.
  2. Install tarpaulins securely with incombustible wood framing and other materials. Close openings of 25SqFt (2.3SqM) or less with plywood or similar materials.
  3. Close openings through floor or roof decks and horizontal surfaces with load-bearing, wood-framed construction.
  4. Where temporary wood or plywood enclosure exceeds 100SqFt (9.2SqM) in area, use UL-labeled, fire-retardant-treated material for framing and main sheathing.
- H. Temporary Lifts and Hoists: Provide facilities for hoisting materials and employees. Truck cranes and similar devices used for hoisting materials are considered “tools and equipment” and not temporary facilities.
- I. Temporary Elevator Use: The Owner will allow use of elevators within the building. All construction personnel will be allowed access only to those specific elevators designated by the Construction Representative.
- J. Project Identification and Temporary Signs: Prepare project identification and other signs of size indicated. Install signs where indicated to inform the public and persons seeking entrance to the Project. Support on posts or framing of preservative-treated wood or steel. Do not permit installation of unauthorized signs.
1. Project Identification Signs: Engage an experienced sign painter to apply graphics. Comply with details indicated.
  2. Temporary Signs: Prepare signs to provide directional information to construction personnel and visitors.
- K. Temporary Exterior Lighting: Install exterior yard and sign lights so signs are visible when Work is being performed.
- L. Collection and Disposal of Waste: Collect waste from construction areas and elsewhere daily. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly. Do not hold materials more than seven (7) days during normal weather or three (3) days when the temperature is expected to rise above 80°F (27°C). Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material lawfully.
- M. Rodent Pest Control: Before deep foundation work has been completed, retain a local exterminator or pest control company to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests. Employ this service to perform extermination and control procedures at regular intervals so the Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using environmentally safe materials.

- N. Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate. Cover finished, permanent stairs with a protective covering of plywood or similar material so finishes will be undamaged at the time of acceptance.

### 3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Except for use of permanent fire protection as soon as available, do not change over from use of temporary security and protection facilities to permanent facilities until Substantial Completion, or longer, as requested by the Designer.
- B. Temporary Fire Protection: Until fire-protection needs are supplied by permanent facilities, install and maintain temporary fire-protection facilities of the types needed to protect against reasonable predictable and controllable fire losses. Comply with NFPA 10 “Standard for Portable Fire Extinguishers” and NFPA 241 “Standard for Safeguarding Construction, Alterations, and Demolition Operations”.
  - 1. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one (1) extinguisher on each floor at or near each usable stairwell.
  - 2. Store combustible materials in containers in fire-safe locations.
  - 3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, stairways, and other access routes for fighting fires. Prohibit smoking in hazardous fire-exposure areas.
  - 4. Provide supervision of welding operations, combustion-type temporary heating units, and similar sources of fire ignition.
- C. Permanent Fire Protection: At the earliest feasible date in each area of the Project complete installation of the permanent fire-protection facility including connected services and place into operation and use. Instruct key personnel on use of facilities.
- D. Barricades, Warning Signs, and Lights: Comply with standards and code requirements for erection of structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and the public of the hazard being protected against. Where appropriate and needed, provide lighting including flashing red or amber lights.
- E. Enclosure Fence: Before excavation begins, install an enclosure fence with lockable entrance gates. Locate where indicated, or enclose the entire site or the portion determined sufficient to accommodate construction operations. Install in a manner that will prevent people, dogs, and other animals from easily entering the site, except by the entrance gates.
  - 1. Provide open-mesh, chainlink fencing with posts set in a compacted mixture of gravel and earth.
  - 2. Provide plywood fence, 8’ (2.5m) high, framed with (4) 2”x4” (50mm x 100mm) rails, and preservative-treated wood posts spaced not more than 8’ (2.5m) apart.
- F. Covered Walkway: Erect a structurally adequate, protective covered walkway for passage of persons along the adjacent public street. Coordinate with entrance gates, other facilities, and obstructions. Comply with regulations of authorities having jurisdiction.
  - 1. Construct covered walkways using scaffold or shoring framing. Provide wood plank overhead decking, protective plywood enclosure walls, handrails, barricades, warning signs, lights, safe and well-drained walkways, and similar

provisions for protection and safe passage. Extend the back wall beyond the structure to complete the enclosure fence. Paint and maintain in a manner acceptable to the Owner and the Designer.

- G. Security Enclosure and Lockup: Install substantial temporary enclosure of partially completed areas of construction. Provide locking entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.
  - 1. Storage: Where materials and equipment must be stored and are of value or attractive for theft, provide a secure lockup. Enforce discipline in connection with the installation and release of material to minimize the opportunity for theft and vandalism.
- H. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and minimize the possibility that air, waterways, and subsoil might be contaminated or polluted or that other undesirable effects might result. Avoid use of tools and equipment that produce harmful noise. Restrict use of noisemaking tools and equipment to hours that will minimize complaints from persons or firms near the site.

### **3.5 OPERATION, TERMINATION AND REMOVAL**

- A. Supervision: Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.
- B. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage by freezing temperatures and similar elements.
  - 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
  - 2. Protection: Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.
- C. Termination and Removal: Unless the Designer requests that it be maintained longer, remove each temporary facility when the need has ended, when replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with the temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
  - 1. Materials and facilities that constitute temporary facilities are the Contractor's property. The Owner reserves the right to take possession of project identification signs.
  - 2. Remove temporary paving not intended for or acceptable for integration into permanent paving. Where the area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil in the area. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at the temporary entrances as required by the governing authority.
  - 3. At Substantial Completion, clean and renovate permanent facilities used during the construction period including, but not limited to, the following:
    - a. Replace air filters and clean inside of ductwork and housing.

- b. Replace significantly worn parts and parts subject to unusual operating conditions.
- c. Replace lamps burned out or noticeably dimmed by hours of use.

**END OF SECTION 015000**

## **SECTION 017400 – CLEANING**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. This Section includes administrative and procedural requirements for cleaning during the Project.
- B. Environmental Requirements: Conduct cleaning and waste-disposal operations in compliance with local laws and ordinances. Comply fully with federal and local environmental and anti-pollution regulations.
  - 1. Do not dispose of volatile wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains.
  - 2. Burning or burying of debris, rubbish, or other waste material on the premises is not permitted.

### **PART 2 - PRODUCTS**

#### **2.1 MATERIALS**

- A. Cleaning Agents: Use cleaning materials and agents recommended by the manufacturer or fabricator for the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

### **PART 3 - EXECUTION**

#### **3.1 PROGRESS CLEANING**

- A. General
  - 1. Retain all stored items in an orderly arrangement allowing maximum access, not impeding drainage or traffic, and providing the required protection of materials.
  - 2. Do not allow the accumulation of scrap, debris, waste material, and other items not required for construction of this Work.
  - 3. At least <once><twice> each month, and more often if necessary, completely remove all scrap, debris, and waste material from the jobsite.
  - 4. Provide adequate storage for all items awaiting removal from the jobsite, observing all requirements for fire protection and protection of the ecology.
- B. Site
  - 1. Daily, inspect the site and pick up all scrap, debris, and waste material. Remove all such items to the place designated for their storage.
  - 2. Weekly, inspect all arrangements of materials stored onsite. Re-stack, tidy, or otherwise service all material arrangements.

3. Maintain the site in a neat and orderly condition at all times.

C. Structures

1. Daily, inspect the structures and pick up all scrap, debris, and waste material. Remove all such items to the place designated for their storage.
2. Weekly, sweep all interior spaces clean. "Clean" for the purposes of this paragraph, shall be interpreted as meaning free from dust and other material capable of being removed by use of reasonable effort and handheld broom.
3. In preparation for installation of succeeding materials, clean the structures or pertinent portions thereof to the degree of cleanliness recommended by the manufacturer of the succeeding material, using all equipment and materials required to achieve the required cleanliness.
4. Following the installation of finish floor materials, clean the finish floor daily while work is being performed in the space in which finish materials have been installed. "Clean" for the purposes of this subparagraph, shall be interpreted as meaning free from all foreign material which, in the opinion of the Construction Representative, may be injurious to the finish of the finish floor material.

### 3.2 FINAL CLEANING

- A. General: Provide final cleaning operations when indicated. Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit of Work to the condition expected from a commercial building cleaning and maintenance program. Comply with manufacturer's instructions.
- B. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for the entire Project or a portion of the Project.
  1. Clean the Project Site, yard and grounds, in areas disturbed by construction activities including landscape development areas, of rubbish, waste material, litter, and foreign substances.
  2. Sweep paved areas broom clean. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
  3. Remove petrochemical spills, stains, and other foreign deposits.
  4. Remove tools, construction equipment, machinery, and surplus material from the site.
  5. Remove snow and ice to provide safe access to the building.
  6. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
  7. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
  8. Broom clean concrete floors in unoccupied spaces.
  9. Vacuum clean carpet and similar soft surfaces removing debris and excess nap. Shampoo, if required.
  10. Clean transparent material, including mirrors and glass in doors and windows. Remove glazing compounds and other substances that are noticeable vision-

obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.

11. Remove labels that are not permanent labels.
  12. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
    - a. Do not paint over “UL” and similar labels, including mechanical and electrical nameplates.
  13. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
  14. Clean plumbing fixtures to a sanitary condition free of stains, including stains resulting from water exposure.
  15. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
  16. Clean ducts, blowers, and coils if units were operated without filters during construction
  17. Clean food-service equipment to a sanitary condition, ready and acceptable for its intended use.
  18. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs and defective and noisy starters in fluorescent and mercury vapor fixtures.
  19. Leave the Project clean and ready for occupancy.
- C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid the Project of rodents, insects, and other pests. Comply with regulations of local authorities.
- D. Removal of Protection: Remove temporary protection and facilities installed during construction to protect previously completed installations during the remainder of the construction period.
- E. Compliances: Comply with governing regulations and safety standards for cleaning operations. Remove waste materials from the site and dispose of lawfully.
1. Where extra materials of value remain after Final Acceptance by the Owner, they become the Owner’s property.

**END OF SECTION 017400**

## **SECTION 23 00 00 – GENERAL PROVISIONS**

### **PART 1 - GENERAL**

#### **1.1 DESCRIPTION OF WORK**

- A. Provide items, articles, materials, operation and methods required by drawings and specifications including labor, equipment, supplies and incidentals necessary for completion of work in Division 23 – Heating Ventilating and Air Conditioning.

#### **1.2 RELATED DOCUMENTS**

- A. The General Provisions described herein, together with the conditions of contract, and the General Requirements of Division 1, apply to the work in Division 23 – Heating Ventilating and Air Conditioning.
- B. This Section is hereby made a part of all other sections of Division 23 – Heating Ventilating and Air Conditioning, as if repeated in each.

#### **1.3 QUALITY ASSURANCE**

- A. All permits and licenses that are required by governing authorities for the performance of shall be procured and paid for by the Contractor.
- B. All work shall be performed in compliance with all applicable and governing safety regulations including the regulations of the Occupational and Safety Health Act. All safety lights, signs and guards required for performance of work shall be provided by the Contractor.
- C. All work shall conform to the requirements of all applicable codes, ordinances and regulations including the rules and regulations of the National Electrical Code, the National Fire Protection Association, OSHA and all State and Local laws, codes and ordinances.
- D. Laws, codes, ordinances and regulations shall take precedent excepting only where the work called for by the drawings and specifications exceeds by quality and quantity.
- E. Fixtures, appliances, equipment and materials which are subject to Underwriter's Laboratory tests shall bear such approval.
- F. Mechanical and electrical designs are based on the requirements for the specified manufacturers listed on the equipment schedules. Conduit, disconnects, motor starters, breakers, fuses and wire sizes are selected on basis of scheduled equipment. Increased current requirements necessitating larger wire, breakers, switches, etc., to accommodate any alternate or substitute manufacturer's equipment, other than as shown on drawings shall be provided without any increase in contract price by contractor furnishing the equipment.
- G. Manufacturers, where specifically called for, must provide factory tests, unit installation observations, unit start-up and tests, etc., as specified, and submit signed reports to the Engineer upon completion of these services. Subletting of these services will not be permitted. Shop drawing submittals shall be accompanied with a letter of certification by the manufacturer that the specified services shall be provided. Failure to do so shall be cause to reject the shop drawing submittals.
- H. The contract drawings are in part schematic and intended to convey the scope of work and indicate the general layout, design and arrangement. The Contractor shall follow these drawings in the layout of his work and shall consult general construction drawings, electrical drawings and all other drawings for this project, and shall verify all existing site conditions

to determine all conditions affecting the work shown or specified. The contract drawings are not to be scaled and the Contractor shall verify spaces in which the work is to be installed.

- I. Follow drawings in laying out work, check drawings of other trades to verify spaces in which work will be installed, and maintain maximum headroom and space conditions at all points. Where headroom or space conditions appear inadequate, Engineer shall be notified before proceeding with installation.
- J. Work in cooperation with one another to fit piping and ductwork into the structure as job conditions may demand. All final decision as to right of way and run of pipe, ducts, etc. to be made by Engineer or his representative.
- K. All work shall be performed by trained mechanics of a particular trade involved and done in neat and workmanlike manner as approved by "Engineer".
  - 1. Work shall be performed in cooperation with other trades and scheduled to allow timely and efficient completion of project.
  - 2. Furnish other trades advance information on locations and sizes of frames, boxes, sleeves and openings needed for work, and also furnish information and shop drawings necessary to permit other trades affected to install their work properly without delay.
  - 3. Where there is evidence that work of one trade will interfere with work of other trades, all trades shall assist in working out space conditions to make satisfactory adjustments.
- L. Work installed before coordinating with other trades causing interference with work of such other trades shall be changed to correct such condition without increase in contract price and as directed by Engineer.
- M. Where specific details and dimensions are not shown on the drawings, the Contractor shall take measurements and make layouts for the proper installation of the work and coordination with all other work on the project. In case of any discrepancies between the drawings and the specifications, it shall be assumed, by the signing of the Contract, that the higher cost (if any difference in costs) is included in the contract price, and the Contractor shall perform the work in accordance with the drawings or with the specifications, as determined and approved by the Engineer.
- N. The Contractor shall be responsible for a scheduled sequence in performing the work so that it will not interfere with the Owner's operation in the existing building. Before any work is started, the Contractor shall consult with the Engineer and Owner and arrange a satisfactory schedule.
  - 1. Make temporary alterations as required to execute work so that all operations and services in the existing building are maintained with the minimum possible interruption.
  - 2. Temporary shut-downs shall be segregated and shall be of the shortest possible duration. All facilities shall be kept in continuous operation unless specific permission to the contrary is granted by Owner.
- O. Definitions:
  - 1. "Piping" includes, in addition to pipe, all fittings, valves, sleeves, hangers, and other supports and accessories related to such piping.
  - 2. "Concealed" means hidden from sight in chases, furred spaces, shafts, hung ceilings, embedded in construction, or in crawl spaces.
  - 3. "Exposed" means not installed underground or "concealed" as defined above.
  - 4. The words "furnish and install", "provide", "furnish", "install", or equivalent words are used or are understood, to mean the Contractor shall furnish and completely install the system, service, equipment, or material named, together with other associated devices,

- equipment, material, wiring, piping, etc. as required for a complete operating installation, and conforming to the manufacturer's standards and recommendations.
5. It is the intent of these specifications and drawings to call for finished work, tested and ready for operation.
  6. All apparatus, appliances, materials or work not shown on drawings, but mentioned in specifications, or vice versa, and/or all incidental accessories necessary to make work complete and ready for operation, even though not specified or shown on drawings, shall be furnished and installed without increase in contract price.
  7. Should there be discrepancies or questions of intent, refer matter to Engineer in writing for decision before ordering any equipment or materials or before starting any related work.

#### 1.4 SHOP DRAWINGS AND SAMPLES

- A. Shop drawings, project data and samples furnished by the Contractor shall illustrate materials, equipment or workmanship, and establish standards by which the work will be judged.
- B. Shop Drawings and Samples shall be submitted to the Engineer by a letter of transmittal. The party making the submission shall be named on Shop Drawing/Sample and also in the letter of transmittal.
- C. When Shop Drawing submissions are in the form of loose pages (8½" x 11") they shall be submitted in sets assembled in portfolio binders showing on the covers or first page inside, a complete list of contents. A minimum of 7 sets of each submission are required, however, additional copies may be requested.
- D. The Contractor shall review, stamp with his approval and submit, with reasonable promptness and in orderly sequence so as to cause no delay in the work or in the work of any other contractor, all Shop Drawings and Samples required by the Contract Documents or subsequently by the Engineer as modifications. Shop Drawings and Samples shall be properly identified as specified or as the Engineer may require. At the time of submission, The Contractor shall inform the Engineer in writing of any deviation in the Shop Drawings or Samples from the requirements of the Contract Documents.
- E. Except in the case of brochures, catalogue cuts and the like, shop drawings shall be in the form of a reproducible print(s) (sepia). In every case, the submittal shall consist of one sepia of each shop drawing and two (2) black line prints of the same. Each print shall be made from the original shop drawing tracing. The transparency shall be capable of producing clean, clear black and white prints.
- F. Contractor shall stamp each sepia and black line print (shop drawing) the same. He shall also stamp each brochure, sample and the like. **Special Note:** Every page with project information shall be stamped. In every instance, the document shall be reviewed by the Contractor and shall also be signed by the Contractor indicating that the document has been reviewed, and that it is approved by the Contractor. The submittals will **not** be reviewed without the Contractor's approval stamp and signature.
- G. The Contractor's approval stamp and signature shall signify that the Contractor has checked the submittals. Any submittals which have not been checked shall be returned to the Contractor for checking, approval stamp, signature, and resubmittal for compliance with the contract documents. After review of the submittals they will be returned to the Contractor with one of the following remarks checked:
  1. **No Exceptions Taken** SUBJECT TO CONTRACT DOCUMENTS.

2. **Note Corrections** SUBJECT TO CONTRACT DOCUMENTS  
RESUBMISSION NOT REQUIRED.
  3. **Revise and Resubmit** REVISE, RESUBMISSION REQUIRED.
  4. **Rejected** NOT APPROVED.
- H. Upon receipt of exhibits submitted and marked for resubmittal the Contractor shall cause the marked corrections, and corrections that may be contained in the Engineer transmittal letter to be made on each submittal. All such corrections shall be circled, numbered, and dated to permit prompt reviewing upon resubmittal to the Engineer. Upon receipt of each submittal now marked:
  - I. The Contractor shall cause submittals to be distributed to the respective contractors and suppliers as is necessary for proper performance of work.
  - J. At the time of submission, the Contractor shall inform the Engineer in writing of any deviation in the exhibits submitted from the requirements of the Contract.
  - K. The Engineer will review exhibits submitted with reasonable promptness so as to cause no delay, but only for conformance with the design concept of the Project and with the information given in the Contract. The Engineer's review of a separate item shall not indicate review of an assembly in which the item functions. The Engineer's review is not intended to indicate approval of dimensions or quantities.
  - L. Contractor shall make any corrections required by the Engineer and shall resubmit the required number of submittals until further resubmittals are no longer required.
  - M. Engineer's review of submittals shall not relieve the Contractor of responsibility for any deviation from the requirements of the Contract unless the Contractor has the Engineer's approval in writing of such deviation at the time of submission and the Owner's Representative has given written notice to the specific deviation; nor shall the Engineer's review relieve the Contractor from responsibility for errors or omissions in the submitted exhibits.
  - N. No portion of the work requiring a submittal shall be commenced until the Engineer has reviewed the submission. All such portions of the work shall be in accordance with reviewed submittals.

## 1.5 OPERATION AND MAINTENANCE MANUALS

- A. In addition to the requirements specified in Division 01, the Contractor at the project's completion shall submit a complete system operating and maintenance manual. O&M manual shall be organized into systems and shall contain the manufacturer's complete detailed operating and maintenance instructions with equipment data for each piece of installed equipment furnished under this project. Manual at a minimum shall include the following:
  - B. Manual shall be composed of typed instructions sheets with large drawing sheets (not reduced) folded in with reinforced margin, shall have a post binder system so that sheets can be easily substituted, and shall have a hard cover.
  - C. Include in O&M manuals Manufacturers written maintenance instruction for each different piece of equipment provided and installed on this project.
  - D. Include spare parts list for each major piece of equipment furnished for the project including but not limited to Chillers, Pumps, Controls and accessories.
  - E. Provide a comprehensive list of maintenance procedures for preventative maintenance and troubleshooting; disassembly, repair and reassemble; aligning and adjusting instructions.

## **PART 2 - EQUIPMENT**

### **2.1 GENERAL**

- A. All materials and equipment shall be new and shall bear manufacturer's name, model number and other identification marking.
- B. All materials and equipment shall be standard product of manufacturer regularly engaged in production of required type of material or equipment for at least 5 years (unless specifically exempted by Engineer) and shall be manufacturer's latest design having published properties.

### **2.2 FIRESTOPPING**

- A. Firestopping is defined herein as the process of furnishing and installing a material, or combination of materials, in various constructions to maintain an effective barrier against the spread of flame, smoke, and gasses and to retain the integrity of time-rated construction. It shall be used in specific locations as specified hereinafter.
  - 1. Piping penetrations through floor slab and through time-rated partitions of fire walls;
  - 2. Opening between floor slabs and curtain walls, including inside hollow curtain walls at the floor slab;
  - 3. Penetrations of vertical service shafts;
  - 4. Openings and penetrations in enclosures with time-rated fire doors;
  - 5. Other locations where specifically shown on drawings or where specified in other sections of these specifications;
  - 6. Openings in non-time-rated construction shall be closed with a compacted fill of  $\frac{3}{4}$  lb. density fiberglass and then sealed gas tight.
- B. Material of firestopping shall be asbestos free and capable of maintaining an effective barrier against flame, smoke and gases in compliance with the requirements of ASTM E 814, UL NO. 1479. Fire-stopping material shall be manufactured by 3M barrier products. Products shall be capable of providing a cold smoke and water seal. When exposed to temperatures exceeding 250°F these products shall rapidly expand up to ten times the original volume.
- C. Installation of fire stopping shall be in accordance with the manufacturer's recommendations and requirements. Surface to be in contact with firestopping shall be cleaned of dirt, grease, oil, loose materials, rust, or other substance that may affect proper fitting or the required fire resistance.
- D. Firestopping materials shall provide an effective barrier regardless of the geometric configurations of the void spaces. Firestopping materials for filling voids in floors having openings of four (4) inches or more shall be installed to support the same load as the floor is designed to support, unless the area is protected by a permanent barrier preventing loading or traffic on the fire-stopped area.
- E. At a minimum fire stop systems shall be designed to achieve a 2-hour F rating with an emphasis on also achieving a 2-hour T rating. In addition to fire and thermal protection, fire stop systems shall be designed to provide a barrier to the transmission of smoke and toxic fumes.
- F. A firestop system as defined by these specifications shall consist of fire barrier products, in certain configuration and quantity, to meet the intent of the specifications above. Fire protection products include:
  - 1. 3M fire barrier CS-195 composite sheet

2. 3M fire barrier moldable putty
  3. 3M fire barrier CP 25WB caulk
  4. 3M fire barrier FS-195 wrap/strip
- G. Firestop systems for floor and chase penetrations shall be installed on both sides of the penetration (top and bottom) (in and out). Firestop systems shall be symmetrically installed on both sides and shall meet or exceed all requirements for AT&T standard practices.

### **2.3 ELECTRICAL EQUIPMENT**

- A. General: Unless specifically specified or shown otherwise, the Contractor shall furnish required motors, variable speed drives with controls, and disconnect switches for equipment furnished under this Division. Motors, drives, and associated controls, and disconnecting equipment shall be provided where indicated and as required for operation of the equipment being furnished. Motors shall be designed for full voltage starting unless otherwise specified or noted on drawings and shall be suitable for continuous duty at 40 C. ambient. All motors shall be selected, designed and fabricated in conformance with the requirements of NEMA-MG-1 standard.
- B. All motors shall be NEMA Design B induction motors with voltage and phase scheduled on drawings. Motors shall be equipped with Class F insulation, rated with a service factor of 1.15 and nominal full-load efficiency within 1.5% of the maximum values provided by the National Electrical Manufacturers Association Standard 12.6C in publication MG 1. The motor efficiency testing standards for all motors is IEEE Standard 112-1984, "Standard Test Procedure for Polyphase Induction Motors and Generators". All motors shall have a 2% - 5% power factor improvement over typical standard efficient motors. Motors shall comply with the frame size assignments of NEMA MG 13-1984. Motor nameplate horsepower ratings shall not be exceeded when the equipment is operating within the limits of the design conditions specified. The motor loading shall not exceed the motor service factor rating on start-up conditions or at the equipment maximum load point.
- C. Rating: Motor rating, service factor and nameplate data shall conform to the requirements of NEMA-MG-1 standards. Motor nameplate horsepower ratings shall not be exceeded when the equipment is operating within the limits of the design conditions specified. The motor loading shall not exceed the motor service factor rating on start-up conditions or at the equipment maximum load point.
- D. Nameplate data shall conform to NEMA MG 1 requirements. For motors of one horsepower and greater, the following additional nameplate data shall be included:
1. Manufacturer's identification number
  2. Frame size number
  3. Insulated system class designation
  4. Service factor
  5. Locked-rotor KVA code letter
  6. Starting limitations (if any)
  7. Hazard classification (if approved)
    - a. Design and construction of each motor shall be coordinated with the driven equipment requirements.
- E. Service factor - All motors of one horsepower and greater shall be furnished with a service factor of 1.15 in accordance with NEMA-MG-1.

- F. Enclosures - All motors shall be self-cooled. Motors for indoor service shall have drip-proof enclosures. Motors for outdoor service shall be totally enclosed and shall have all exposed metal surfaces protected, where practical, with a corrosion resistant polyester paint or coating. Exposed unpainted and uncoated metal surfaces shall be of a corrosion resistant material. All self-ventilated open type motors and the fan hoods of totally enclosed fan cooled motors shall meet NEMA MG 1 requirements for a fully guarded machine. Totally enclosed motors shall be furnished with cast iron frames, bearing brackets and terminal housings. Fan cooled motors shall have fans fabricated of corrosion resistant metal and cast iron fan covers.
- G. Bearings for fractional horsepower motors shall be designed to operate in any position or angle. One-piece sleeve bearings with wick lubrication shall be furnished where available. Ball bearings shall be furnished where sleeve bearings are not available and where axial thrust loads exceed 20 pounds.
- H. Bearings for motors of one horsepower and greater shall be oil lubricated sleeve bearings. If motor frame size is such that sleeve bearings are not available, bearings shall be grease lubricated rolling element type, self-lubricated and re-greaseable.

## 2.4 DISCONNECT SWITCHES

- A. Material - Disconnect switches shall be NEMA type HD (Heavy Duty) quick-make, quick-break disconnect switches not furnished by others with equipment and where indicated on drawings or where required by Code. Switches shall be fusible or non-fusible as called for or as required. Switches shall have NEMA I enclosure unless otherwise specified or called for otherwise on drawings. Switches shall have door interlock and shall be pad lockable in "open" and "closed" position. Where indicated for use in motor circuits utilizing VSDs switch shall be furnished with interlock contacts for interface with VSD, preventing operation of VSD when load is disconnected.
- B. Reference E-series drawings and Division 26 for disconnect switches provided by electrical contractor. If not shown and required, it is assumed the equipment manufacturer is providing it. If not, the contractor shall be responsible for all providing including all labor for installation.

## PART 3 - EXECUTION

### 3.1 CUTTING AND PATCHING

- A. The responsibility for any cutting of construction, which is required for the installation work, shall be by the Contractor. The Contractor shall coordinate with the Owner before any cutting and obtain approval from the Engineer and the Owner prior to any cutting.
- B. Where openings for work within this Division are provided under other sections of the specifications, this Contractor shall be responsible for locating and providing the proper dimensions for all such openings.
- C. Cutting shall be done with extreme care and in such a manner that the strength of the structure will not be endangered. Wherever possible, openings in concrete or masonry construction shall be by concrete saw or rotary core drill. Openings in any construction shall be cut the minimum size required for the installation of the work.
  - 1. Adequate protection shall be provided to prevent damage to adjacent areas and to prevent dust from spreading to adjacent areas.
  - 2. The use of jackhammers will not be permitted.

- D. Where openings or holes are cut in existing construction and the cutting breaks existing electrical circuitry or control circuitry, or communications, conduit and wiring, then it shall be the responsibility of the Contractor to have the circuitry, conduit and rewiring re-routed and to complete the circuitry as required and as approved by the Owner. Temporary completion shall be provided where necessary before the permanent re-routing and completion work is finished. All costs for this work shall be the responsibility of the Contractor and no additions will be allowed to the Contract price.
- E. Before any cutting, patching, or finishing work is started, dust and moisture protection shall first be installed as required to protect adjacent construction and equipment and to prevent dust spreading from the immediate area where work is being performed.
- F. After any work is installed through any opening in walls, partitions, ceilings, or floors, the opening around the work shall be patched to match the existing construction, and the openings around pipe sleeves, between pipes and sleeves, and around ductwork shall be sealed watertight through floors and shall be sealed fireproof and smoke tight through floors, walls, partitions and ceilings.
- G. Where existing work is removed from openings in existing construction and the opening is not to be reused for new work, the opening shall be filled and patched to match existing adjacent construction and to be watertight for floors and to be fireproof and smoke tight for floors and all other construction.
- H. No structural member shall be cut without the approval of the Consultant, and all such cutting shall be done in a manner directed by him.

### **3.2 EXISTING CONDITIONS**

- A. Each bidder shall inspect the site as required for knowledge of existing conditions and failure to obtain such knowledge shall not relieve the successful bidder of the responsibility to meet existing conditions in performing the work under the contract.
- B. Where new work cannot be installed without changes in existing plant, facility, or systems or where it is indicated on drawings to re-work an existing installation, this contract shall include alterations to existing work as required to install new work. Additions to the contract cost will not be allowed because of the Contractor's failure to inspect existing conditions.
- C. Existing conditions indicated on the drawings are taken from the best information available on previous contract drawings and from visual site inspection and are not to be construed as "As Built" conditions, but are to indicate the intent of this work. It shall be the responsibility of the Contractor to verify all existing conditions at the project site and to perform the work as required to meet the existing conditions and the intent of this work indicated.
- D. Unless specified otherwise, all existing material and equipment shown or required to be removed from existing construction and not shown to be reused or turned over to the Owner shall become the property of the Contractor and shall be promptly removed from the site.
- E. Any existing material or equipment which is to be reused or is to remain in place and which is damaged by this Contractor in performing the contract work, shall be repaired to the satisfaction of the Owner or shall be replaced with new equipment and material.

### **3.3 ELECTRICAL COORDINATION**

- A. All electrical products and installation used on this project shall conform unless otherwise specifically noted, to applicable standards of the National Electrical Manufacturers Association, NFPA 70, Division 26 of these specifications, and shall also be listed by Underwriter's Laboratories, Inc. and/or other agencies, as required.

- B. Electrical power sources and motor connections for all equipment shall be provided as specified within Division 26 of these specifications. All control wiring, safety interlock wiring, and temperature control system wiring required shall be furnished and installed as specified within these specifications. The control wiring shall include the furnishing and installation of all conduit, boxes, fittings, devices, accessories, wire, and connections required for complete and properly functioning systems. All wiring shall be installed in conduit, and all splices and connections shall be made in approved type enclosures or boxes.
  - 1. If motors or controls are not shown on the Electrical Drawings, it has been assumed that these motors and controls have been wired as part of a piece of package equipment, or that control wiring will be run by the Contractor.
- C. Reports: The Contractor shall submit to the Engineer, after mechanical systems are completely installed and operating under normal load conditions and prior to final acceptance of the project, four (4) copies of tabulated report on each piece of mechanical equipment motor and motor starter. The tabulated reports shall show the following information:
  - 1. Mechanical equipment identification on which motor and starter is used
  - 2. Motor nameplate horsepower, full load amperes, and voltage
  - 3. Motor nameplate service factor and temperature rise
  - 4. Actual (metered) motor running amperes and voltage
  - 5. Motor starter nameplate: HP rating and voltage
  - 6. Motor starter thermal overload protection unit current rating, manufacturer's name and manufacturer's catalog number marked on thermal units.

### **3.4 NOISE AND VIBRATION**

- A. Contractor shall be responsible for the installation of all equipment in such a manner as to control the transmission of noise and vibration from any installed equipment or system, so the sound level shall not exceed NC35, in any occupied space. Contractor shall be responsible for the correction of any objectionable noise in any occupied area due to improperly installed equipment.

### **3.5 TEMPORARY UTILITIES, SERVICES AND CONNECTIONS**

- A. The Contractor shall provide temporary electric power for construction purposes in accordance with all Codes and Ordinances and as required by projects. All temporary equipment, materials and connections required for the temporary services shall be furnished and installed by the Contractor. At the completion of the project or at such time as the temporary services are no longer needed, the Contractor shall remove all temporary equipment, materials, and connections and shall restore facilities to permanent finished conditions. Contractor may obtain temporary service from the existing building.
- B. Temporary wiring connections and facilities shall be installed as required, so that all spaces, fixtures, devices, equipment, and circuits that are required to stay in operation do so, and so that interruptions in the use of any space, device, fixtures or piece of equipment can be held to the absolute minimum time possible.
- C. Interruptions in existing utilities, services, or in the electrical circuitry and facilities shall be scheduled and sequenced as hereinbefore specified in this section of the specifications, and sequencing shall also conform to specific requirements as specified in other sections of the specification or as indicated on the drawings. The scheduling and sequencing shall be coordinated in advance with the Owner and shall be as approved by these parties. Even though a schedule is approved, the Owner shall also be notified immediately prior to any

interruption in any electric facilities and circuits so that alternative arrangements can be made.

### **3.6 METHOD OF INSTALLATION**

- A. The Contractor shall be responsible for a scheduled sequence in performing the work so that it will not interfere with the building occupant's operation in the existing building. Before any work is started, the Contractor shall consult with the Owner's designated Representative and arrange a satisfactory schedule. The schedule shall be as approved by the Owner. Make temporary alterations as required to execute work so that all operations and services in the existing building are maintained with the minimum possible interruption. Temporary shutdowns shall be segregated and shall be of the shortest possible duration. All facilities shall be kept in continuous operation unless specific permission to the contrary is arranged by the Owner's designated Representative.
- B. The Contractor shall provide to the Owner's designated Representative, prior to any shut down of power or systems, a typewritten detailed proposed procedure of shut down outlining each step including estimated time during the shut down procedure, during the actual shut down, and during the start procedure. These procedures shall also indicate all equipment and systems that will be effected by the shut down. The Contractor shall not proceed with any shut down without approval of the procedure from the Owner's designated Representative or the Owner.
- C. Trades that perform work under this Division shall cooperate and confer with all other trades on the project, as to locations of their materials and equipment before erecting the work so as to avoid interference and delay in progress of construction. In instances where interference may develop, the Contractor shall relocate his work as approved by the Owners Representative, to depart from such interferences at no additions to the contract price.
  - 1. Where it is necessary to make adjustments in the locations or routing of conduits, wireways, or other installations (from that shown on drawings) to clear obstructions or other installed work, the Contractor shall be responsible for making these adjustments as a part of the contract work.
- D. The Contractors shall coordinate with the Owner's designated Representative as to scheduling his work in all areas and shall obtain approval from the Owner's designated Representative prior to any disruption of services or activity. All shutdowns of services shall be maintained to a minimum.
- E. Material and equipment under this Division shall be protected from dirt and damage and maintained in a clean condition during the performance of the work. This shall include adequate protection from the weather if storage is outside. All parts of material and equipment that have become rusted or damaged shall be replaced or restored to an acceptable condition as approved by the Owner's designated Representative. This shall include factory finishes damaged during construction. Any refinishing shall be spray painted, brush applied paint will not be acceptable.

### **3.7 INSPECTION**

- A. Each bidder shall inspect the site as required for knowledge of existing conditions and failure to obtain such knowledge shall not relieve the successful bidder of the responsibility to meet existing conditions in performing the work under the contract.
- B. Where new work cannot be installed without changes in existing plant, facility or systems or where it is indicated on drawings to rework an existing installation, this contract shall include alterations to existing work as required to install new work. Additions to the

contract cost will not be allowed because of this Contractor's failure to inspect existing conditions.

- C. Where existing power, lighting, or control circuitry is broken by removal of existing devices, equipment, or fixtures, or by demolition work, cutting or removal of existing building construction, and where the existing circuitry is required by remaining devices or equipment to stay in service, then the circuitry shall be completed as required by job conditions.
- D. Existing conditions indicated on the drawings are taken from the best information available on previous contract drawings and from visual site inspection and are not to be construed as "As-Built" conditions, but are to indicate the intent of this work. It shall be the responsibility of the Contractor to verify all existing conditions at the project site and to perform the work as required to meet the existing conditions and the intent of this work indicated.

### **3.8 TESTING**

- A. All electrical equipment furnished under this Division shall be adjusted and tested by this Contractor. Motors and other equipment furnished by others, to which electrical connections are made under this Division, shall be checked for short circuit and open circuits before energizing. Motors shall be checked for proper phasing and rotation. The thermal overload protection devices shall be checked in all motor starters, and equipment and all protection device size, motor nameplate full load amperage, and voltage rating for protection of the motor shall be listed (include equipment designation, rating of heater, motor nameplate horsepower, full load amps and voltage) and 4 copies of list shall be submitted to the Engineer.
- B. Mechanism of all electrical equipment shall be checked, adjusted and tested for proper operation. Protective devices and parts shall be checked and tested for specified and required application and adjusted as required. Adjustable parts of all lighting fixtures and electrical equipment shall be checked, tested and adjusted as required to produce the intended performance.
- C. Completed wiring systems shall be free from short circuits and after completion, perform tests for insulation resistance in accordance with the requirements of the National Electrical Code.
- D. The Contractor shall be held responsible for the operation, service and maintenance of electrical equipment during construction and prior to acceptance by the Owner. All electrical equipment shall be maintained in the best operating condition. Operational failure caused by defective material and/or labor furnished under this Division shall be immediately corrected. Engineer shall be immediately notified of any operational failures caused by defective material and/or labor covered under other Divisions or furnished by others.

### **3.9 START-UP**

- A. All labor for the installation of material and equipment furnished under this Division shall be done by experienced mechanics of the proper trade and all workmanship shall be first class and in compliance with the specific requirements of drawings and specifications.
- B. All material and equipment provided under this Division shall be installed under competent supervisory service furnished by the Contractor. Where necessary, this shall include the services of special erection and operation personnel.
- C. The Contractor shall furnish all hoists, scaffolds, staging, runways, tools, machinery and equipment required for the performance of work.

- D. Dirt and refuse resulting from the performance of the work shall be removed from the premises daily as required (broom clean) to prevent accumulation and the Contractor shall cooperate in the maintaining of reasonably clean premises at all times.
- E. Immediately prior to the final inspection, Contractor shall clean all material and equipment. Dirt, refuse and stains shall be removed from all surfaces and damaged finishes restored to original condition.

### **3.10 TRAINING**

- A. The Contractor shall furnish all services as required for adequate verbal and printed instructions to the Owner and the Owner's operating and maintenance personnel for operation and maintenance of all equipment and systems installed under this Division. Three complete copies of service manuals in hardback binder shall be furnished at the end of the project in accordance with the General Conditions of the specifications. The manuals shall include printed operating and maintenance instructions for systems and equipment specified under this Division, all approved shop drawings and all manufacturer printed data.
- B. When the work is complete and at a time designated by the Owner's designated Representative, the Contractor shall furnish the services of a qualified instructor to instruct the Owner's personnel in the operation and maintenance of the systems and equipment.
- C. The bound copies of the operating and maintenance manuals shall be used during the verbal instructions.

### **3.11 PROTECTION OF EXISTING FACILITIES AND DUST CONTROL**

- A. Provide and maintain dust-proof and weatherproof temporary partitions from floor to ceiling for the full length required where existing walls and/or partitions are indicated to be removed and around isolated locations where it is necessary to cut or remove portions of existing walls, ceilings, floor slabs, or partitions. Erect prior to beginning work in the following manner:
  - 1. Construct of fire retardant treated No. 2 common S.Y.P. 2"x4" studs and ¼" thick fire retardant treated plywood. Tape all joints to be dust-proof. Fire retardant treatment shall be in accordance with the American Wood Preservers Association Standard AWPA C30B and C27B to obtain classification of 25 or less for Flame Spread and Smoke Developed rating of 50 or less. Each piece shall bear the UL label. Plywood shall be A.P.A. Grade "Sheathing Grade" or better and be laminated with waterproof glue. For interior work, fire resistive polyethylene sheet equal to Griffolyn Type 55FR (Griffolyn Houston, Texas) may be used in lieu of plywood. Flame spread rating of all materials shall be less than 25.
- B. The Contractor shall provide adequate protection, wherever work is to be performed in the existing building, to prevent damage to adjacent areas, equipment, or furnishings; to prevent accidental injury to building occupants and the public; to prevent the spreading of dust, dirt, debris, and moisture from the area where work is being performed; and to prevent dust, dirt, debris, and moisture from getting on or in the building occupant's furnishings or equipment.
- C. Every precaution shall be taken during handling, transporting, erection, and performing any work to prevent and eliminate dust, debris, and moisture from entering or being carried into spaces outside the work area and onto or into the building occupant's equipment or furnishings that may remain in the area of work. Cutting, patching, finishing, painting, or any other construction work, which will cause dirt or dust to be created, shall be separated from occupied spaces by temporary dustproof partitions or curtains sealed at top, bottom and all around. Curtains or dust catching covers may be fire-resistant polyfilm sheeting or other

approved effective materials. Dust mats shall be provided as necessary and shall be kept clean to prevent tracking dust, dirt or debris from the work areas.

**END OF SECTION 23 00 00**

## SECTION 23 05 19 – METERS & GAUGES FOR HVAC PIPING

### PART 1 - GENERAL

#### 1.1 DESCRIPTION OF WORK

- A. Thermometers
- B. Pressure gauges

#### 1.2 SUBMITTALS

- A. Submit shop drawings in accordance with Submittal Procedures, Division 01, Section 013300.
- B. Shop Drawings:
  - 1. Submit copies of thermometer and pressure gauge schedule for approval before ordering.
  - 2. Submit detailed shop drawings indicating make, model, location, type and size.

### PART 2 - EQUIPMENT

#### 2.1 THERMOMETERS

- A. Material - Thermometers shall be easy reading, mercury column, industrial type with cast non-ferrous case, separable well socket and 9" scale with divisions as required for operating temperature range of system. Thermometer wells shall be stainless steel, pressure rated to match piping system design pressure; with 2-inch extension for insulated piping and threaded cap nut. Thermometers installed over 6'-0" from floor shall be angle type.
- B. Manufacturer:
  - 1. Trerice
  - 2. Weiss
  - 3. WeksleR

#### 2.2 PRESSURE GAUGES

- A. Material - Gauges shall have 4½" dial. Gauges shall have precision movements, black enameled cases with N.P. rings. Gauges installed on the suction side of pumps shall be of the compound type. Gauges shall be labeled for function with engraved laminated plastic nameplates attached to gauge in accordance with Section 230553 HVAC Mechanical Identification. Gauges shall be selected with dial ranges as required for system pressures and for accurate readings. Gauges in insulated piping or surfaces shall have extension necks as required to clear insulation. For each pressure gauge provide upstream ball valve for isolation and service. Ball valve shall be provided as specified in Section 230523 General Duty Valves for HVAC Piping.
- B. Manufacturer:
  - 1. Ashcroft
  - 2. Trerice
  - 3. Weiss
  - 4. Weksler

## **PART 3 - EXECUTION**

### **3.1 METHOD OF INSTALLATION**

#### **A. Thermometers:**

1. Locate so they are easily read from floor level or operating platform.
2. Locate and arrange wells and sensing elements so that sensing element is in path of moving fluid and not in stagnate or dead-end locations.

#### **B. Pressure Gauges:**

1. Locate so they are easily read from floor level or operating platform.
2. Provide compound gauges where normal operating pressure is at or near atmospheric.
3. In piping, locate gauges in straight pipe runs and provide with ball valve in sensing line.
4. Furnish and install gauges on suction and discharge of all pumps, and, wherever shown on drawings, and, for all systems and equipment which depend upon pressure or vacuum for maintenance and operation.

**END OF SECTION 23 05 19**

## **SECTION 23 05 23 – GENERAL DUTY VALVES FOR HVAC PIPING**

### **GENERAL**

#### **1.1 DESCRIPTION OF WORK**

- A. HVAC Valves:
  - 1. Ball Valves
  - 2. Butterfly Valves (Low Pressure Systems)
  - 3. Check Valves
- B. Pressure and Temperature Relief Valves

#### **1.2 QUALITY ASSURANCE**

- A. Valves shall be of the same manufacture throughout, where possible. Manufacturer's name and pressure rating shall be located on outside of valve.
- B. Unless noted otherwise, cut-off valves shall be gate valves or ball valves or butterfly valves. Flow control (balancing) valves shall be ball valves or butterfly valves, except flow setting valves with metering connections shall be installed where indicated by symbol on drawings. Flow setting valves with metering connections, shall be provided and installed in accordance with Section 230524.
- C. Cut-off valves used in water and water/glycol systems including chilled, process chilled, condenser, heating and process heating shall be ball valves for 2" size and smaller, and shall be butterfly valves 2½" size and larger.

#### **1.3 SUBMITTALS**

- A. Submit shop drawings in accordance with Submittal Procedures, Division 1, Section 013300, and as follows:
  - 1. Submit copies of valve ordering schedule for approval before ordering valves.
  - 2. Submit detailed shop drawings indicating make, model, location, type, size, and pressure rating.

### **EQUIPMENT**

#### **2.1 BALL VALVES**

- A. Ball valves shall be manufactured to comply with MSS SP 110 and shall be 3-piece type. Valves shall be all bronze (B-584 or B-62) with stainless steel ball, full port and shall be designed for 150 PSI, 600 WOG; working temperature range of at least 0°F. to 300°F. Ball valves shall be three-section assembly with Double-O ring seal and removable center section with replaceable Teflon, TFE seats. Ball valves shall have blow-out proof stem with high extended stem to provide for insulating, lever type handle with vinyl grip and 90° stop on the extended stem. All valve stem housings shall be of length to receive up to 1½" thick insulation and shall have NIB seal valve extension.
- B. Ball valves in water piping shall have a bronze body and rated at 150 PSI 600 WOG at 180° F. Seats shall be TFE, EPT or Teflon. Ball and stem shall be chrome plated with Viton or Teflon packing. Handle shall be steel with non-heating plastic coating. Valves shall be

union body with screwed or solder joint ends. Solder joint valves shall be disassembled before soldering, as recommended by the manufacturer.

C. Manufacturer

1. Ball valve manufacturers for HVAC applications
  - a. Nibco
  - b. Stockham
  - c. Jamesbury
2. Ball valve manufacturers for plumbing applications
  - a. Ball valves in water piping shall be NIBCO T595-66 or approved equal.
  - b. Ball valves provided in compressed air piping shall be NIBCO T585-70-66 or approved equal.

## 2.2 BUTTERFLY VALVES (LOW PRESSURE SYSTEMS)

- A. Butterfly valves shall be manufactured to comply with MSS-SP67.
- B. The valve body shall be of ductile iron and suitable for alignment with ANSI class 125/150 pound weld neck flanges, shall be 200 psi bi-directional droptite shutoff and shall be of the lug style type. The lug style body shall be drilled and tapped for isolation and removal of downstream piping. The valve body shall have an extended neck of sufficient length such that 2 inch, pre-molded fiberglass insulation and jacketing can be installed up to and around the valve neck. The neck extension shall allow sufficient clearance for valve operator without damage to the insulation.
- C. The valve disk shall be of aluminum bronze construction. The valve stem shall be of 316 stainless steel. The method of attachment to valve stem shall be by self locking stainless steel screws, or press fitted taper pins, or one piece stem with double D design to fit disc. The valve body neck shall have a valve stem bushing to absorb valve stem side thrust and shall have upper and lower RTFE lined stainless steel bearings or RTFE bushings. The valve seat shall be a field replaceable resilient type and shall be of EPDM with a rating of -40°F to 250°F. The seat shall be reinforced.
- D. Valves intended for manual throttling shall be equipped with an infinite position throttling handle for valves 5 inches and smaller. Valves 6 inches and larger shall be equipped with gear operators and adjustable memory stops.
- E. Manufacturer
  1. Keystone **HS2**
  2. Bray
  3. DeZurik
  4. NIBCO

## 2.3 CHECK VALVES

- A. Check valves in HVAC applications shall be spring-loaded, non-slamming, silent closing, with renewable seat and disc guided at both ends, stainless steel or bronze trim, and rated for not less than 250 psi cold water working pressure at temperature up to not less than 100°F. Valves shall close off bubble-tight. Valves 1½" and smaller shall have bronze body and screw ends, and valves 2" and larger shall have globe style body of carbon steel, ductile iron, or semi-steel, and with ANSI Class 150 pound flanged ends.

- B. Manufacturer
  - 1. Mueller Steam Specialty Co
  - 2. Keystone
  - 3. Metraflex

## **2.4 PRESSURE & TEMPERATURE RELIEF VALVES**

- A. Material - Pressure and temperature relief valves shall be designed, constructed and rated to ASME Code. Valves shall have a capacity at pressure indicated on drawings, in Btu's/Hr. of not less than capacity of units which they protect and they shall have test levers. Extend relief line full size and end over drain.
- B. Manufacturer
  - 1. Watts
  - 2. McDonnell
  - 3. Apollo

## **PART 3. EXECUTION**

### **3.1 METHOD OF INSTALLATION**

- A. Valves shall be installed within each system to provide the required flow control and to provide isolation for inspection, maintenance and repair of each piece of equipment and each main and branch service loop. The foregoing shall apply whether or not valves are shown on drawings. Valves shall also be installed in other locations shown on drawings. Each valve shall be installed so as to be easily accessible for operation and visual inspection after construction is complete.

A union connection shall be installed within two feet and on each end of a screw end valve. Valves and specialty items shall be rated for not less than the cold water working pressure and the test pressure specified for each piping system.

**END OF SECTION 23 05 23**

## **SECTION 23 05 24 – HVAC HYDRONIC SPECIALTIES**

### **PART 1 - GENERAL**

#### **1.1 DESCRIPTION OF WORK**

- A. Air Vent Valves
- B. Pressure and Temperature Test Plugs
- C. "Y" Type Strainers

#### **1.2 QUALITY ASSURANCE**

- A. Manufacturer's Qualifications:
  - 1. Firms regularly engaged in the manufacture of equipment specified within this section of types and capacities required, whose products have been in satisfactory use in similar service for a minimum of 5 years.

#### **1.3 SUBMITTALS**

- A. Submit in accordance with Division 01, Section 013300.
- B. Product Data:
  - 1. Submit manufacturer's catalog cut sheets, specifications, installation instructions, and dimensioned drawings for each type of manufactured hydronic specialty.
  - 2. Include a pressure drop curve or chart for each type and size of hydronic specialty.
  - 3. Submit a schedule showing manufacturer's model number, size, location, rated capacities, and features for each hydronic specialty.

### **PART 2 - EQUIPMENT**

#### **2.1 AIR VENT VALVES**

- A. General:
  - 1. Provide air vent valves in water systems at all high points and at all locations as required to prevent the accumulation of air in the system. Vent valves shall be manual key type except where shown on drawings to be automatic. Manual and automatic air vent valves shall be rated for water working pressure of not less than 250 psi.
- B. Material:
  - 1. Vent valves shall be all brass with copper tube pig-tail. Turn pig-tail downward for manual vent valves.
- C. Accessories:
  - 1. Extend drain line from automatic vent valves to floor drain. Install vent valve in locations to be accessible without requiring removal of equipment or cabinets.
- D. Manufacturers:
  - 1. Automatic air vent valves: Armstrong #1-AV, Watts, Bell & Gossett
  - 2. Manual air vent valves: Dole Key No. 10, Watts, Bell & Gossett

## **2.2 PRESSURE AND TEMPERATURE TEST PLUGS**

### **A. General:**

1. Provide capped test plugs in piping systems in all locations where testing and balancing is required and where shown on drawings. At a minimum test plugs shall be provided in piping system wherever there is a change in temperature or pressure due to installed equipment. This includes but not limited to coils, boilers and pumps. Provide test plugs on both the inlet and outlet of the equipment.
2. Provide test plugs for all differential pressure transmitters so that pressure difference can be measured without the removal of piping.
3. Plugs shall be installed in accordance with the manufacturer's recommendations, including approach and depart distances from pipe fittings, valves, etc.

### **B. Material:**

1. Plug shall have a 1/4" NPT brass fitting with Nordel valve core seals rated up to 1000 psi at -40°F and 275°F and shall allow insertion of a pressure or temperature probe while the pipe or equipment is under pressure. Each plug fitting shall have a threaded brass cap.

### **C. Accessories:**

1. Provide a ball valve upstream of each plug for servicing.

### **D. Manufacturer:**

1. Petersen Engineering Co.: #110 "Pete's Plug"
2. Watts
3. FNW

## **2.3 "Y" TYPE STRAINERS**

### **A. Material:**

1. Strainer body shall be [cast iron, carbon steel, stainless steel, bronze] with [stainless steel, Monel, brass] screen. Screen size shall be selected for application.

### **B. Accessories:**

1. Provide strainers 2½" and larger with off center blowdown to allow for near complete cleanout. Provide a shutoff valve on the blowdown and extend a blowdown line to the nearest floor drain. Provide a ball valve upstream of all strainers for servicing. Unless otherwise noted, strainers shall be rated for not less than 125 psi at 250°F. Strainers 2½" and larger shall have flanged connections; 2" and smaller shall be NPT threaded.

### **C. Manufacturers:**

1. Armstrong
2. Hayward
3. Keckley

## **PART 3 - EXECUTION**

- A. Provide and install hydronic specialties as shown on drawings and specified above.
- B. Specialties shall be installed in accordance with manufacturers written instructions.

**END OF SECTION 23 05 24**

## **SECTION 23 05 29 – HANGERS & SUPPORTS FOR HVAC PIPING & EQUIPMENT**

### **PART 1 - GENERAL**

#### **1.1 DESCRIPTION OF WORK**

- A. Piping Hangers and Supports

### **PART 2 - EQUIPMENT**

#### **2.1 PIPING HANGERS AND SUPPORTS**

- A. Provide factory-fabricated horizontal piping hangers, clamps, attachments and supports in compliance with ANSI SP-59 and ANSI SP- 89. Select hangers and supports sized to exactly fit pipe size for bare piping, and to exactly fit around pipe insulation with saddle and shield for insulated piping. Hangers in contact with copper pipe shall be copper plated.
- B. Unless specified otherwise, pipes shall be hung with malleable iron, split ring hangers or clevis hangers not less than 1/8" thick. Strap type hangers shall not be acceptable. Roller type hangers shall be used where required or shown to allow for movement of pipes by expansion. Hangers shall have rods and turnbuckles of required length. Suspension shall be from suitable steel supports fastened to overhead construction or steel wall brackets. Hangers and supports shall be installed so that pipes are run parallel and evenly spaced.
- C. Anchors in concrete construction shall be threaded compound type or Phillips self-drilling type of sufficient size to adequately support the load.

### **PART 3 - EXECUTION**

#### **3.1 METHOD OF INSTALLATION**

- A. Comply with MSS SP-58 and SP-89 for installation of hangers, supports and anchors. Install hangers, supports, clamps, and attachments directly from building structure complete with inserts, bolts, rods, nuts and washers, and washers, and accessories. Do not use wire or perforated metal to support piping; pipe support from other piping shall not be permitted. Install hangers with minimum ½" clear space between finished covering and adjacent work. Place hanger within 1 foot of each horizontal elbow. Use hangers vertically adjustable 1½" minimum after piping is erected.
- B. Insulated pipe, hangers and supports shall be furnished with ribbed galvanized steel shields of not less than 18 gauge; two-piece pre-molded, high compressive strength, insulation inserts (360° around pipe); and vapor barrier jacket covering the insulation inserts. Inserts shall be constructed of high density, 100 psi, waterproofed calcium silicate, encased in 360° sheet metal shield. Provide assembly of same thickness as adjoining insulation.
- C. Maximum spacing of hangers and supports shall be in accordance with the following schedule for size of pipe:

Pipe Size	Rod Size	Ferrous Pipe	Copper Pipe	Plastic Pipe
½" & ¾"	¼"	8'-0"	6'-0"	4'-0"
1" & 1¼"	3/8"	9'-0"	7'-0"	4'-6"
1½"	3/8"	9'-0"	8'-0"	5'-0"
2" & 2½"	3/8"	10'-0"	9'-0"	5'-0"
3" & 4"	5/8"	10'-0"	10'-0"	6'-0"

- D. Hangers for cast iron pipe shall be installed on maximum 5'-0" centers.
- E. Supports on masonry walls shall have bolts through wall fastened to suitable steel plate on back of wall. Where required to allow for movement of pipe by expansion due to short hanger rods, pipes shall rest on rollers and covering protection saddles. All piping shall be supported and secured as required to prevent vibration and the transmission of noise and lateral movement.
- F. The Contractor shall furnish and install all necessary material, hangers and support including all structural steel members and shapes to substantially support and/or suspend all piping and equipment, in an approved manner. Perforated strap hangers will not be acceptable.
1. Drive screws, pins, studs, etc., which are secured in place by means of explosive force will not be permitted.
  2. Except as specifically otherwise approved, no item of equipment shall support any pipe or duct nor shall any item of equipment be supported on any pipe or duct.
- G. Hangers shall be provided at every item of equipment and at every change in direction or branch connection to every pipe.
- H. All pipes through roof shall be installed with sleeves and openings, and with roof flashing/counterflash assembly or pipe curb assembly as herein specified. The complete installation shall be coordinated with the roofing installer and shall be watertight and weather tight.
- I. Sleeves shall be steel pipe and shall be installed for single pipe installation. Openings shall be boxed out for multiple installations. Sleeves for acid waste vent stacks shall be installed as specified under the heading: Sleeves and Openings.
- J. Single, un-insulated pipes through roof shall be installed with flashing/counterflashing assembly with four pound seamless lead flashing assembly with 8" high boot and not less than 8" skirt. A conical shaped steel reinforcing boot underneath lead flashing assembly shall also be installed. Cast iron counterflashing fitting with rust-resistant prime coat, of the caulking type to fit over all types of piping, vandal-proof set-screws for anchoring in place, and top annular space for sealant fill shall also be installed for single, un-insulated pipes. Assemblies shall be furnished in sizes to properly fit size of pipe with which they are installed. Flashing assembly shall be designed to fit properly on roofs from level up to 20° pitch. Top of flashing cone shall be sealed before installing counterflash fitting. Annular space in top of counterflash fitting shall be completely filled with epoxy sealing compound.
- K. Furnish and set all boxouts for openings and all sleeves for work to be installed under this division. Sleeves shall be installed for all pipes passing through floors, walls, and partitions. All sleeves shall be set tight in construction, without space between the sleeve and construction. Sleeves through walls and partitions shall be flush at each end and sleeves through floor shall extend 2" above finished floor unless indicated otherwise.

- L. Sleeves through concrete slabs, concrete walls, and bearing masonry walls shall be steel pipe of not less than Schedule 30. Sleeves through non-bearing wall and partitions may be Schedule 10 pipe or 22 ga. sheet steel with formed bead on each end.
- M. The annular space around bare pipes and pipe insulation on insulated pipes through sleeves shall be packed tightly with mineral wool to prevent transmission of air and sound. Each end of sleeve at floors and through fire-rated walls shall also be sealed with 1" thickness of waterproof and fireproof caulk equivalent to 3M #CP25 fireproofing caulk.
- N. Sleeves for round and rectangular ducts shall be galvanized steel. Sleeves through fire and smoke walls shall comply with NFPA 90A. Size sleeves to allow for expansion movement and to provide for continuous insulation.
- O. Each Contractor shall provide all structural steel and materials necessary to properly support and anchor equipment and lines provided under this contract.
- P. All equipment and materials shall be securely attached to the building structure in an approved manner. Attachments shall be of a strong and durable nature and suitable for the service required.
- Q. Concrete bases shall be provided where shown on the drawings. Equipment which is to be grouted in place shall be grouted with Embecco or approved non-shrink grout.

**END OF SECTION 23 05 29**

## **SECTION 23 05 53 – HVAC MECHANICAL IDENTIFICATION**

### **PART 1 - GENERAL**

#### **1.1 DESCRIPTION OF WORK**

- A. Mechanical Identification for:
  - 1. Piping systems
  - 2. Valves
  - 3. Mechanical equipment
  - 4. Warning signs
  - 5. Control devices and wiring
  - 6. Painting

#### **1.2 SUBMITTALS**

- A. Submit shop drawings in accordance with Submittal Procedures, Division 01, Section 013300.
- B. Submit copies valve schedule for each piping system, typewritten and reproduced on bond paper. Tabulate valve number, piping system, system abbreviation, location of valve and variations for identification. Mark valves which are intended for emergency shut-off and similar special uses, by special "flag", in margin of schedule. Include valve schedules within Maintenance Manuals (Re: Section 230000, HVAC General Provisions) and Division 01.

### **PART 2 - EQUIPMENT**

#### **2.1 MECHANICAL IDENTIFICATION MATERIALS**

- A. Stencils: Fiberboard: ANSI A13.1 letter sizes for piping and similar applications; minimum 1-1/4" high letters for ductwork and minimum 3/4" high letters for access door signs and similar operational instructions. Stencil paint: Exterior type black.
- B. Valve tags: 19 gauge polished brass, 1-1/4" diameter, stamp engraved black enamel fitted. Valve tag fastener shall be solid brass chain.
  - 1. At Contractors option, valve tags may be 3/32" thick engraved plastic laminated valve tags, within piping system abbreviation in 1/4" high letters and sequenced valve numbers 1/2" high letters, and with 5/32" hole for fastener. [Valve tag colors shall correspond to color scheme specified below.] [Valve tag shall be white with black lettering.]
- C. Valve schedule frames: For each page of valve schedule, provide glazed display frame with screws for removable mounting on masonry walls. Frame shall be extruded aluminum with SSB-grade sheet glass.
- D. Engraved plastic-laminate signs: Engraving stock melamine plastic laminate; sizes and thicknesses indicated; engraved with engraver's standard letter style of sizes and wording indicated; punched for self-tapping stainless steel fasteners. Laminated signs thickness shall be 1/16" for units up to 20 sq.in. or 8" length and 1/8" for larger units. Laminated tags and signs shall be color coded, conforming to the current building color codes.

## **PART 3 - EXECUTION**

### **3.1 PIPING IDENTIFICATION**

- A. Identify piping with stenciled signs and arrows, showing piping service. Locate wherever piping is exposed to view in occupied spaces, machine rooms, accessible maintenance spaces (shafts, tunnels, plenums) and exterior non-concealed locations.
- B. Identify piping near each valve and control device and near each branch, excluding short take-offs for fixtures and terminal units. Mark each pipe at branch, where flow pattern is questionable and near locations where pipes pass through walls or floors/ceilings, or enter non-accessible enclosures.
- C. Identify piping at access doors, manholes and similar access points which permit view of concealed piping and near major equipment items and other points of origination and termination.
- D. Piping shall be identified at specified hereinbefore and spaced intermediately at maximum spacing of 50 feet along each piping run. However, reduce spacing to 25 feet in congested areas of piping and equipment.

### **3.2 VALVE IDENTIFICATION INSTALLATION**

- A. Valve tag location: Provide valve tag on all valves, cocks, and control devices in each piping system. List each tagged valve in valve schedule for each piping system. Mount valve schedule frames and schedules in machine room where directed by Owner's Representative.

### **3.3 MECHANICAL EQUIPMENT IDENTIFICATION**

- A. Install engraved plastic laminate signs except where lettering larger than 1" is required for proper identification. Locate signs in or near each piece of mechanical equipment and each operation device.
  - 1. Provide plastic laminated signs at main control and operating valves, fans, pumps, meters, gauges, thermometers, thermostats, VAV boxes, fan terminal units, fan coil units, control devices, sensors, fans and primary balancing dampers.
  - 2. Laminated tags, at a minimum, shall be provided for each piece of equipment scheduled on drawings.
- B. All temperature sensors, differential pressure switches, and control devices integrated with the building control systems shall be permanently marked to indicate normal operating points or range for both summer and winter operation. Coordinate with Engineer and Owner prior to marking. In addition, all room sensors shall have laminated tags mounted adjacent to the room sensor on wall or within the cover of the sensor itself. The laminated tag shall indicate the device which the sensor serves; (FCU-1, VAV-1 etc.).

### **3.4 WARNING AND DANGER SIGNS**

- A. Where identifications signs are required to indicate a warning or danger, signs shall be plastic laminated with red background and white lettering. At a minimum warning signs shall be provided as follows:
  - 1. All air handling unit access doors to fans and access doors downstream of fan discharge and elsewhere as required, to indicate an unsafe condition.
  - 2. All motor driven equipment that automatically starts shall include a warning sign indicating such. Coordinate wording of danger sign with facility manager.

### **3.5 PAINTING**

- A. All new piping shall be painted including all steel supports, pipe hangers, valve handles, valve yokes and iron surfaces of every nature. Thoroughly clean all pipe covering and equipment before painting. All paint shall be applied with a brush.
- B. All canvas and PVC jackets on piping shall be brush painted with prime coat of Foster's No. 81-42W lagging primer and one finish coat of Sophir-Morris, Sherwin Williams, or Cooks high gloss enamel. Color shall meet Owner's color scheme. Coordinate with Owner in the field.
- C. All exposed steel, including structural members for mechanical equipment, piping, structural steel bases, and all other non-ferrous metals, shall be painted with a high solids epoxy coating manufactured by Ameron - Amerlock-400 or approved equal. Apply epoxy coating in accordance with manufacturers written instructions.
- D. All painting that will be exposed to weather shall be painted with Aliphatic Polyurethane manufactured by Ameron - Amersheild or approved equal. All painting shall be applied in accordance with manufacturers written instructions.

**END OF SECTION 23 05 53**

## **SECTION 23 09 23 – DIRECT DIGITAL CONTROL SYSTEM FOR HVAC**

### **PART 1 - GENERAL**

#### **1.1 DESCRIPTION OF WORK**

- A. Complete system of automatic temperature controls
- B. Installation and interface with existing building automation system
- C. Control devices, components, wiring, and materials
- D. Assist in system validation of control systems, including device calibration, software validation and system wiring.
- E. Work with Owner during system debugging and Owner provided Commissioning
- F. Instructions to Owner

#### **1.2 SUBMITTALS**

- A. One electronic copy in PDF format and (2) hard copies of submittals are required.
- B. Before proceeding with installation of controls and devices, the Contractor shall submit complete shop drawings and descriptive data as specified under each Section of this Division.
- C. Shop drawings, project data and samples furnished by the Contractor shall illustrate materials, equipment or workmanship, and establish standards by which the work will be judged.
- D. Shop Drawings and Samples shall be submitted to the Engineer by a letter of transmittal. The party making the submission shall be named on Shop Drawing/Sample and also in the letter of transmittal.
- E. Upon receipt of exhibits submitted and marked for resubmittal the Contractor shall cause the marked corrections and corrections that may be contained in the Engineer transmittal letter to be made on each submittal. All such corrections shall be circled, numbered, and dated to permit prompt reviewing upon resubmittal to the Engineer.
- F. At the time of submission, the Contractor shall inform the Engineer in writing of any deviation in the exhibits submitted from the requirements of the Contract.
- G. The Engineer will review exhibits submitted with reasonable promptness so as to cause no delay, but only for conformance with the design concept of the Project and with the information given in the Contract. The Engineer's review of a separate item shall not indicate review of an assembly in which the item functions. The Engineer's review is not intended to indicate approval of dimensions or quantities.
- H. Engineer's review of submittals shall not relieve the Contractor of responsibility for any deviation from the requirements of the Contract. Unless the Contractor has the Engineer's approval in writing of such deviation at the time of submission and the Owner's Representative has given written notice to the specific deviation; nor shall the Engineer's review relieve the Contractor from responsibility for errors or omissions in the submitted exhibits.

- I. No portion of the work requiring a submittal shall be commenced until the Engineer has reviewed the submission. All such portions of the work shall be in accordance with reviewed submittals.
- J. Shop Drawings: Indicate dimensions, description of materials and finishes, general construction, specific modifications, component connections, anchorage methods, hardware, and installation procedures, including specific requirements indicated.
- K. Control diagrams: Use at least one individual sheet for each major HVAC system.
  - 1. HVAC system flow diagram with sensing, control and interlock devices
  - 2. Internal control panel layouts & control panel cover layouts.
  - 3. Ladder-type wiring diagrams showing interlock, monitoring and control wiring to and from equipment, including control systems equipment.
  - 4. Communications wiring schematic drawings indicating interconnections with integration devices and other peripherals.
  - 5. Provide a summary points list and software.
- L. Descriptive data and sequence of operations for operating user and application software, including complete operator's manual and programmer's manual.
  - 1. **Note the controls contractor is expected to develop the sequence of operations using the provided sequence on the drawings as a guide. It is the contractors responsibility to develop custom sequences that provides specific language as to how the system shall be programmed.**
- M. Point to point and basic function commissioning forms to be used on site for the start, test and check of control components and systems.
  - 1. List of specific personnel who will be involved in the system installation and commissioning.
  - 2. Instrumentation to be used for testing and calibrating during point-to-point and basic function testing.
- N. Contract Closeout Submittals.
  - 1. Operating and Maintenance Manuals, including:
    - a. Backup software copies including system graphics
    - b. Shop drawings and product data in Project Record format
  - 2. Special warranty conditions, special servicing conditions, and expanded warranty or service contract proposals.
  - 3. List of recommended spare parts and calibration tools for Owner's maintenance staff.

## **PART 2 - EQUIPMENT**

### **2.1 GENERAL**

- A. Controls work shall be provided by Johnson Controls Inc. Contact Terry Rhoades at 866.298.7696 to receive a proposal for this work. This work shall be incorporated into the project by the successful contractor.

- B. New monitoring and control devices shall be provided as detailed on the drawings. New system components shall connect to existing controls associated with the remainder of the Fletcher Daniels State Office Buildings control system manufactured by Johnson Controls.
- C. Modification of the existing system shall be closely coordinated with facility personnel to ensure system disruptions are minimized.
- D. Control systems shall be complete and effective in the highest degree and shall comprise all parts and mechanisms necessary for their successful operation. Systems shall be free from defects in workmanship and material and shall be guaranteed to operate as required to maintain specified conditions and functions. Any repairs, adjustments or replacements made necessary by such defects during the first full year from the time of acceptance of the project by the Owner shall be made by the Contractor and control manufacturer without charge to the Owner.
- E. Examine and compare the (BAS) Specifications and Drawings with the Specifications and Drawings of the other trades and report any discrepancies between them to the Engineer. Obtain the Engineer's written addenda for changes necessary in the BAS work. Install and coordinate the BAS work in cooperation with the other trades installing interrelated work. Before installation, take proper provisions to avoid interference in a manner approved by the Engineer. All changes required in the work of the Contractor, caused by noncompliance with the specifications, shall be made at contractor's expense.
- F. Transmit to other trades information required for work to be provided under their respective Sections in ample time for installation.
- G. Install the BAS work to permit removal (without damage to other parts) of other parts requiring periodic replacement or maintenance.
- H. Graphical user interface shall be modified/reworked for the condenser water system at the Fletcher Daniels State Office Building. Reference the drawings for more details pertaining to system modifications and control sequences.
- I. The system includes controls for (3) new VFD's, new water level controller monitoring, new separator monitoring, and modifications to the existing programming for the condenser water system associated with the existing chilled water system controls.
- J. Coordination with other trades shall be required to ensure a seamless and smooth installation. Work shall be performed in an existing building and coordination is paramount.

## **2.2 SYSTEM VALIDATION**

- A. Before each DDC panel is allowed to come on-line the system shall be fully tested, commissioned, and validated. The Contractor shall complete the validation of the control systems installed under this project. Validation services shall include the following:
  - 1. Point-to-Point verification of all wiring and tubing within the new control system. Provide qualified technicians to assist the Owner's Engineer in verifying correct installation of all wiring and pneumatic tubing in the system.
  - 2. Software Verification: Provide qualified technicians and all necessary testing software to complete a through step-by-step walk through, verification and challenge to all system software, including alarms, loop tuning, set point adjustments and control sequences.
  - 3. Component Calibration: Provide qualified technicians and calibration equipment to field calibrate 100% of control components installed under this contract. Each control device

shall be calibrated in accordance with the manufacturers written instructions and procedures. All Component calibration shall be documented on standard calibration reporting forms provided to the Contractor for that purpose.

4. All PID control loops shall be tuned using Closed Loop or Open Loop method. Contractor shall submit process variable (PV) curve created by the process bump or control oscillation that was used to calculate proportional, reset and derivative settings. All PV curves and PID settings shall be documented in the O&M manuals as specified above and shall be submitted to the Engineer for approval before project completion.
5. All controls and controlled items shall be placed in complete and proper operating condition subject to approval of the Engineer.
6. Once Owner and Engineer has accepted system the Contractor shall note all field modifications and settings on approved shop drawings and submit to the Engineer for approval. Changes to system operation, set points programming source code and loop parameters once accepted by Owner shall not be permitted unless prior approval has been given by the Engineer or the Owner.
  - a. All changes shall be documented with the date of the change and type of change, reason for change and complete description of change including point names, software code and other pertinent data.

### **2.3 NAMEPLATES**

- A. As specified in Section 23 05 53 HVAC Mechanical Identification provide color coded plastic laminated nameplates with engraving on or adjacent to each controller, transmitter, indicator, valve and/or damper operator, relay, sensor, switch, regulator, panel gage and elsewhere as indicated on drawings. Name plates shall identify device and loop number. Name plates for control devices shall be mounted adjacent to the device or control panel backplate using screws.
- B. For each control loop and device furnish and install identification nameplates on loop wiring or pneumatic tubing where it enters DDC and/or control panels and at its final termination at control device. Name plate shall indicate loop number identification as noted on DDC panel schedule and P&ID's. Nameplate shall be permanently attached to control signal (wire or tube) using standard wire ties and hole penetration at both ends of the name plate.
- C. Provide nameplates for all controls, devices, actuators and equipment interfaced with the new BAS system regardless if equipment or device is new or existing.

### **2.4 CONTROL WIRING**

- A. In addition to Section 23 00 00 – HVAC General Provisions, the Contractor shall provide all control wiring and connections required for control systems. The wiring shall include the furnishing and installation of all wire, conduit, boxes, and all other necessary materials and devices required for a complete and operable installation. All materials and installation shall comply with requirements as specified in Division 26, Electrical Work and with the National Electrical Code and all applicable state and city codes and regulations. All wire for circuitry above 50 volts shall be installed in conduit and all splices and connections shall be made in boxes or device or equipment enclosures. All electrical boxes installed to serve control systems shall be painted black for that control wiring can be easily identified.
- B. Unless indicated otherwise, provide all normally visible or otherwise exposed wiring in conduit. Circuits operating at more than 50 volts shall be in accordance with Division 26

specifications. Use plenum-rated cable for circuits under 50 volts in enclosed spaces. Examples of these spaces include HVAC plenums, within walls, above suspended ceilings, in attics, and within ductwork. Plenum rated cable shall be installed in a neat and workmanlike manner. Cables installed exposed on the outer surface of ceiling and sidewalls shall be supported by the structural components of the building structure in such a manner that the cable is not damaged by normal building use. Such cables shall be attached to structural components by straps, staples, hangers, or similar fittings designed and installed so as not to damage the cable. The installation shall also conform with NEC 300.4(D) and 300.11.

- C. Provide all required transducers, transformers, relays, or other devices required for interface between pneumatic and electronic control equipment and as required to interface with pneumatic or electronic control systems, with the HVAC and electrical equipment, and systems being controlled.
- D. Low voltage (25 volts and under) control wiring shall not be installed in the same conduit with higher voltage circuitry wiring. Where low voltage wiring enters the same box or enclosure with higher voltage wiring, dividers, and separation shall be provided to comply with codes and regulations, and as required to prevent malfunctions in low voltage control. Where separation of conductors for certain functions or control is recommended by the equipment or system manufacturer, then the conductors for these functions or control shall be installed in conduit separate from other conductors, regardless of voltage differential.

## **2.5 ELECTRONIC SUBASSEMBLIES AND COMPONENTS**

- A. Plug-in assemblies shall be mechanically secured in place with captive fasteners and keyed for proper insertion.
- B. Components shall be mounted for ease of replacement and maintenance after assembly. Controls and adjustments for maintenance personnel shall be separately located from those required by operation personnel, and shall be readily accessible.
- C. Transducers and associated parts shall be constructed and installed in such a manner as to provide accessibility and adequate protection against mechanical damage, degradation of performance and contamination from the environment.

## **2.6 APPLICATION SOFTWARE**

- A. The Contractor shall provide all application software and development including writing, loading and debugging as well as generation of all graphic displays.

## **2.7 WET/WET DIFFERENTIAL PRESSURE TRANSMITTER**

- A. Accuracy
  - 1. +/- 1% of range
- B. Enclosure rating shall be NEMA 4 power coated aluminum.
- C. Provide transmitter with LCD display with a minimum of 4-digits.
- D. Manufacturers:
  - 1. Setra
  - 2. Veris

3. Modus
4. Ashcroft

## **2.8 CURRENT TRANSMITTERS**

- A. AC current transmitters shall be self-powered, combination split-core current transformer type with built-in rectifier and high-gain servo amplifier with 4–20 mA two-wire output. Full-scale unit ranges shall be 10 A, 20 A, 50 A, 100 A, 150 A, and 200 A, with internal zero and span adjustment. Unit accuracy shall be  $\pm 1\%$  full-scale at 500 ohm maximum burden.
- B. Transmitter shall meet or exceed ANSI/ISA S50.1 requirements and shall be UL/CSA recognized.
- C. Unit shall be split-core type for clamp-on installation on existing wiring.
- D. Manufacturers:
  1. Kele
  2. Veris
  3. Dwyer

## **2.9 INSTALLATION**

- A. Locate controls, relays, instruments, switches, valves, devices and accessories so they are readily accessible for adjustment, service and replacement, or as indicated.
- B. Install control valves with power unit up.
- C. Insulated surfaces:
  1. Where insulation on ductwork or equipment is punctured or penetrated due to installation of sensing elements or tubing, re-seal openings air and vapor tight.
  2. Where control devices are located on insulated surfaces, provide brackets to clear finished surface of insulation avoiding punctures of vapor seal.
- D. Limitations:
  1. Locate, support, enclose and install control devices and equipment so as not to subject to vibration, excessive temperatures, dirt, moisture or other harmful effects or conditions beyond their rated limitations.
  2. If devices must be located subject to conditions beyond their recommended or rated limitations, provide necessary protective enclosures and/or furnish equipment constructed of materials and features capable of withstanding adverse conditions.
- E. Taps:
  1. Install pressure sensing taps on fluid lines in straight runs of pipe with minimum length of 10 pipe diameters both upstream and downstream of pressure tap.
  2. Provide shut-off cock in sensing line at each pressure tape.
  3. Provide isolating seal where fluid can injure measuring element.
- F. Control valves, damper operators:
  1. Install control valve and damper operators capable of smoothly positioning under load through full ranges and strokes indicated in both directions without binding or fluttering,

and be further capable of holding steady in any intermediate or extreme position while respective systems are functioning at design flows, temperature and pressures.

## **2.10 WARRANTIES**

- A. The system, including all hardware furnished by the BAS manufacturer, and all software, shall be warranted by the Contractor (BAS Manufacturer) for a period of one year from the date of acceptance by the Owner. Any manufacturing defects, malfunctions, improper or ineffective control or functions arising during this warranty period shall be corrected without cost to the Owner.
- B. All applicable software initially provided in the system shall be updated with the most up-to-date software available during the warranty period, at no additional cost to the Owner. The update shall include making any additions or revisions in the system programming or graphic displays required for proper functioning with the updated software.
- C. The BAS manufacturer's authorized and qualified service technician shall respond to the Owner's call for service within 24 hours on any service call that involves defects, malfunctions, or ineffective control, that causes the operation of a building HVAC system or other equipment or system to affect the Owner's operation in the building. The respond time to non-critical service calls shall not exceed 48 hours unless otherwise waived by the Owner.

## **2.11 INSTRUCTIONS TO OWNER & SYSTEM TRAINING**

- A. The Contractor shall submit a detailed proposed training plan to the Engineer and Owner for review and approval before commencement of training. Training plan shall outline all training sessions' content and duration.
- B. Training manuals (minimum of 3 required) shall be provided in loose leaf binders and shall include all necessary documentation for Host computer operation, DDC panel operation and Maintenance data.
- C. The Contractor shall provide a minimum of 1 full days of training to the owner's staff on the operation of the control systems installed. Training may be spread out over a period of several days to accommodate owners staff requirements. Formal training shall be provided once system installation is complete and prior to acceptance of the system by Owner. Training shall include but not limited to the following:
  - 1. Owner personnel shall participate during the installation, software generation, system validation, system commissioning and start-up of the BAS.
  - 2. Owner training shall be provided on a formalized basis and as an integral task within project contract requirements. Training at a minimum shall be divided into four separate categories as follows:
    - a. Host computer and operator workstation training
    - b. DDC panel operation, trouble shooting and maintenance
    - c. Loop control, tuning and control device calibration
  - 3. For each typical control loop instruct the owner on operation and calibration of each device. Document proportional and integral settings for each PID loop and instruct Owner's staff on calibration adjustments and trouble shooting of electronic control systems.

4. Instruct owner on operation and maintenance for each control device and demonstrate calibration technique.
5. Contractor shall provide Owner training on I/O point definition, software strategy, system backup procedures and system down loading procedure.
6. Contractor shall provide Owner training on the operation and usage of the Host Computer system. Training shall include explanation of all required DOS commands as well as system software commands. Training shall include hardware operation, peripheral devices and components, report generation, software modification techniques and graphic generation and modification techniques.
7. Owner training shall include operation and function of LAN system used for communication between DDC panels and host computer systems.

**END OF SECTION 23 09 23**

## **SECTION 23 21 00 – HYDRONIC PIPING**

### **PART 1 - GENERAL**

#### **1.1 DESCRIPTION OF WORK**

- A. Condenser Water Piping (Above Ground)

#### **1.2 PIPING SPECIALTIES:**

- A. Unions
- B. Strainers

#### **1.3 QUALITY ASSURANCE**

- A. All welders shall be qualified in accordance with ASME Boiler and Pressure Vessel Code, Section IX, Welding and Brazing Qualifications. Welding procedures and testing shall comply with ANSI Standard B31.1.0 - Standard Code for Pressure Piping, Power Piping, and the American Welding Society, Welding Handbook. Soldering and Brazing procedures shall conform to ANSI B9.1 Standard Safety Code for Mechanical Refrigeration.
- B. All materials to be incorporated into a permanent piping system shall be new and undamaged. The piping shall be installed as shown on the design drawings and shall run either parallel or perpendicular to the building structure. All new piping shall be installed to allow for expansion and contraction without undue stress on the piping and pipe hangers.
- C. Unions: All piping unions shall be of the ground joint type constructed of materials equivalent in alloy composition and strength to other fittings in the piping systems in which they are installed. Union pressure classes and end connections shall be the same as the fittings in the piping systems in which they are installed. Steel unions shall have hardened stainless steel seating surfaces on both faces. Unions shall be dielectric where connecting dissimilar metals together.
- D. Unless specified otherwise, steel pipe shall be Grade A120 or Grade A53, conforming to ASTM Specifications and ANSI Specifications. All steel piping shall bear ASTM stamp on pipe. Piping not bearing ASTM stamp shall be removed and new piping shall be installed in accordance with these specifications.
- E. Fittings shall be standard screwed type or screwed flange type for threaded pipe and standard steel welding type for welded pipes. Piping systems, fittings, valves, and specialty items and accessories shall be furnished, installed and rated for not less than the minimum water working pressure and hydrostatic test pressure specified for each piping system.

### **PART 2 - EQUIPMENT**

#### **2.1 JOINING MATERIALS**

- A. Welding materials shall comply with Section II, Part C ASME Boiler and Pressure Vessel Code for welding materials appropriate for the wall thickness and chemical analysis of the pipe being welded. All welding shall be done in accordance with Owner requirements.
- B. Brazing materials shall comply with SFA-5.8, Section II, ASME Boiler and Pressure Vessel Code for brazing filler metal materials appropriate for the materials being joined. For copper tube and fitting joints, braze joints in accordance with ANSI B31.1.0

- C. Gaskets for flanged joints shall be full-faced for cast-iron flanges and raised faced for steel flanges. Select materials to suit the service of the piping system in which installed and which conform to their respective ANSI Standard. Provide materials that will not be detrimentally affected by the chemical and thermal conditions of the fluid being carried.

## **2.2 CONDENSER WATER PIPING (ABOVE GROUND)**

- A. All piping greater than 12-inches shall be standard weight with 0.375 inch wall thickness. Supply and return piping less than 12-inches shall be Schedule 40 black steel pipe. Pipe size 1¼" and smaller shall be installed with screwed fitting and joints. Piping 1½" size through 2½" size shall be installed with screwed or welded joints and fittings. Pipe size 2½" and larger shall be installed with welding fittings and joints. Provide flanges where required for flanged connections. Leak test piping systems with 150 psi hydrostatic pressure.

## **2.3 UNIONS**

- A. Unions for use in ferrous pipe shall be malleable iron with brass to iron ground joint spherical seat, screwed ends, and rated for not less than 300 psi water working pressure.
- B. Unions for use with copper piping shall be cast brass or cast bronze with ground joint spherical seat and with cast brass or bronze or wrought copper sweat ends.
- C. Unions shall be installed wherever necessary for replacement or repair of equipment, valves, strainers, etc. Right and left hand couplings are not acceptable.
- D. Unions in refrigerant systems shall be designed for a maximum 400 psig working pressure, 330°F maximum operating temperature; two brass tailpiece adapters for solder end connections to copper tubing. Flanges for 7/8" to 1-5/8" unions shall be forged steel, and for 2-1/8" rough 3-1/8" shall be ductile iron; four plated steel bolts, with silicon bronze nuts and fiber gasket. Flanges and bolts shall have factory applied rust resistant coating.
- E. Dielectric isolating type unions shall be installed wherever ferrous piping is connected to copper or copper alloy equipment or copper piping. Dielectric unions shall be rated for not less than 250 psi W.P.
  - 1. Furnish and install dielectric unions at all locations where copper piping material is connected to any dissimilar metal.
  - 2. Fittings used shall be union type, of size and materials as required for service involved. Gaskets for fittings shall conform to manufacturer's recommendations for the intended service. Fittings shall meet all requirements of ASNI B16.8 and shall, as a minimum, be capable of effectively isolating stray electrical currents up to 600 volts.

## **2.4 STRAINERS**

- A. Strainers, unless specified otherwise or shown on drawings otherwise, shall be basket or "Y" type of same size as pipe line and with cast iron body, direction of flow arrow cast in body, and removable screen of not less than .0625 inch thick (22 gauge) sheet brass perforated for total net free area opening equal to four times the area of pipe. Strainers shall have bodies drilled and tapped for drain and blow-down. Furnish and install drain valve with drain line extended to drain for strainers of 4" size and larger.

## PART 3 - EXECUTION

### 3.1 METHOD OF INSTALLATION

- A. Ream pipes and tubes. Clean off scale and dirt, inside and outside before assembly. Remove welding slag or other foreign material from piping. During construction, until system is fully operational, keep all openings in piping and equipment closed except when actual work is being performed on that item or system. Provide closures, plugs, caps, blind flanges or other similar items specifically designed for this purpose.
- B. Run pipe lines straight and true, parallel to building lines with minimum use of offsets and couplings. Provide offsets only to provide headroom or clearance and to provide flexibility in pipe lines. Changes in direction of pipe lines made only with fittings or pipe bends. Changes in size made only with fittings. Do not use miter fittings, face or flush bushings, or street elbows. All fittings of long radius type, unless otherwise indicated. Use full and double lengths of pipe wherever possible.
- C. Cut pipe to exact measurement and install without springing or forcing except in case of expansion loops where cold springing is indicated. Take particular care to avoid creating, even temporarily, undue loads, forces or strains on valves, equipment or building elements with piping connections or piping supports.
- D. Install piping to allow for expansion and contraction without stressing pipe or equipment connected.
- E. Provide clearance for installation of insulation and for access to valves, air vents, drains and unions.
- F. Final connections to all equipment and fixtures shall be made in a manner that will permit the complete removal of any fixtures or any piece of equipment without cutting pipe lines.
- G. Use main sized saddle type branch connections or directly connecting branch lines to mains in steel piping if main is at least one pipe size larger than branch for up to 6" mains; and if main is at least two pipe sizes larger than branch for 8" and larger mains. Do not project branch pipes inside main pipe.
- H. Provide flanges or unions at all final connections to equipment, traps and valves to facilitate dismantling. Arrange piping and piping connections so that equipment being served may be serviced or totally removed without disturbing piping beyond final connections and associated shut-off valves.
- I. Threaded joints shall be full and clean cut. Joints shall be made up tight with joint compound or Teflon joint tape manufactured and approved for use with the contents to flow within the pipe and exposed threads of ferrous pipe shall be painted with acid-resisting paint after piping has been tested and proved tight. No caulking, lampwick, or other material shall be used for correction of defective joints.
- J. Flanged joints shall be steel pipe flanges: ANSI B16.5. Steel flanges shall have raised-face, except when bolted to flat-face cast-iron flange. Bolting for services up to 500°F: ASTM A307, Grade B, with square head bolts and heavy hexagonal nuts conforming to ANSI B18.2.1 and B18.2.2. Set flange bolts beyond finger tightness with indicating torque wrench to ensure equal tension in all bolts. Tighten bolts such that those 180° apart or directly opposite are torqued in sequence.
- K. Water piping shall be pitched to drain at low points. Steel to copper connections shall be made with dielectric unions.

- L. Expansion joints or expansion loops and offsets shall be installed where shown on plans and where necessary to provide for expansion of piping.
- M. Weld pipe joints in accordance with ANSI B31. Qualify welding procedures, welders and operators in accordance with ANSI B31.1, paragraph 127.5 for shop and project site welding of piping work. Weld pipe joints in accordance with recognized industry practice. Bevel pipe ends at 37.5° angle where possible, smooth rough cuts and clean to remove slag, metal particles and dirt. Install welding rings for butt-welded joints. Use pipe clamps or tack-weld joints with 12" long welds. Use four welds for pipe sizes up to 10", or use eight welds for pipe sizes 12" through 20". Build up welds with stringer-bead pass, followed by hot pass, followed by cover or filler pass. Eliminate valleys at center and edges of each weld. Weld by procedures which will ensure elimination of unsound or unfused metal, cracks, oxidation, blow-holes and non-metallic inclusions. Do not weld-out piping system imperfections by tack-welding procedures; re-fabricate to comply with requirements. Install forged branch-connection fittings wherever branch pipe is indicated.
- N. Hot water heating piping shall be downgraded to drain connections at low points and shall be upgraded to vent connections at high points. Vent connections shall be provided with manual air vent cocks and copper tube "pigtailed" to facilitate catching water, except automatic vent valves shall be furnished and installed where indicated on drawings and drain lines shall be extended from automatic vent valves and ended over drains.
- O. Refrigerant hot gas discharge piping shall be installed with ½" per 10 feet downward slope away from compressor. Install traps and double risers where indicated, and where required to entrain oil in vertical runs under all load conditions.
- P. Drain piping for coil drain pans shall extend full size of pan outlet, or minimum of ¾". Use plugs on all joints with crosses. Provide trap on drain pan outlets on air systems to prevent blowing through trap. Extend drain line to open waste over floor drains.

### **3.2 INSPECTION**

- A. The inside and outside surfaces of all pipe, tubing, valves, and fittings shall be cleaned of all dirt, sand, loose mill scale, and other foreign materials immediately after removal from storage and before erection. After completion of all piping systems, all lines shall be thoroughly flushed or blown out before being placed in service. The Contractor shall notify the Owner prior to starting any post erecting cleaning operation in sufficient time to allow witnessing the operation. Prior to blowing or flushing erected piping systems, the Contractor shall disconnect all instrumentation and equipment, fully open all valves, and ensure that all strainer screens are in place.
- B. Pipe and components on water systems shall be flushed with clean water until all discharge from the system is clean. A water sample from each system shall be analyzed for cleanliness after system is flushed with clean water. If the water analysis indicates that the system is not clean, the system shall be flushed with a precleaning chemical designed to remove oil, pipe dope, loose mill scale, and other extraneous materials. The Contractor shall submit to the Engineer the proposed precleaning chemicals for approval. This cleaning shall be followed by water flushing as described. Minimum velocities of 5 feet/second shall be maintained at all points. Flow shall be in same direction as when the system is in normal operation. Discharge shall be from low points of lines, ends or headers, and as otherwise required to flush the entire system. After flushing, any residual water shall be drained and/or blown out prior to testing.

### 3.3 TESTING

- A. All hydraulic and pneumatic testing shall conform to ANSI B31.1, B31.5, B31.8 and B31.9. The Contractor shall apply the specified test pressure for a minimum time at least equal to the applicable standard's requirements.
- B. Perform tests only after the pipe and contents have stabilized at ambient temperature and the source of test pressure is shut off. Piping tests shall apply to piping only, with all equipment, and instruments blocked off or disconnected. No component or piping shall be subjected to pressures which exceed their respective pressure ratings. Provide temporary restraints on expansion joints and flexible connections during pressure testing.
- C. Hydrostatic and pneumatic tests shall apply to piping as shown on the following schedule. The pressure shall be gradually raised to the value specified and the source then blocked off. Leakage or loss of pressure in the test duration period shall not be acceptable unless otherwise noted.

#### PIPING TEST

Service	Hydro Working Press. (psig)	Test Press. (psig)	Pneumatic Working Press. (psig)	Test Press. (psig)	Test Period Hours
<b>Condenser Water</b>	<b>10-175</b>	<b>250</b>			<b>2</b>

- D. Audible or visible procedure at no additional cost to the Owner.
- E. Upon successful completion Contractor shall visually examine all joints during the tests. and approval of the tests, the Contractor shall relieve leaks detected during testing shall be cause to disapprove the test even though the maximum allowable pressure drop has not been exceeded. The Contractor shall repair all leaks and shall repeat the complete testing the piping of pressure, drain the system, and put the system into normal operation after further complying with all cleaning requirements as specified.

**END OF SECTION 23 21 00**

## SECTION 23 65 00 - COOLING TOWERS

### PART 1. GENERAL

#### 1.1 DESCRIPTION OF WORK

- A. The existing Marley Induced-Draft, Cross-Flow Cooling Tower is to be refurbished.

#### 1.2 RELATED DOCUMENTS

- A. National Electrical Manufacturers Association; NEMA:
  - 1) Comply with applicable portions of NEMA standards
  - 2) Underwriters Laboratories, UL

#### 1.3 SUBMITTALS

- A. Submit in accordance with Division 01, Section 013300.
- B. Product Data: Include rated capacities, pressure drop, fan performance, rating curves with selected points indicated, startup instructions, furnished specialties, and accessories for each model indicated.
- C. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of assembly, components, and location and size of each field connection.
- D. Product Certificates: Signed by manufacturers of cooling towers to include certified performance curves plotting leaving-water temperature against wet-bulb temperature.

### PART 2. PRODUCTS

#### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provided products by one of the following:
  - 1) Induced-Draft, Cross-Flow Cooling Towers:
    - (a) Marley Cooling Tower Co.
    - (b) Baltimore Aircoil Co.
    - (c) Evapco AXS Cooling Tower

#### 2.2 FILL

- A. Materials: The fill type shall be Marley MX75 or approved equal. Integral louvers and eliminators shall be thermoformed integrally with each fill sheet. Flame spread rating of the material must not exceed 25 per ASTM E-84. The fill must comply with CTI Standard 136. The fill sheets must be self-spacing on a minimum 0.75" centers.
- B. Configuration: The fill must be designed specifically for crossflow cooling tower applications. It must contain a minimum of 51 square feet of wetted heat transfer surface per cubic foot of fill material. The fill supplier will determine the total volume of fill required to achieve the specified thermal performance. Fill shall be suspended from structural tubing supported from the upper tower structure and shall be elevated at least 2" above the floor of the cold water basin to facilitate cleaning. Structural tubing material shall be appropriate for the application. Air inlet faces of the tower shall be free of water splash-out. Drift eliminators shall be triple pass and shall limit drift losses to no more than .005% of the design gpm flow rate. Air from the drift eliminators will discharge at a minimum angle of 45° from the horizontal.

- C. Supports: The fill supplier will review the details of the existing tower structure, either by review of detailed dimensional tower drawings or by physical inspection. Based on this review, the fill supplier will provide fill support and sealing design details appropriate for the existing tower structure.
- D. Hot Water Distribution: The fill supplier will define any necessary changes to assure uniform water distribution to all areas of the fill section.
- E. Fill Depth (air travel): The fill depth will be chosen to provide the proper thermal performance. If a fill height greater than the maximum height of available fill packs is required, a second layer of fill packs may be added, but no more.
- F. Performance: The vendor will supply a fill characteristic line based on the CTI method of analysis to demonstrate the fill capability at the required design conditions. The vendor will guarantee fill performance as installed.

### **2.3 WETTED CASING PANELS**

- A. Except where otherwise specified, all components of the cooling tower shall be fabricated of steel, protected against corrosion by G-235 galvanizing. The tower shall be capable of withstanding water having a pH of 6.5 to 8.0; a chloride content (NaCl) up to 300 ppm; a sulfate content (SO<sub>4</sub>) up to 250 ppm; a calcium content (CaCO<sub>3</sub>) up to 500 ppm; and silica (SiO<sub>2</sub>) up to 150 ppm. The circulating water shall contain no oil, grease, fatty acids or organic solvents. Fiberglass casing, polyurethane barriers, and thermosetting hybrids and the components they are adhered to shall be considered non-recyclable and not allowed.

### **2.4 COLD WATER BASIN LINER**

- A. Basin shall be prepared with a diamond wire wheel to rough surface and ensure a good seal with the liner.
- B. Two part epoxy "roll on" liner to be applied to seal basin and any current leaks.

### **2.5 COOLING TOWER FILTRATION**

- A. All components of the system provided will be manufactured and supplied by a single company and be certified to be functionally compatible, such as the GLS™ manufactured by Griswold Water Systems of Corona, CA or an approved substitution.
- B. Provide the optional Low Energy Sweeper System using water jets to move debris in the basin for picking up by the filtration unit if shown and detailed on the contract documents.
- C. System Description:
  - 1) System shall consist of a Low Energy Vortex Solids Separator, Pump and Motor, Pump Suction Strainer, Control Panel and means for removal of collected solids as specified in the contract documents.
  - 2) Provide Low Energy Filtration Skid with Inlet Block Valve and Outlet Throttling Valve as shown and detailed on the contract documents to allow for servicing of system components and adjustment for proper operation.
  - 3) If a Sweeper System is detailed in the contract documents, it shall be of Low Energy Design and provided by the Filtration System Manufacturer. Systems preinstalled by the Tower manufacturer that are not approved by the Filtration System Manufacturer as of proper Low Energy design are not acceptable. Size and Design the Low Energy Filtration System to reduce the amount of debris circulating in the cooling system water.
    - (a) Size GLS™ Systems to provide a minimum of 10 percent of the total tower recirculation rate as detailed on the contract documents or 1.5 gpm per square foot of swept area for sweeper systems.
    - (b) Calculated flows shall be at 40 Feet Total Dynamic Head for standard systems that do not use Sweepers.

- (c) For Sweeper Systems, calculated flows shall be at 40 feet total dynamic head. The typical high pressure sweeper systems requiring 60 to 100 feet of total dynamic head are not acceptable. The Filter System Manufacturer based upon proposed skid location and lengths and sizes of interconnecting pipe will calculate actual required head.
- D. Low Energy Separator:
- 1) low energy vortex style, solids from liquid separator shall be employed to remove particulates from the cooling tower basin and circulating water.
  - 2) Low Energy Separator shall be constructed to ASME standards with high quality carbon steel or stainless steel as shown and detailed on the contract documents
  - 3) Material thickness shall be a minimum of 0.25 inches.
  - 4) Maximum operating pressure shall be 150 psig unless otherwise specified.
  - 5) Low Energy Separator inlet shall be capable of passing a solid sphere equal to 25 percent of the inlet pipe connection size.
  - 6) Low Energy Separator shall be designed to minimize internal turbulence that results in higher pressure drops for a given flow and more chance for entrainment of particulates in the outlet water discharge.
  - 7) Low Energy Separator shall operate properly with a pressure drop across the separator in the range of 4-8 psi. Separators designed for higher pressure drops such as 8-12 psi will not be acceptable as more than 40 feet of head will be required by the system.
  - 8) Low Energy Separator shall not have a flanged body or removable dome.
    - (a) No slots or movable parts are allowed in the head area that require servicing or cleaning.
  - 9) Low Energy Separator shall incorporate both an automatic internal air bleed and manual air bleed.
  - 10) Deposition slots shall be installed at the bottom spin plate to facilitate collection and removal of solids from the separator.
  - 11) The GLS™ Separator system is equipped with a timer controlled motor-operated purge valve to flush solids collected in the separator periodically down the service drain.
    - (a) Normally a fast acting motorized ball valve (MBV) is supplied that will stop at its then position upon loss of power.
    - (b) Cycle time for the MBV option is between 11 and 25 seconds.
    - (c) Normal time between purge cycles is from 4 to 8 hours.
  - 12) A slow acting spring return motorized ball valve such as the MBVSR used for system bleed control with cycle time longer than 30 seconds shall not be used as proper flushing action cannot be obtained..
  - 13) If the contract documents so state a battery backup system can be applied to the faster operating motorized ball valve to provide for failsafe operation (MBVFS option).
  - 14) If the purge valve option is elected, the contractor shall provide either one of the following:
    - (a) A drain sized to prevent overflowing during the normal unrestricted operation of the valve. Restricting flow rate with a throttling valve is not acceptable as it will prevent proper flushing of the solids collection area.
    - (b) Size a surge tank large enough to collect the full discharge of the valve during normal unrestricted operation of the valve and slowly discharge to the floor drain without overflow.
  - 15) Recovery Tank in lieu of the purge valve is not acceptable.
- E. Pump and Motor will be as shown and detailed on the contract documents.
- 1) Piping between pump and separator will be provided with union or flanged connections to allow for easy replacement of pump seals when required.
- F. A basket strainer with 0.25 inch perforated 304 stainless steel screen shall protect the pump inlet.

- G. Low Energy Filtration System electrical panel shall be certified and labeled to UL 508A and CSA 22.2 14-95, with NEMA 4 powder coated steel, door interlock safety, fusible disconnect switch or disconnect motor starter with thermal overload, 120 VAC magnetic contactor, 460/120 VAC transformer with primary/secondary circuit breakers, pump "run" light and provision for automatic and manual operation.
- H. Low Energy Sweeper System, if required by the contract documents:
  - 1) Sweeper system shall not consist of nozzles, eductors or other devices that require more than 6 psi of system pressure to operate properly.
  - 2) The manufacturer shall provide custom System design and assembly drawing after receipt of purchase order.
  - 3) System shall consist of a kit containing all PVC pipes, water jets, couplings, valves, pressure gauges, and other components required to assemble the complete system inside the tower basin.
    - (a) Contractor shall be responsible for proper installation of equipment.
    - (b) Manufacturer shall label and provide alignment marks to facilitate easy and accurate assembly.
  - 4) System shall include an exit header suitable for vacuum extraction of suspended solids to effectively eliminate the suspended solids from entering the cooling system recirculation loop.
  - 5) Low Energy Filtration System piping from the basin sweeper system to the filter skid shall be supplied and installed by the contractor.

## **2.6 WATER LEVEL CONTROL**

- A. General: The water level controls shall provide a means to control and monitor the water level in the cooling tower collection basin. Relays shall operate in conjunction with suspended stainless steel electrode probes, monitor basin water levels, providing simple solenoid valve water makeup.
- B. System Description: The electrode probe tips are 303 stainless steel suspended from a noncorrosive PVC enclosure box with 30 feet of wire lead for each probe. A galvanized or stainless steel metal stilling chamber is installed over the probes to calm the water for accurate readings.

## **PART 3. EXECUTION**

### **3.1 EXAMINATION**

- A. Verify field conditions and suitability for installation according to manufacturers published installation data.

### **3.2 INSTALLATION**

- A. Refurbish cooling towers according to manufacturer's written instructions.
- B. Install cooling towers level and plumb and fasten to supporting structure with vibration isolators and seismic restraints.
- C. Maintain recommended clearances for service and maintenance.
- D. Electrical Wiring: Install electrical devices furnished by cooling tower manufacturer that are not factory mounted.

### **3.3 CONNECTIONS**

- A. Drawings indicate general arrangement of piping, fittings, and specialties. The following are specific connection requirements:
  - 1) Install piping adjacent to cooling towers to allow service and maintenance.

- 2) Install flexible pipe connections for towers mounted on vibration isolators.
  - 3) Pitch piping down to drain into sump.
  - 4) Connect overflow drain and bleed lines to sanitary sewage system.
  - 5) Condenser-Water Piping: Connect to supply and return cooling-tower connections with shutoff valve, flow control valve, and union or flange on supply connection to the tower and shutoff valve and union or flange to return connection from the tower to the chiller.
- B. Electrical: Comply with applicable requirements in Division 26 Sections.

### **3.4 COMMISSIONING**

- A. Complete installation and startup checks according to manufacturer's written instructions and do the following:
- 1) Clean entire unit and wash basins
  - 2) Ensure accessories are properly installed
  - 3) Check makeup water float
  - 4) Check clearances for airflow and for tower servicing
  - 5) Check for vibration isolation and structural support
- B. Obtain wet-bulb, tower-size, and performance selection tables from manufacturer.
- C. Lubricate bearings on fans and shaft as recommended by manufacturer.
- D. Ensure fan wheels rotate in correct direction without vibration or binding.
- E. Adjust belts to proper alignment and tension.
- F. Start cooling-tower and condenser-water pumps. Follow manufacturers written starting procedures.
- G. Check water level in tower basin.
- H. Check operation of tower basin, makeup line, automatic freeze protect dump, and controlling device.
- I. Check operation of basin immersion heater and control thermostat.
- J. Ensure system chemical treatment is working, and measure chemical treatment levels. Check operation of tower basin automatic blow-down, and controlling device.
- K. Verify that tower discharge is not recirculating into air intakes.

**END OF SECTION 23 65 00**

## **SECTION 26 05 00 – COMMON WORK RESULTS FOR ELECTRICAL**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. The Preliminary Matters and General Conditions, Supplemental Conditions, and Instructions to Bidders are part of this Division of the Specifications and shall be consulted as to detail as they apply to all work in this Division of the Specifications.

#### **1.2 DRAWINGS AND SPECIFICATIONS**

- A. All drawings and specifications on the project are complementary, each to all other sets, and they shall be used in combination for the execution of this work. Division 26 – ELECTRICAL work shown on any one set of drawings, including all Architectural drawings for general work and equipment, and Division 26 work called for under any section of the project specifications, shall be considered as included in this work unless specifically excluded by inclusion in some other branch of the work. This shall include roughing-in for connections and equipment as called for or inferred. The Contractor shall check all drawings and specifications for the project and shall be responsible for the installation of all Division 26 - ELECTRICAL.
- B. The contract drawings for Division 26 – ELECTRICAL are part schematic, intended to convey the scope of work and indicate the general layout, design and arrangement. The Contractor shall follow these drawings in the layout of his work and shall consult general intent construction drawings, structural drawings mechanical drawings and all other drawings for this project to determine all conditions affecting the Division 26 – ELECTRICAL work. The contract drawings are not to be scaled and the Contractor shall verify spaces and conditions in which the Division 26 work is to be installed.
- C. Where specific details and dimensions for Division 26 work are not shown on the drawings, the Contractor shall take measurements and make layouts as required for the proper installation of the work and coordination with all other work on the project. In case of any discrepancies between the drawings and the specifications that have not been clarified by addendum prior to bidding, it shall be assumed by the signing of the contract that the higher cost (if any difference in costs) is included in the contract price, and the Contractor shall perform the work in accordance with the drawings or with the specifications, as determined and approved by the Architect, and no additional costs shall be allowed by the contract price.

#### **1.3 WORK INCLUDED**

- A. This work shall include all labor, material and equipment as required to furnish and install Division 26 work including demolition as shown on drawings and as hereinafter specified. Work shall also include all labor, material and equipment not shown on drawings and not specified but necessary and reasonably incidental to comply with the intent of contract to provide first class and complete installations of Division 26 work. Furnish and install all materials, equipment, devices, and accessories not specifically called for by item but that are necessary to provide the requirements in operation and function that is established by the design and by the equipment specified.
- B. Work shall also include:
  - 1. The procurement of and payment for all permits and licenses required for the performance of the work;
  - 2. All fees and direct expenses involved in any inspections required for the project;

3. All hoists, scaffolds, staging, runways, and equipment required for the performance of the work.
  4. All job measurements and shop layouts required for the proper installation of material and equipment included in the work.
  5. All lights, guards, and signs as required by safety regulations applicable to the work;
  6. The removal from the premises, as it accumulates, of all dirt and refuse resulting from the performance of the work;
  7. Any modifications or revisions required to existing plant, facility, or systems necessary to perform work as called for or inferred.
- C. Work shall include providing labor and equipment for current and voltage readings, and adjustments required on Division 26 equipment for testing and balancing of mechanical systems as specified in Division 23 of this specification.
- D. The work shall include revisions, modifications, and rework of the existing plant, facility, or systems as required for installation of new work, and for connections between existing work and new work where required. The work shall also include the completion of existing electrical and control circuits, for devices and equipment that are to remain in service, if the circuits are broken by demolition work, or by the removal or cutting of existing building construction, existing devices or equipment. Existing conduit and wiring shall be rerouted where necessary.

#### **1.4 SHOP DRAWINGS AND SAMPLES**

- A. Acceptance of the work shall be subject to the Architect's approval of shop drawings, product data and samples. Shop drawings shall include manufacturer's detail drawings of equipment and material and Contractor's shop drawings of equipment and material and Contractor's shop details for installation of material and equipment. Descriptive literature shall include catalog data covering design, size and capacity of material and equipment. Samples shall be parts or complete units of material and equipment made available for inspection by the Architect. Samples shall be as requested by the Architect.
- B. Submittals shall include the manufacturer's model number, capacity, performance data, electrical characteristics, etc., all clearly shown and marked for the specific item of equipment to be furnished on this project. General catalog data that does not indicate the specifics for the item to be furnished for this project will not be accepted. Performance data shown or marked on the submittals shall be at the actual specified operating conditions for this project.
- C. The Contractor shall, prior to forwarding shop drawings to the Architect, review all shop drawings, check all conditions and make all corrections and sign and date each set. No shop drawings will be reviewed by the Engineer without signature of Contractor which will signify that he has checked drawings.
- D. Other requirements for shop drawings shall be as specified in the "General Conditions" of these specifications, and in each appropriate specification section.

#### **1.5 RECORD DRAWINGS**

- A. The Contractor shall keep a day-to-day record of all changes or variations made from the contract drawings and at the end of the project shall obtain reproducible mylars, at the Contractor's cost, of the original contract drawings for Division 26 - ELECTRICAL and show all changes from the original plans made during the installation of his work. Any reference to Addendum and Change Orders shall be deleted from mylars. Drawings shall indicate but not be limited to the following:

1. The correct location of lighting fixtures, feeder conduits, and other equipment where it differs from the location shown on the drawings
  2. The location of all switches, receptacles, security devices, panelboards, junction boxes, etc.
  3. Any other information of a pertinent or useful nature
  4. Any change order items not issued on supplementary drawings
- B. All notations shall be made in a neat and legible manner with any additional explanatory drawings or sketches necessary.
- C. The complete set of Record Drawings shall be delivered to the Architect at the completion of the work. Final payment will not be made until Record Drawings are received.

#### **1.6 CONDUCT AND SEQUENCE IN PERFORMING WORK**

- A. The Contractor shall be responsible for a scheduled sequence in performing the work so that it will not interfere with the building occupant's operation in the existing building. Before any work is started, the Contractor shall consult with the Owner's designated Representative and arrange a satisfactory schedule. The schedule shall be as approved by the Architect. Make temporary alterations as required to execute work so that all operations and services in the existing building are maintained with the minimum possible interruption. Temporary shut-downs shall be segregated and shall be of the shortest possible duration. All facilities shall be kept in continuous operation unless specific permission to the contrary is arranged by the Architect and or the Owner's designated Representative.
- B. The Contractor shall provide to the Owner's designated Representative, prior to any shut down of power or systems, a typewritten detailed proposed procedure of shut down outlining each step including estimated time during the shut down procedure, during the actual shut down, and during the start procedure. These procedures shall also indicate all equipment and systems that will be effected by the shut down. The Contractor shall not proceed with any shut down without approval of the procedure from the Owner's designated Representative or the Owner.

#### **1.7 EXISTING MATERIAL AND EQUIPMENT**

- A. Existing material and equipment removed from existing construction and not shown or required to be reused shall become the property of the Owner, if they so elect. The Contractor shall present the equipment and materials removed to the Owner's designated Representative and he shall select the equipment and materials which he elects to retain. Material and equipment not retained shall become the property of the Contractor and shall be promptly removed from the site.
- B. Any existing material or equipment which is to be reused or left in place and is damaged by performance of work under this contract shall be repaired or shall be replaced with new equipment and material at the expense of the Contractor, to the satisfaction of the Owner and the Architect.

#### **1.8 MATERIAL AND MANUFACTURE**

- A. All material and equipment shall be new except as stated otherwise; shall be of the best quality and design; shall be free from defects and imperfections and shall have markings or a nameplate identifying the manufacturer and providing sufficient reference to establish quality, size and capacity. As possible, all material and equipment of the same type shall be of the same manufacturer. Equipment shall function and perform efficiently and quietly at the required capacity without producing objectionable noise within the occupied areas of the

building; if not, the Contractor shall remedy the condition or replace the equipment at no additional cost to the contract.

## **1.9 SUBSTITUTIONS**

- A. Reference in the specifications to any article, device, product, material, fixture, equipment, form or type of construction by name, make or catalog number shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition. Any article, device, product, material, fixtures, equipment, form or type of construction other than those specified may be substituted, in accordance with the preliminary matters, general conditions, supplemental conditions applicable unless otherwise specified if in the opinion of the Architect, it is equal in every respect to that specified.
- B. All products proposed for use, including those specified by required attributes and performance shall require approval by the Architect before being incorporated into the work. Do not substitute materials, equipment, or methods unless such substitution has been specifically approved for this work by the Architect. Approved substitutions for proprietary materials and systems will be considered, however, approval must be requested prior to use. Burden of proof of equal quality, appearance, performance, and utility rests with the Contractor. Submit technical data and other pertinent information to the Architect.
- C. Where the phrase "or equal" or "approved equal" occurs in the contract documents, do not assume that materials, equipment, or methods will be approved as equal unless the item has been specifically approved for this work by the Architect/Engineer. The decision of the Architect/Engineer shall be final.

## **1.10 LABOR, WORKMANSHIP AND SUPERVISION**

- A. All labor for the installation of material and equipment furnished under the Division 26 - ELECTRICAL shall be done by experienced mechanics of the proper trade and all workmanship shall be first class and in compliance with the specific requirements of drawings and specifications.
- B. All material and equipment for the Division 26 - ELECTRICAL shall be installed under competent supervisory service furnished by the Contractor. Where necessary, this shall include the services of special erection and operation personnel.

## **1.11 SAFETY REGULATIONS**

- A. All Division 26 - ELECTRICAL shall be performed in compliance with all applicable and governing safety regulations including the regulations of the Occupational and Safety Health Act. All safety lights, signs and guards required for performance of Division 26 - ELECTRICAL shall be provided by the Contractor.

## **1.12 PERMITS AND LICENSES**

- A. All permits and licenses that are required by governing authorities for the performance of Division 16 work shall be procured and paid for by the Contractor.

## **1.13 CODES, ORDINANCES, REGULATIONS AND U.L. APPROVAL**

- A. All Division 26 work shall conform to the requirements of all applicable codes, ordinances and regulations including the current rules and regulations of the National Electrical Code, the National Fire Protection Association, O.S.H.A. and all state and local laws, codes and ordinances.
- B. Laws, codes, ordinances and regulations shall take precedent excepting only where the work called for by the drawings and specifications exceeds by quality and quantity.

- C. Fixtures, appliances, equipment and materials which are subject to Underwriter's Laboratory tests shall bear such approval.

#### **1.14 CONTRACTOR'S EQUIPMENT**

- A. All hoists, scaffolds, staging, runways, tools, machinery and equipment required for the performance of the Division 26 - ELECTRICAL shall be furnished by the Contractor.

#### **1.15 COORDINATION AND COOPERATION**

- A. The Division 26 trades shall cooperate and confer with all other trades on the project, as to locations of their materials and equipment before erecting the work so as to avoid interference and delay in progress of construction. In instances where interference may develop, the Contractor shall relocate his work as approved by the Architect, to depart from such interferences at no additions to the contract price. Where it is necessary to make adjustments in the locations or routing of conduits, wireways, or other installations (from that shown on drawings) to clear obstructions or other installed work, the Contractor shall be responsible for making these adjustments as a part of the contract work.
- B. The Contractors shall coordinate with the Owner's designated Representative as to scheduling his work in all areas and shall obtain approval from the Owner's designated Representative prior to any disruption of services or activity. All shut down of services shall be maintained to a minimum.

#### **1.16 STORAGE AND PROTECTION**

- A. Material and equipment for the Division 26 work shall be protected from dirt and damage and maintained in a clean condition during the performance of the work. This shall include adequate protection from the weather if storage is outside. All parts of material and equipment that have become rusted or damaged shall be replaced or restored to an acceptable condition as approved by the Owner's designated Representative. This shall include factory finishes damaged during construction. Any refinishing shall be spray painted, brush applied paint will not be acceptable.

### **PART 2 - EQUIPMENT**

#### **2.1 MANUFACTURER'S STANDARD PRODUCTS**

- A. It is the intention of these contract documents, drawings and specifications, to require manufacturers' standard products, equipment, components and accessories to complete the work.
- B. The equipment, components and accessories furnished by the Contractor shall be the manufacturer's standard, off-the-shelf products as modified only by the manufacturer's standard options and accessories. Do not provide prototypical equipment, components and accessories when standard, off-the-shelf products are available. Standard products that do not meet these specifications shall not be custom-manufactured or otherwise modified to meet the specifications, but shall be rejected.
- C. The Engineer shall make the final determination whether standard, off-the-shelf products are available, and whether any given product is the manufacturer's standard product.
- D. The products of approved manufacturers meet the intent of these specifications.

## **2.2 ADJUSTING, ALIGNING AND TESTING**

- A. All electrical equipment furnished under this Division shall be adjusted and tested by this Contractor. Motors and other equipment furnished by others, to which electrical connections are made under this Division, shall be checked for short circuit and open circuits before energizing. Motors shall be checked for proper phasing and rotation. The thermal overload protection devices shall be checked in all motor starters, and equipment and all protection device size, motor nameplate full load amperage, and voltage rating for protection of the motor shall be listed (include equipment designation, rating of heater, motor nameplate horsepower, full load amps and voltage) and 4 copies of list shall be submitted to the Architect.
- B. Mechanism of all electrical equipment shall be checked, adjusted and tested for proper operation. Protective devices and parts shall be checked and tested for specified and required application and adjusted as required. Adjustable parts of all lighting fixtures and electrical equipment shall be checked, tested and adjusted as required to produce the intended performance.
- C. Completed wiring systems shall be free from short circuits and after completion, perform tests for insulation resistance in accordance with the requirements of the National Electrical Code.
- D. The Contractor shall be held responsible for the operation, service and maintenance of electrical equipment during construction and prior to acceptance by the Owner. All electrical equipment shall be maintained in the best operating condition. Operational failure caused by defective material and/or labor furnished under this Division shall be immediately corrected. Architect shall be immediately notified of any operational failures caused by defective material and/or labor covered under other Divisions or furnished by others.

## **2.3 ELECTRICAL CIRCUITRY FOR EQUIPMENT**

- A. The electrical circuits, components, and controls for all equipment are selected and sized, based on the equipment specified. If substitutions and/or equivalent equipment are furnished, it shall be the responsibility of all parties concerned, involved in, and furnishing the substitute and/or equivalent equipment to verify and compare the electrical characteristics and requirements of that furnished to that specified and/or shown. If greater capacity or more materials or labor is required for the rough-in, circuitry or connections than for the item specified and provided for, then it shall be the responsibility of the parties involved in providing the substitute and/or equivalent items of equipment to provide all compensation for additional charges made for the proper rough-in, circuitry and connections for the equipment furnished. No additional charges above the Base Bid shall be allowed for such revisions.
- B. Before rough-in of circuitry or connecting to equipment, the Contractor shall verify the electrical characteristics and requirements of the equipment being furnished, and for that specified and shown on drawings.

## **2.4 CLEARANCES**

- A. All electrical equipment shall be so installed to maintain proper clearance and headroom as required by the National Electrical Code.

## **2.5 CUTTING AND PATCHING**

- A. The responsibility for any cutting of construction which is required for the installation of Division 26 - ELECTRICAL, shall be by the Contractor. The Contractor shall coordinate

with all other Contractors and the Owner before any cutting and obtain approval from the Architect prior to any cutting. All patching and finishing shall be by the Contractor.

- B. Cutting shall be done with extreme care and in such a manner that the strength of the structure will not be endangered. Wherever possible, openings in concrete or masonry construction shall be by concrete saw or rotary core drill. Openings in any construction shall be cut the minimum size required for the installation of the work. Adequate protection shall be provided to prevent damage to adjacent areas and to prevent dust from spreading to adjacent areas.
- C. Where openings or holes are cut in existing construction and the cutting breaks existing electrical circuitry or control circuitry conduit and wiring, then it shall be the responsibility of the Contractor to reroute the circuitry conduit and rewiring and to complete the circuitry as required and as approved by the Architect. Temporary completion shall be provided where necessary before the permanent rerouting and completion work is finished.
- D. Before any cutting, patching, or finishing work is started, dust and moisture protection shall first be installed as specified.
- E. Openings cut in floor shall be cut by core drilling where possible. After work is installed through any opening in floor, the opening around the work shall be patched and sealed watertight and epoxy or silicone based, non-cracking elastomeric sealant.
- F. Where existing work is removed from sleeves or openings through floor and the sleeve or opening is not to be reused, patch the hole or opening by filling with non-shrink epoxy cement grout, in strict accordance with the grout manufacturer's instructions and recommendations and as required to make completely watertight. Finish the floor surface as directed by the Architect..
- G. Contractors bidding on this project shall coordinate prior to bidding all cutting requirements under this division with the General Contractors for patching requirements to be included in their bids. See Division 01 – GENERAL REQUIREMENTS of the specifications for additional requirements.
- H. Unless otherwise noted, x-ray existing concrete slabs, walls, etc., to locate rebar. X-ray equipment used shall include protective shielding to prevent any harmful radiation from being transmitted to surrounding working equipment. Submit complete diagram of x-ray set up and predicted radiation disbursement for review.

## **2.6 OPENINGS IN FIRE RATED ASSEMBLIES**

- A. Where openings are made, or left due to demolition through fire rated assemblies for conduit or nipples, for sleeves containing cable or wire, and for open conduits through rated assemblies the area around openings, sleeves, and conduits shall be firestopped as specified below. The area around conduits or nipples and unused openings shall be sealed and finished to match adjacent surface prior to opening. Voids up to ½" wide around conduit penetrations shall be sealed with fire resistant foam sealant as specified.
- B. Where the conduit or nipple is left unused for use by others, install a pipe cap on end of raceway on each side of wall or floor.
- C. Electrical boxes in fire rated walls shall be fireproofed around with Monocoat fire proofing compound as manufactured by W.R. Grace. The electrical boxes shall be completely covered with a thickness as recommended by the manufacturer and as approved by the authority having jurisdiction. Submit shop drawings on material and recommended installation.

## 2.7 FIRESTOPPING

- A. Firestopping is defined herein as the process of furnishing and installing a material, or combination of materials, in various constructions to maintain an effective barrier against the spread of flame, smoke, and gasses and to retain the integrity of time-rated construction. It shall be used in specific locations as specified hereinafter.
  - 1. Piping penetrations through floor slab and through time-rated partitions of fire walls
  - 2. Opening between floor slabs and curtain walls, including inside hollow curtain walls at the floor slab
  - 3. Penetrations of vertical service shafts
  - 4. Openings and penetrations in enclosures with time-rated fire doors
  - 5. Other locations where specifically shown on drawings or where specified in other sections of these specifications
  - 6. Openings in non-time-rated construction shall be closed with a compacted fill of  $\frac{3}{4}$  lb. density fiberglass and then sealed gas tight
- B. Material of firestopping shall be asbestos free and capable of maintaining an effective barrier against flame, smoke and gases in compliance with the requirements of ASTM E 814, UL NO. 1479. Firestopping material shall be manufactured by 3M barrier products. Products shall be capable of providing a cold smoke and water seal. When exposed to temperatures exceeding 250°F these products shall rapidly expand up to ten times the original volume.
- C. Installation of fire stopping shall be in accordance with the manufacturer's recommendations and requirements. Surface to be contact with firestopping shall be cleaned of dirt, grease, oil, loose materials, rust, or other substance that may affect proper fitting or the required fire resistance.
- D. Firestopping materials shall provide an effective barrier regardless of the geometric configurations of the void spaces. Firestopping materials for filling voids in floors having openings of four (4) inches or more shall be installed to support the same load as the floor is designed to support, unless the area is protected by a permanent barrier preventing loading or traffic on the firestopped area.
- E. At a minimum fire stop systems shall be designed to achieve a 2-hour F rating with an emphasis on also achieving a 2-hour T rating. In addition to fire and thermal protection, fire stop systems shall be designed to provide a barrier to the transmission of smoke and toxic fumes.
- F. A firestop system as defined by these specifications shall consist of fire barrier products, in certain configuration and quantity, to meet the intent of the specifications above.
- G. Firestop systems for floor and chase penetrations shall be installed on both sides of the penetration (top and bottom) (in and out).

## 2.8 ANCHORS

- A. Provide anchors for all equipment, raceways, hangers, etc. to safely support weight of item involved plus 100% for dead loads. Live loads shall be considered in addition to dead loads.
- B. Anchors to consist of expansion type devices similar to "Redhead" or lead expansion anchors. Plastic anchors are not acceptable. Protect telephone equipment from drilling residue. Powder actuated "shot" type anchors are not allowed.
- C. Use preset anchor steel inserts in concrete slabs. Provide preset anchor size and type for anticipated or specified rod/bolt size and live/dead load.

## **PART 3 - EXECUTION**

### **3.1 CLEANING**

- A. Dirt and refuse, resulting from the performance of the work shall be removed from the premises daily as required (broom clean) to prevent accumulation and the Contractor shall cooperate in the maintaining of reasonably clean premises at all times.
- B. Immediately prior to the final inspection, Contractor shall clean all material and equipment. Dirt, refuse and stains shall be removed from all surfaces and damaged finishes restored to original condition.

### **3.2 NOISE AND VIBRATION**

- A. Contractor shall be responsible for the installation of all equipment in such a manner as to control the transmission of noise and vibration from any installed equipment or system, so the sound level shall not exceed NC35, in any occupied space. Contractor shall be responsible for the correction of any objectionable noise in any occupied area due to improperly installed equipment.

### **3.3 OPERATION AND MAINTENANCE INSTRUCTIONS**

- A. The Contractor shall furnish all services as required for adequate verbal and printed instructions to the Owner and the Owner's operating and maintenance personnel for operation and maintenance of all equipment and systems installed under this Division. Three complete copies of service manuals in hardback binder shall be furnished at the end of the project in accordance with the General Conditions of the specifications. The manuals shall include printed operating and maintenance instructions for systems and equipment specified under this Division, all approved shop drawings and all manufactures printed data.
  - 1. Data to include serial numbers, catalog/model numbers, parts lists, description of operation, final shop drawings, wiring diagrams, all electrical ratings, set-up and maintenance procedures and other literature required for maintenance of equipment. See Technical Sections for other required information.
- B. When the work is complete and at a time designated by the Owner's designated Representative, the Contractor shall furnish the services of a qualified instructor to instruct the Owner's personnel in the operation and maintenance of the systems and equipment.
- C. The bound copies of the operating and maintenance manuals shall be used during the verbal instructions. Maintenance Manual Requirements:
  - 1. Provide emergency instructions including addresses and telephone numbers for service sources.
  - 2. Provide regular system maintenance procedures
  - 3. Indicate proper use of tools and accessories
  - 4. Provide wiring and control diagram for each system
  - 5. Provide manufacturer's data for each operational item in each system
  - 6. Provide manufacturer's product warranties, and guarantee relating to the system and equipment items in the system
  - 7. Provide Final Shop and Erection drawings relating to the system
  - 8. Bind each operating and maintenance manual in one or more vinyl-covered, 2" 3-ring binders, plus pocket-folders for folded drawings. Index with thumb tab collated with

Table of Contents for sections. Mark the back spine and front cover of each binder with system identification and volume number.

- D. Maintenance Materials: Deliver all materials to the Owner in fully identified containers or packages suitable for storage. Obtain receipt for all delivered materials signed by Owner's Operation Manager.

### **3.4 EXISTING CONDITIONS**

- A. Each bidder shall inspect the site as required for knowledge of existing conditions and failure to obtain such knowledge shall not relieve the successful bidder of the responsibility to meet existing conditions in performing the work under the contract.
- B. Where new work cannot be installed without changes in existing plant, facility or systems or where it is indicated on drawings to rework an existing installation, this contract shall include alterations to existing work as required to install new work. Additions to the contract cost will not be allowed because of this Contractor's failure to inspect existing conditions.
- C. Where existing power, lighting, or control circuitry is broken by removal of existing devices, equipment, or fixtures, or by demolition work, cutting or removal of existing building construction, and where the existing circuitry is required by remaining devices or equipment to stay in service, then the circuitry shall be completed as required by job conditions.
- D. Existing conditions indicated on the drawings are taken from the best information available on previous contract drawings and from visual site inspection and are not to be construed as "As-Built" conditions, but are to indicate the intent of this work. It shall be the responsibility of the Contractor to verify all existing conditions at the project site and to perform the work as required to meet the existing conditions and the intent of this work indicated.

### **3.5 DEMOLITION**

- A. This work shall include demolition by this Contractor. Demolition shall consist of but not be limited to removal of existing wire, conduit, boxes, existing lighting fixtures, existing devices, as shown on plans or that is in the way of New Construction. This work shall include removal of all of the aforementioned items as specified or noted on drawings. It will be the Contractor's responsibility to maintain circuits and circuitry to keep areas in operation not included in demolition work but affected by the demolition work.
- B. The Contractor shall coordinate with the involved telephone companies for removal of telephone cable indicated in drawings to be removed or required to be removed and this Contractor shall remove same which are not removed by the telephone companies. All related charges shall be paid by this contractor.
- C. The Contractors bidding on this work shall be responsible to visit the project site and determine the existing conditions and shall include in their bid the total cost for this demolition work, and cartage as specified above.
- D. Where demolition of existing walls or partitions, leave existing conduits protruding through floor slab and new walls will cover their exposure they shall have unused wiring removed, be saw cut off at floor, ground smooth with floor and filled with non-shrink grout. All circuits affected by the removal of these conduits shall be re-fed from overhead as specified hereinbefore.

### **3.6 Safety and Lockout/Tagout Procedures**

- A. Safety of all personnel during work performed is the responsibility of the Contractor. Working on and around electrical equipment and circuits requires more than normal precautions. Obtain checklist for lockout and tagout of all energy driven equipment from Architect/Engineer prior to construction.

**END OF SECTION 26 05 00**

# **SECTION 26 05 19 – LOW VOLTAGE (600V AND LESS) CONDUCTORS AND CABLES**

## **PART 1 - GENERAL**

### **1.1 WIRES (SINGLE CONDUCTOR) AND CABLES (MULTI-CONDUCTOR ASSEMBLIES) USED FOR THE FOLLOWING APPLICATIONS:**

1. Power: 480/277V and 120/208V Systems
2. Lighting: 480/277V and 120/208V Systems
3. Control: 120V
  1. Low Voltage Control & Instrumentation
  2. Wiring Connectors and Connections

### **1.2 SUBMITTALS**

- A. Submit in accordance with Division 1 Submittal Procedures.
- B. Product Data: Submit manufacturer's technical product data, including specifications and installation instructions.

### **1.3 QUALITY ASSURANCE**

- A. Codes and Standards:
  1. NFPA 70: National Electrical Code
  2. UL 83: Thermoplastic Insulated Wire
  3. UL 1063: Machine Tool Wire
  4. UL 44: Rubber Insulated
  5. UL 854: Service Entrance Cables
- B. Acceptable Manufacturers:
  1. POWER, LIGHTING and 120 VOLT CONTROL
    1. American Insulated Wire
    2. Essex-Paranite Cable
    3. Rome Cable
  2. LOW VOLTAGE CONTROL & INSTRUMENTATION
    1. Alpha
    2. Belden
    3. Dekoron

## **PART 2 - PRODUCTS**

### **2.1 POWER, LIGHTING, & 120V CONTROL**

- A. NEC Type THHN/THWN (90°C Dry/75°C Wet)
- B. Single conductor, stranded (all sizes), soft annealed copper conductors with 600 volt thermoplastic insulation and nylon jacket.

- C. Wire smaller than No.12 gauge shall not be used unless specifically called for on drawings or in specifications. All emergency lighting branch circuit wire from emergency panels shall be No. 10 AWG.
- D. Wire insulation shall be color coded as follows:
  - 277/480V, 3 phase, 4 wire
  - Phase A            Brown
  - Phase B Orange
  - Phase C Yellow
  - Neutral Gray
  - Ground Green
  - 120/208V, 3 phase, 4 wire
  - 1. Phase A            Black
  - 2. Phase B Red
  - 3. Phase C Blue
  - 4. Neutral White
  - 5. Ground Green
- E. Black insulation is acceptable for #8 wire or larger. Conductor ends shall be wrapped with colored tape as indicated above.

## 2.2 LOW VOLTAGE CONTROL AND INSTRUMENTATION

- A. Application: Conductor operating voltage shall not exceed 50-volts.
- B. Shielded single twisted pair, 600V, 90-degree C:
  - 1. Conductors-16 AWG, stranded copper
  - 2. Conductor insulation of PVC with a nylon jacket
  - 3. Foil shield with tinned copper drain wire
  - 4. Black PVC outer jacket
  - 5. Wire insulation color coded black and white
  - 6. Dekoron #IC 52-67000 or equal
- C. Shielded three-conductor, 600V, 90-degree C:
  - 1. Conductors-16 AWG, stranded copper
  - 2. Conductor insulation of PVC with a nylon jacket
  - 3. Foil shield with tinned copper drain wire
  - 4. Black PVC outer jacket
  - 5. Wire insulation color coded black, white, and red
    - 1. Dekoron #IC 62-67000 or equal
- D. Overall shielded, multiple pairs, 600V, 90-degree C:
  - 1. Conductors-18 AWG, stranded copper
  - 2. Conductor insulation of PVC with a nylon jacket
  - 3. Foil shield with tinned copper drain wire
  - 4. Black PVC outer jacket
  - 5. Wire insulation color coded black, white, and numbered

6. Dekoron or equal #IC 70-80400: 4 pair
  7. #IC 70-80800: 8 pair
- E. Overall shielded, multiple conductor; 600V, 90-degree C
1. Conductors-14 AWG, stranded copper
  2. Conductor insulation of PVC with a nylon jacket
  3. Foil shield with tinned copper drain wire
  4. Black PVC outer jacket
  5. Wire insulation color coded black with printed number and color.
  6. Dekoron or equal
    1. #IC 99-40500-001: 5 conductor
    2. #IC 99-40900-002: 9 conductor
    3. #IC 99-41200-002: 12 conductor
- F. Cables shall pass the U.L. 1581 Vertical Tray Flame Test, and be listed as Tray Cable under U.L. 1277 and in accordance with NEC Articles 318, 340, and 501.
- G. Ground conductors connected to structure shall be connected with non-metallic approved fasteners.

### **2.3 CONNECTORS AND SPLICES**

- A. Provide UL-listed factory-fabricated wiring connectors of size, ampacity rating, material, type and class for application and for service indicated. Select connectors to comply with Project's installation requirements and as specified in Part 3 "Applications" of this Article.
- B. For Conductors #10 AWG and Smaller: Wire and cable connectors shall be solderless, twist on, 600 volts, 105°C., shall comply with UL 486A/C standards. Connectors coded for easy selection compatible with wiring to be spliced. Install connectors as recommended by manufacturer. Use proper crimping tool where crimp sleeves are used.
1. Acceptable Connector Manufacturers:
    1. 3M- "Scotchlock"
    2. Buchanan - "B Cap"
    3. Thomas & Betts - "Stak-On"
    4. Ideal - "Wing Nuts"
- C. Mechanical splices and tap connectors for feeder conductors shall be mounting block type, insulated with clamp-on molded covers that accommodate the lug types specified herein.
1. Acceptable Mechanical Connector Manufacturers:
    1. Burndy Engineering Company
    2. O-Z Gedney
    3. Thomas and Betts
- D. Compression Splices: Splice conductor #8 and larger with solid copper barrel, type fittings applied with an appropriate hydraulic tool. Splices used only where approved. Splice fittings: Burndy "Hydent". Insulate splices with 600 volt, 105°C, "heat shrink", "cold shrink" covers, or taped insulation consisting of rubber, friction and vinyl tapes applied per manufacturer for 600 volt, 105°C covering.
1. Acceptable Splice and Tape Manufacturers:

1. Burndy
  2. Thomas & Betts
  3. ILSCO
  4. Anderson
  5. Blackburn
  6. Oz/Gedney
- E. Connectors and/or Terminations for Conductors #6 AWG and larger: Tin plated, 98% copper, dual crimp long barrel compression lugs with two bolt holes, insulated with molded covers to accommodate 1/2" bolts. Apply with hydraulic tool recommended by manufacturer.
1. Acceptable Manufacturers and Products
    1. O-Z Gedney
    2. Burndy Engineering Company "Hylugs"
    3. Thomas and Betts, "Color Keyed"
    4. Anderson
- F. Use pulling lubricant which will not be detrimental to insulation of conductors indicated by published user information.
1. Acceptable Manufacturers of Lubricant:
    1. Ideal Industries
    2. Panduit Corp.
    3. OZ/Gedney
    4. Plymouth/Bishop
    5. American Polywater Corp.
    6. Thomas & Betts
- G. Insulate all live joints to 600 volts with strip rubber, friction tape, and electrical vinyl tape installed in accordance with manufacturer's recommendations.
1. Acceptable Tape Manufacturers:
    1. 3M
    2. Plymouth
    3. Scotch

## **PART 3 - EXECUTION**

### **2.4 INSTALLATION**

- A. Install electrical conductor, cables, wires, and connectors in compliance with NEC.
- B. All wires shall be run in conduit or cable tray as indicated.
- C. All terminations and splices shall be made in accordance with proper methods and recommendations for the type of wire and devices used and as recommended by the manufacturers of material and equipment involved.
- D. Splice and tap connectors for conductors #8 AWG and smaller shall be 3-M "Scotchlok" or Ideal Industries "Super-Nut" spring connectors with molded vinyl caps.

- E. Splice and tap connectors for conductors #6 AWG and larger shall be compression type installed with hydraulic tool of proper capacity as recommended by the manufacturer for the size of conductor on which the connector is used. Connector size shall be selected in accordance with manufacturer's recommendations for the size and number of wires or cables on which the connector is used.
- F. All terminating connections for conductors size #6 AWG and larger shall be made with two-hole hydraulic compression type lugs.
- G. Pull conductors simultaneously where more than one is being installed in same conduit. Use UL listed pulling compound or lubricant, where necessary, unless indicated otherwise in this specification or on drawings.
- H. Use splice and tap connectors which are compatible with conductor material.
- I. Provide adequate length of conductors within electrical enclosures and neatly train the conductors to terminal points with adequate excess. Bundle multiple conductors, with conductors larger than #10 AWG cabled in individual circuits. Make terminations with no bare conductor showing at the terminal.
- J. Prior to energizing, check installed wires and cables with megohm meter to determine insulation resistance levels to assure requirements are fulfilled.
- K. Prior to energizing, test wires and cables for electrical continuity and for short-circuits.
- L. Subsequent to wire and cable hook-ups, energize circuits and demonstrate proper functioning. Correct malfunctioning units, and retest to demonstrate compliance.
  - 1. Clean conductor surfaces before installing lugs and connectors.
  - 2. Make splices, taps and terminations to carry full ampacity of conductors with no perceptible temperature rise.
  - 3. Use split bolt connectors for copper conductor splices and taps, #6 AWG and larger; tape uninsulated conductors and connector with electrical tape to 150 percent of insulation rating of conductor.
  - 4. Use solderless pressure connectors with insulating covers for copper conductor splices and taps, #8 AWG and smaller.
  - 5. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, #10 AWG and smaller.

**END OF SECTION 26 05 19**

## SECTION 26 05 33 – RACEWAYS FOR ELECTRICAL SYSTEMS

### PART 1 - GENERAL

#### 1.1 WORK INCLUDES

- A. Conduit:
  - 1. Electrical metallic tubing (EMT)
  - 2. Flexible metal conduit
  - 3. Metal Clad Cable
  - 4. Rigid non-metallic conduit
- B. Wireways:
  - 1. Screw cover
  - 2. Hinged cover
  - 3. JIC Oiltight

#### 1.2 SUBMITTALS

- A. Submit in accordance with Division 01 Submittal Procedures.
- B. Product Data: Submit manufacturer's technical product data, including specifications and installation instructions, for each type of raceway system required. Include data substantiating that materials comply with requirements.
- C. As-builts: The Contractor shall submit marked-up contract drawings accurately indicating the actual routing of all raceways installed.

#### 1.3 QUALITY ASSURANCE

- A. Codes and Standards:
  - 1. NFPA 70-National Electric Code
  - 2. NEMA Standards
  - 3. ANSI Standards

#### 1.4 PROJECT REQUIREMENTS

- A. Work on this project shall match existing installations as close as possible. EMT raceways shall be used for all network, control and mission critical power systems. Metal Clad cable shall be provided for lighting, receptacles and power to furniture systems.

### PART 2 - PRODUCTS

- A. Rigid metal galvanized steel conduit (RMC) to conform to Federal Specification WW-C-581E, NEC Article 346, ANSI Standard C80.1 and U.L. Standard No. 6 for rigid metallic conduit, except hot dipped galvanized after threading. Minimum size concealed in concrete or below grade shall be ¾". Minimum size shall be 1/2 inch.
  - 1. Fittings, ells, couplings, etc., galvanized threaded type meeting above standards. Threadless fittings shall not be used.
  - 2. Terminate rigid conduit in dry locations with two steel locknuts, one inside, one outside of the cabinet, junction box or outlet box and an insulated bushing. Bushings shall be

malleable iron or steel with smooth insulating ring molded into edge of bushing to prevent damage to cable. Insulated bushings shall be 150°C self-extinguishing thermoplastic. Provide grounding bushings on 1 ¼" conduit and larger. Construction of bushings shall be similar to steel bushings described above except provide lugs for grounding connection.

- B. Flexible steel conduit, "Greenfield", continuous spirally wound and inter-locked, threadless, galvanized steel conforming to U.L. Standard No. 1, NEC 357, and CSA Standards for flexible steel conduit. Finish shall be zinc-coated steel.
1. Acceptable Flexible Steel Conduit Manufacturers:
    - a. Anaconda Metal Hose
    - b. Midwest Conduit and Cable Company
    - c. Electri Flex Company
    - d. MWS Incorporation
    - e. International Metal Hose Company
    - f. Steelflex Electro Corporation
  2. Connectors and fittings galvanized steel, threadless type with insulated throats, U.L. approved for grounding means.
  3. Acceptable Connector Manufacturers:
    - a. Thomas & Betts Corporation
    - b. Steel City-Midland Ross
    - c. Midwest-Cooper Industries
    - d. ETP-Berger Industries
    - e. Appleton Electric Company
    - f. Raco Incorporation
- C. Liquid tight flexible steel conduit constructed similar to flexible steel conduit above, except with polyvinyl chloride jacket and conforming to UL Standard 360.
1. Acceptable Liquid Tight Flexible Conduit Manufacture:
    - a. Anaconda Metal Hose Company
    - b. Electri-Flex Company
    - c. International Metal Hose Company
  2. Fitting Assembly - sealing type, with steel gland, nylon ring and ground cone inside locknut. All fittings with insulated throat, U.L. approved for grounding means.
  3. Acceptable Fitting Manufacturers:
    - a. Thomas & Betts
    - b. Raco
    - c. Midwest
    - d. Steel City
    - e. Appleton
    - f. ETP
- D. Electrical Metallic Tubing, EMT, threadless, steel type conforming to ANSI Standard C80.3, NEC 348, and UL 797; galvanized inside and out, and with additional corrosion resistant finish.
1. Acceptable EMT manufactures:

- a. Wheatland Tube Company
  - b. ETP-Berger Industries
  - c. Pittsburgh Tube Company
  - d. LTV Steel Tubular Products Company
  - e. Triangle Wire and Cable Company
  - f. Western Tube and Conduit Corporation
2. EMT Fittings, connectors, couplings, etc., for lighting and power feeders and branch circuits. Use insulated throat galvanized steel, raintight, compression type fitting. Provide grounding bushing on 1 ¼" and larger. Zinc alloy and similar soft metal castings are not allowed. Set screw fittings are allowed for 2" and larger.
  3. Acceptable Fitting manufacturers:
    - a. Thomas & Betts
    - b. Raco
    - c. Efcor
    - d. Appleton
    - e. ETP
    - f. Steel City
    - g. Midwest
- E. Metal Clad Cable, shall be provided in accordance with UL 1569, UL-4 and NFPA 70.

### **PART 3 - EXECUTION**

#### **3.1 RIGID CONDUIT**

- A. Rigid threaded steel conduit shall be galvanized and of standard NEC size. Minimum conduit size for this project shall be 3/4" dia. Rigid conduit shall be used for the following:
  1. All medium voltage feeders
  2. Circuits run underground (Paint with asphaltum)
  3. Circuits in hazardous locations
  4. Circuits exposed to physical damage and heavy moisture both indoors and outdoors
  5. All sleeves
  6. All motor circuits where subject to physical damage or below 10' AFF
  7. Service entrance conduits installed exposed or concealed in walls or above ceilings
  8. From AC Standby plant to first distribution system
  9. AC Standby plant control wiring
  10. Intermediate grade metal conduit (threaded only) may be used in lieu of rigid steel conduit where allowed by NEC, and local ordinances.

#### **3.2 FLEXIBLE CONDUIT**

- A. Short sections of flexible conduit (greenfield) shall be used from junction or outlet boxes to lighting fixtures as permitted by the National Electrical Code. Connections from outlet boxes above ceilings to fluorescent fixtures recessed in ceiling shall be made with flexible metallic steel conduit not to exceed 6 ft. in length. Flexible conduit shall not be installed

outdoors or in damp or wet areas. Use of "BX" or "MC" type cable will not be permitted on this project. Use flexible conduit, "greenfield" as follows:

1. Connection to vibrating equipment in dry locations between rigid conduit and connection box on equipment.
2. Final connections to equipment in dry locations
3. Final connections to equipment requiring adjustments
4. Final connections to recessed lighting fixtures from conduit system
5. Connection to distribution transformers
6. Connection to bus duct plug-in switches

### **3.3 EMT CONDUIT**

- A. Electrical Metallic Tubing, EMT, shall be used for the following:
  1. Branch circuits in dry non-corrosive, non-hazardous locations (steel compression fittings only for 1½" and smaller).
  2. Auxiliary systems and controls

### **3.4 INSTALLATION**

- A. Short sections of flexible watertight (Sealtite) conduit, minimum 24 inches, shall be used for connections to motors, transformers and vibrating type equipment, at all locations and shall be utilized for rigid connections to equipment in damp or wet areas.
- B. Unless specified or noted on drawings otherwise, conduit shall be installed concealed, excepting in areas where concealment of conduit is not possible or practicable. Conduits shall be installed continuous between outlets, boxes, cabinets, etc.
- C. Conduits shall be run parallel and perpendicular to building lines and shall be run against the structure in a neat workmanlike manner with conduit offsets neatly formed around all structure offsets and obstructions (tight to structure).
- D. Conduits shall be securely fastened in place with approved type hangers, clamps and supports. Conduit shall not be fastened to or supported from ductwork, piping, lay in ceiling support wires, Owners unistrut framing or equipment, or mechanical equipment.
- E. Conduit ends shall be reamed before installation and all conduit shall be thoroughly cleaned before installation and kept clean after installation. All conduit shall be fished clean before pulling of wires. Plug ends of conduits, with temporary plugs, where conduits are open to weather to keep inside of conduit free of water and debris.
- F. Where portions of a cable raceway or sleeve are known to be subjected to different temperatures and where condensation is known to be a problem, as in cold storage areas of buildings or where passing from the interior to the exterior of a building, the raceway or sleeve shall be filled with an approved material to prevent the circulation of warm air to a colder section of the raceway or sleeve. An explosion proof seal shall not be required for this purpose.
- G. Conduit Fittings
  1. Construct locknuts, for securing conduit to metal enclosure, with sharp edge for digging into metal, and ridged outside circumference for proper fastening, and where used outdoors fitting shall be furnished with a gasket material to seal watertight.
  2. Bushings for terminating conduits smaller than 1-1/4" are to have flared bottom and ribbed sides, with smooth upper edges to prevent injury to cable insulation.

3. Install insulated type bushings for terminating conduits 1-1/4" and larger; bushings are to have flared bottom and ribbed sides; upper edge to have phenolic insulating ring molded into bushing.
  4. Bushing of standard or insulated type to have screw type grounding terminal.
  5. Electrical metallic tubing shall be installed with water-tight compression fittings only. Rigid threaded conduit shall be installed with threaded couplings and fittings.
  6. Install miscellaneous fittings such as reducers, chase nipples, 3-piece unions, split couplings, and plugs that have been specifically designed and manufactured for their particular application. Install expansion fittings in raceways every 200' linear run or wherever structural expansion joints are crossed. Expansion fittings shall be specifically designed for this purpose, flexible conduit (greenfield) will not be considered as adequate.
  7. Fasten conduit terminations in sheet metal enclosures by 2 locknuts, and terminate with bushing. Install sealing locknuts inside and outside enclosure.
- H. Avoid use of dissimilar metals throughout the conduit system to eliminate possibility of electrolysis. Where dissimilar metals are in contact, the Contractor shall install special fittings for the prevention of electrolysis and shall coat all surfaces with corrosion inhibiting compound before assembling.
- I. Keep conduits a minimum distance of 6" from parallel runs of flues, hot water pipes or other sources of heat. Wherever possible, install horizontal raceway runs above air ducts, water and steam piping.
- J. Install conduits as not to damage or run through structural members. Avoid horizontal or cross runs in building partitions or side walls.
- K. Install exposed conduit work as not to interfere with ceiling inserts, lights or ventilation ducts or outlets.
- L. Support all conduits by use of hangers, clamps, or unistrut trapeze supports. Support conduits on each side within 3'0" of boxes and bends. Conduit support spacing shall not to exceed following:
- |    |                  |                        |
|----|------------------|------------------------|
| 1. | Conduit Diameter | Maximum Hanger Spacing |
| 2. | 3/4" & 1"        | 6'-0"                  |
| 3. | 1 1/4" & Larger  | 8'-0"                  |
- M. Coordinate layout and installation of raceway systems with other construction elements to ensure adequate headroom, working clearance, and access.
- N. Furnish offsets required to meet field conditions. Make bends in conduit in accordance with the National Electrical Code, except make minimum radius of 6 times conduit diameter or 6" whichever is greater; bend IMC conduit without deforming. Do not exceed 270° total bends in any conduit run without pullbox or acceptable conduit body.
- O. Where conduit crosses expansion joints, install expansion type fittings with bonding jumper. Use expansion joint with lateral conduit movement of 4" or 8" as indicated. When both vertical and lateral movement is expected the joint shall be a 1" braided flexible coupling allowing both directional movements.
- P. Raceways, which contain cables supplying essential loads, shall be adequately designed to perform satisfactorily after an earthquake. Raceways determined to be hazardous to adjacent essential equipment due to potential movement during a seismic event, shall have seismically designed supports and attachments.

- Q. Support for multiple conduit runs shall consist of trapeze type hangers as required. Galvanized bolts or rods shall be ½" minimum diameter and anchored to structure. Provide support system clamp for each conduit on hangers. Support systems shall utilize 1-5/8" x 1-5/8" x 12 gage multi-purpose steel channels, complete with all necessary hardware, clamps, etc. all channel hardware shall be galvanized and/or plated to prevent corrosion. Channel sizes and quantity, and number of support rods shall be increased to support increased weights. Design each assembly to carry the combined weight of conduit and wire, assembly itself plus 100 pounds. Provide space for 25 percent additional conduit of the same size. See Section 260500 Common Work Results for Electrical for anchor requirements.
1. Acceptable Manufacturers of channel support Systems:
    - a. Bee-Line
    - b. Kindorf
    - c. Superstrut
    - d. Unistrut
  - R. Support vertical riser conduits with galvanized bolted clamps at each floor. Do not support conduits to ceiling support system. Do not support electrical conduits from existing telephone equipment frames, racks, substructures, piping, other conduits, etc.
  - S. Where ground conductor installed in conduits, 1¼" and larger, provide grounding bushings, and bond full size ground wire to bushings, and from bushing to box or cabinet; bond with bolt, nut, lock washer and appropriate lug. Where ground wires are run in smaller conduits, provide non-grounding bushing and bond to outlet and junction boxes with bolt, nut, lock washer and appropriate lug. Provide all service entrance raceways with grounding bushing and bond to ground bus with conductor sized per Table 250-94c of N.E.C.

### **3.5 SLEEVES**

- A. Provide sleeves for all 1½" and larger raceways penetrating floors, structural members and walls. Sleeves consist of Rigid Metal conduit set in forms. (Exception: Use Schedule 40 PVC for individual ground conductors and install adequate expanding type firestopping material to give fire rating equal to substrate penetrated).
- B. Size sleeves to allow ½" minimum clearance around raceway extending from bottom of floor construction to 2" above floor, minimum sleeve size 2½" diameter.

### **3.6 CLEANING**

- A. Upon completion of installation of system, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish, including chips, scratches and abrasions.

### **3.7 WIREWAY AND INSTALLATION**

- A. Furnish and install hinged-cover wireway system with all accessories and fittings as required for installation as shown on drawings. Wireway shall be minimum 4" x 4" (unless noted otherwise on drawings) and shall have clustered conduit knockouts on three sides spaced at not more than one foot on center for each cluster, and shall have enameled finish.
- B. Wireways shall be substantially supported from building structure. Wireways shall be positioned so that hinged covers may be opened without obstructions and so that wire or cables may be laid into wireway and be fully accessible for wiring connections.
- C. Where wireways pass through walls, floor, or ceiling construction, the cover on that portion of the wireway though the construction and for approximately 1" on each side of the

construction shall be fastened on the wireway with screws. The remainder of the wireway shall be positioned and installed so that the hinged covers can be opened without obstruction and so that the covers will be securely latched in place when the covers are closed. The opening through construction for wireway shall be finished against all sides of the wireway to match adjacent construction. Furnish and install flat 18 gauge galvanized sheet steel collars around wireway on each side of opening. Collars shall have opening to fit snugly around wireway and shall have overall dimensions 1½" larger than wireway cross-sectional dimensions. Fit against construction and fasten in place to prevent pulling away from construction.

- D. Contractor shall coordinate routing and location of wireway with conduit, piping, architectural and structural elements.

**END OF SECTION 26 05 33**

## **SECTION 26 05 34 – ELECTRICAL BOXES AND FITTINGS**

### **PART 1 - GENERAL**

#### **1.1 WORK INCLUDES**

- A. JUNCTION BOXES:
  - 1. Boxes for electrical service outlets
  - 2. Boxes for lighting fixtures and wall switches
  - 3. Boxes for monitoring and control devices
  - 4. Bushings
  - 5. Wiring gutters
  - 6. Locknuts
  - 7. Knockout closures
- B. PULLBOXES:
  - 1. Boxes for distribution feeders

#### **1.2 SUBMITTALS**

- A. General: Submittals shall be made on all items in this section and shall be in accordance with Division 01 Submittal Procedures.
- B. Product Data: Submit manufacturer's technical product data, including specifications and installation instructions, for each type of box required. Include data substantiating that materials comply with requirements.

#### **1.3 PREREQUISITE CONDITIONS**

- A. The General Conditions, Supplemental General Conditions and Special Conditions are part of this contract and requirements set forth in those sections apply to all work in this division of the specifications.

### **PART 2 - PRODUCTS**

#### **2.1 JUNCTION BOXES**

- A. Boxes for exposed work where permitted or approved, shall be 4" square or 4" long by 2-1/8" wide standard utility boxes. Boxes shall be specifically designed for surface installation and as required by the device, wiring, and number of conduits. All covers for devices and blank covers shall be stamped steel with turned down edges to fit with sides of box. Where surface mounted die cast boxes are specified or indicated to be used the Contractor shall furnish new deep housing die cast aluminum boxes with cast mounting lugs and threaded hubs as required for the installation.
- B. Outlet boxes shall be installed for all electrical service outlets, including plug receptacles, lamp receptacles, lighting fixtures, switches, etc. Boxes for concealed work shall be size 4" code gauge steel knockout boxes, galvanized or sherardized and of required depth for services and devices. Boxes installed for concealed work shall have code gauge galvanized raised plaster rings set to plaster ground or markers with outside edge flush with plaster or wall finish. Plaster rings shall be selected with proper opening for device installed in box. Thru-wall type boxes or back to back wall boxes will not be permitted. Outlet boxes in

unplastered concrete block walls in finished rooms shall be masonry type and shall be set to line with wall joints.

- C. Where lighting control switches are indicated to be installed in hollow metal door jambs or where wall space is not adequate width for the standard wall switches and boxes, furnish and install boxes with Raco #970 or equal support and anchor fittings to solidly anchor boxes in the jambs. Coordinate the installation for the boxes and conduit connections with the door jamb installer.
- D. Box covers shall be identifiable from the floor by painting the box cover as follows:
  - 1. RACEWAY SYSTEM -- COVER COLOR
    - a. EWFD System Boxes Red
    - b. Security System Boxes Blue
    - c. DDC System & Building Alarm Points Black
    - d. Emergency Lighting Systems Yellow
    - e. UPS Power Wiring Orange
- E. Bushings, Knockout Closures and Locknuts: Provide corrosion-resistant box knockout closures, conduit locknuts and malleable iron conduit bushings, offset connectors, of types and sizes, to suit respective installation requirements and applications.
- F. Available Manufacturers: Subject to compliance with requirements, manufacturers offering bushings, knockout closures, locknuts, and connectors which may be incorporated in the work include, but are not limited to, the following:
  - 1. Steel City
  - 2. OZ/Gedney
  - 3. Appleton
  - 4. Pass and Seymour, Inc.
  - 5. Hubbell-RACO
  - 6. Thomas & Betts Co., Inc.
- G. Device Box Accessories: Provide surface mount type device box accessories as required for each installation, including mounting brackets, device box extensions, switch box supports which are compatible with device boxes being utilized to fulfill installation requirements for individual wiring situations. Choice of accessories is Installer's code-compliance option.
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering outlet boxes which may be incorporated in the work include, but are not limited to, the following:
    - a. Steel City
    - b. OZ/Gedney
    - c. Appleton
    - d. Pass and Seymour, Inc.
    - e. Hubbell-RACO
    - f. Thomas & Betts Co., Inc.
- H. Outlet Box Accessories: Provide outlet box accessories as required for each installation, including box supports, mounting ears and brackets, wallboard hangers, box extension rings, fixture studs, cable clamps and metal straps for supporting outlet boxes, which are compatible with outlet boxes being used to fulfill installation requirements for individual wiring situations. Choice of accessories is Installer's code-compliance option.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering outlet boxes which may be incorporated in the work include, but are not limited to, the following:
  - a. Steel City-
  - b. OZ/Gedney Co.
  - c. Appleton
  - d. Pass and Seymour, Inc.
  - e. Hubbell-RACO
  - f. Thomas & Betts Co., Inc.
- I. Provide cable clamps and corrosion-resistant screws for fastening cable clamps, and for equipment type grounding.

## 2.2 PULLBOXES

- A. Pull and junction boxes shall be code gauge galvanized steel boxes of size shown or required and with bolted or screwed covers. Boxes shall be flush or surface mounted as shown or required and shall be finished with factory prime coat of paint.
  1. Box construction per NEC and conforming to UL Standard No. 50, and manufactured with galvanized sheet steel, 12 gage minimum, with angle iron frame where required for rigidity; welded or bolted construction is acceptable. Install bolts to prevent damage to cables in box.
- B. Provide galvanized code-gage sheet steel pull boxes, with screw-on covers; of types, shapes and sizes, to suit each respective location and installation; with welded seams and equipped with stainless steel screws and washers.
  1. Provide split covers where necessary for access. Maximum single piece cover - 36" x 36".
- C. Provide cable clamps and corrosion-resistant screws for fastening cable clamps, and for equipment type grounding.
- D. Furnish pull, tap and cable support boxes required by NEC for excessive number of 90 degree conduit bends, conductor taps and cable supports.
- E. Provide separate junction boxes for each feeder. If conduit is installed so separate junction boxes are not practical, one large pull-box may be used with each set of feeder conductors separated by 12 gage steel barriers. Furnish junction box or each compartment in junction box with ground lug for connection of ground wire.
- F. Boxes located in damp or wet locations shall be welded construction and finished white inside and gray outside with waterproof paint. Provide gasketed door and corners. Provide rain drip shields. Boxes shall carry NEMA 3R (weatherproof) or NEMA 4 (watertight) labels as specified.
- G. Acceptable Manufacturers
  1. Hubbell
  2. Hoffman
  3. Keystone
  4. Burns

## 2.3 CONDUIT BODIES

- A. Conduit bodies shall be installed to provide ease of pulling conductors and to provide neat appearance of conduit installation, and as shown on drawings. Conduit bodies constructed of malleable iron or copper free aluminum castings. Bodies shall be finished with standard durable exterior coatings of manufacturer specified. Provide rollers in type "C" and type "LB" bodies, 1-1/4" size and larger. Provide gasketed plated steel or malleable iron covers.
- B. Provide screws-in type blanking caps for all open conduit entrance
- C. Acceptable Conduit Body Manufacturers:
  - 1. Crouse-Hinds
  - 2. Killark
  - 3. Pyle National
  - 4. Appleton

## 2.4 GUTTERS (WIREWAYS)

- A. 8" x 8" and smaller - use standard assembly consisting of code gage galvanized or painted steel and combination hinged/screw covers. Make special and larger gutters of code grade galvanized sheet steel with combination hinged/screw covers and approved fastening device.
- B. Acceptable Wiring Gutter Manufacturers
  - 1. Square D
  - 2. B&C Stamping Co.
  - 3. General Electric
  - 4. Walker Electric

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Where lighting fixtures and appliance outlets are to be mounted on masonry walls or plastered furring or other finishes, the boxes shall be roughed-in to general locations before installation of walls and furring are constructed. All outlet boxes shall be set true to horizontal and vertical lines, parallel to walls, floors and ceilings and true to finish lines. Install electrical boxes and pullboxes in compliance with NEC.
- B. Coordinate electrical box and pullbox installation with other work, equipment suppliers, system
- C. Switch outlets, convenience receptacle outlets and telephone outlets, unless shown otherwise or required otherwise by wainscots, counters, etc., shall be mounted at a height as specified under the device heading in this specification. Each device shall be carefully aligned to center vertically on other devices that are installed in the same vicinity in wall, including room thermostats.
- D. Install electrical boxes and fittings as indicated, in accordance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation", and in accordance with recognized industry practices to fulfill project requirements.
- E. Provide weathertight outlets & covers for interior and exterior locations exposed to weather or moisture.
- F. Provide knockout closures to cap unused knockout holes where blanks have been removed.

- G. Install electrical boxes in those locations which ensure ready accessibility to enclosed electrical wiring.
- H. Position recessed outlet boxes accurately to allow for surface finish thickness. Attachment to suspended ceiling support wires or the like will not be acceptable. Spring type steel supporting (clip on type) fastening devices will not be acceptable on this project.
- I. Location of outlets on drawings is approximate and, except where dimensions are shown, exact location of outlets shall be as taken from plans and details on general drawings or as directed by the Architect. Outlets shall be located generally from column centers and finished wall lines or to center of acoustical and decorative ceiling panels and to centers of joints of wall panels. Outlets shall be installed in accessible locations and no outlets shall be installed above ducts, behind furring or other obstructions. Outlets below ducts shall be connected with extension connections to outlets in ceiling or slab above.
- J. Upon completion of installation work, properly ground electrical boxes and demonstrate compliance with requirements.
- K. Seal boxes during construction to prevent entrance of construction debris.
- L. Stagger back to back boxes 3" minimum.
- M. Support All Boxes:
  - 1. Outlet boxes - with ¼" diameter galvanized rods or bolts anchored to structure.
  - 2. Outlet boxes for surface mounted luminaires on furred ceilings with ¾" channel iron fastened to ceiling channels.
  - 3. Pull, junction and cable boxes with 3/8" diameter galvanized rods or bolts (4 minimum).
  - 4. Support outlet boxes in steel stud partitions with bar hangers or approved equivalent. Hangers must provide substantial support and rigidity before wall finish, i.e.: sheet rock, plaster, etc. is applied.
- N. Install adjacent outlets at different levels in one vertical line where possible.
- O. Provide green covered bonding jumper, screw connected to outlet box in all receptacle boxes.
- P. Mark outlet box covers with markers as specified under Section 260553 Identification for Electrical Systems to indicate circuit number(s) and panel of origination. Use black markers for normal service circuits and orange for emergency service.
- Q. Install conduit bodies where shown or where required for sharp bends and/or aesthetics in raceway system. Do not use in lieu of pullboxes except in limited space or as directed by Consultant.
- R. In "Fire Rated" partitions, boxes shall comply with ASTM Standard No. E119.

### **3.2 INSTALLATION OF GUTTERS**

- A. Mount gutters on 3/4" thick fire retardant plywood backboard, sized for devices to be mounted, 2 coats of Albi No. 107A fire retardant paint or accepted equivalent by Sherwin Williams, or Indurall, (install Class A fire label on board), mount all equipment thereon.
- B. Run conductors in gutter without reduction in size, entire length of gutter. Connect parallel phase conductors to feed together at end of run with tap/splice connector.

**END OF SECTION 26 05 34**

## **SECTION 26 05 53 – IDENTIFICATION FOR ELECTRICAL SYSTEMS**

### **PART 1 - GENERAL**

#### **1.1 WORK INCLUDES**

- A. Extent of electrical identification work is indicated by drawings and schedules.
- B. Types of electrical identification work specified in this section include the following:
  - 1. Electrical power, control and communication conductors
  - 2. Operational instructions and warnings
  - 3. Conduit labeling
  - 4. Cable/conductor identification
  - 5. Operational instructions and warnings
  - 6. Danger signs
  - 7. Equipment/system identification labels and signs
  - 8. Device labeling
  - 9. Junction box labeling

#### **1.2 SUBMITTALS**

- A. General:
  - 1. Submittals shall be made on all items in this section and shall be in accordance with Division 01 Submittal Procedures.
- B. Submit a typewritten list describing the intended method of identifying the electrical equipment, including information on all electrical system components and the intended verbiage to be used. This typewritten list shall be submitted with the equipment shop drawings.

### **PART 2 - EQUIPMENT**

#### **2.1 ELECTRICAL IDENTIFICATION**

- A. Conform to ANSI A13.1, Table 3 for minimum size of legend letters and minimum length of color field for each raceway or cable size. Use colors prescribed by ANSI A13.7, NFPA 70 and these specifications.
- B. Color-Coded Conduit Markers:
  - 1. Manufacturer's standard preprinted flexible or semi-rigid, permanent, plastic-sheet conduit markers, extending 360 degrees around conduits. Attach with adhesive, adhesive lap joint of marker, matching adhesive plastic tape at each end of marker, or pretensioned snap-on. Lettering to indicate voltage, function of conductors in conduit and shall be 8" minimum length (i.e. ac power, dc power, fire alarm).
  - 2. Colors: Orange markers with black letters.
- C. Color-Coded Plastic Tape:
  - 1. Manufacturer's standard self-adhesive vinyl tape; minimum 3 mils thick by 1½" wide
  - 2. Color: Orange

D. Cable/Conductor Identification Bands:

1. Manufacturer's standard vinyl self-adhesive self laminating cable/conductor markers, wrap-around type; pre-numbered plastic coated, or write-on type with clear plastic self-adhesive cover flap, lettered to show circuit identification. Similar to Panduit "Instacode" or accepted equivalent by T&B, or Tyton

E. Self-Adhesive Plastic Signs:

1. Manufacturer's standard, self-adhesive, pre-printed, flexible vinyl signs for operational instructions or warnings. Sizes suitable for application and visibility, with proper wording for application
2. Color: Orange with black lettering

F. Danger Signs:

1. Manufacturer's standard "DANGER" signs, baked enamel finish on 20 gage steel; standard red, black and white graphics; 14" x 10" unless 10" x 7" is largest which can be applied, or where larger size is needed for visibility use recognized explanation wording (as examples: HIGH VOLTAGE, KEEP AWAY, BURIED CABLE, DO NOT TOUCH SWITCH, DANGER-STARTS AUTOMATICALLY).

G. Engraved Signs (Nameplates):

1. Engraved Plastic-Laminate Signs & Nameplates shall be utilized on all pieces of electrical distribution equipment. Provide engraving stock melamine plastic laminate, complying with FS L-P-387, in sizes and thicknesses indicated, engraved with engraver's standard Helvetica style and sizes and wording indicated. Sign or nameplate shall be punched for mechanical fastening except where adhesive mounting is necessary because of substrate. Material thickness shall be 1/16", for units up to 20 sq. in. or 8" length; 1/8" for larger units. Self-tapping stainless steel screws shall be utilized for mounting nameplates, except contact-type permanent adhesive where screws cannot or should not penetrate substrate. Letter Style shall be Helvetica, bold, minimum 1/4" high.
  - a. Coordinate names, abbreviations and other designations used in electrical identification work, with corresponding designations shown, specified or scheduled. Provide numbers, lettering and wording as indicated or, if not otherwise indicated, as recommended by manufacturer or as required for proper identification and operation/maintenance of electrical systems and equipment. Comply with ANSI A13.1 pertaining to minimum sizes for letters and numbers.
2. Color:
  - a. White field with black letters for nonessential service;
  - b. Red field, white letters for essential service;
  - c. Orange field, white letters for UPS service
3. Fasteners: Self-tapping stainless steel screws, except contact epoxy adhesive where screws cannot or should not penetrate substrate.

H. Device Labeling:

1. Tape labels on device plate for switches and receptacles outlets identifying branch circuit and panel designation.

- I. All junction box and device cover plates shall be installed with an adhesive backed identification label installed on both the inside and outside of the coverplate. Label shall indicate both the panelboard designation and the circuit number which the device is connected on.

1. Electrical junction boxes and pull boxes covers serving the different electrical and control systems shall be color coded by painting the face of all Junction boxes as follows:
  - a. Control systems Black
  - b. Door security systems Blue
  - c. Early Warning Fire Detection Red
  - d. UPS Power Wiring/Protected Power Orange
  - e. Emergency Lighting Yellow

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Install electrical identification products as indicated, in accordance with manufacturer's written instructions, and requirements of NEC.
- B. Where identification is to be applied to surfaces which require finish, install identification after completion of painting.
- C. Comply with governing regulations and requests of governing authorities for identification of electrical work.
- D. Apply cable/conductor identification, including voltage, phase and feeder number, on each cable/conductor in each box/enclosure/cabinet. Match identification with marking system used in panelboards, shop drawings, contract documents, and similar previously established identification for project's electrical work. Indicate identification on "As-Built" drawings.
- E. Wherever reasonably required to ensure safe and efficient operation and maintenance of electrical systems, and electrically connected mechanical systems and general systems and equipment, including prevention of misuse of electrical facilities by unauthorized personnel, install self-adhesive plastic signs or similar equivalent identification, instruction or warnings on switches, outlets and other controls, devices, equipment and covers of electrical enclosures. Where detailed instructions or explanations are needed, provide plasticized tags with clearly written messages adequate for intended purposes.
- F. In addition to installation of danger signs required by governing regulations and authorities, install appropriate danger signs at locations indicated and at locations subsequently identified by Installer of electrical work as constituting similar dangers for persons in or about project.
- G. Install danger signs on switches and similar controls, regardless of whether concealed or locked up, where untimely or inadvertent operation (by anyone) could result in significant danger to persons, or damage to or loss of property. At a minimum provide danger signs for the following:
  1. Provide as required by codes.
- H. Install signs at locations indicated or, where not otherwise indicated, at location for best convenience of viewing without interference with operation and maintenance of equipment. Secure to substrate with fasteners, except use adhesive where fasteners should not or cannot penetrate substrate.
- I. Conduit Identification:
  1. Use adhesive marking tape labels, 1" high x 12" long (min.), at 10 foot intervals to identify all conduits run exposed or located above accessible ceilings. Conduits located above non-accessible ceiling or in floors and walls shall be labeled within 3 feet of

becoming accessible. Labels for multiple conduits shall be aligned. Use the following colors:

- a. Above 600 Volts: Black letters on orange background indicating feeder identification and voltage. Feeders within walls provide identification on wall surfaces directly external to the conduits. Alternate identification labels with "DANGER - HIGH VOLTAGE" warning signs of the same color.
  - b. 600 Volt and Below Normal: White letters on black background indicating feeder identification and voltage
  - c. 600 Volt and Below Emergency: White or black letters on red background indicating feeder identification and voltage
  - d. 600 Volt and Below UPS: Black letters on yellow background indicating feeder identifications, circuit number and voltage
  - e. Fire Alarm: Red letters on white background indicating "FIRE ALARM"
  - f. Temperature Control: Reference division 17 for controls color scheme
  - g. Ground: White or black letters on green background indicating "GROUND" and equipment and designation
2. Where conduits enter or exit a panelboard, pull or junction box, switchboard, or other distribution equipment, conduit labels shall include circuit number in addition to feeder identification and voltage.
  3. For overhead conduits, place identification such that it can be read standing on the floor below.

J. Engraved Plastic Laminated Signs:

1. Provide signs for each unit of the following categories:
  - a. Electrical cabinets and enclosures; indicate cabinet designation, voltage, phase and feeder origin.
  - b. Access panel/doors to electrical facilities; indicate room name and use.
  - c. Major electrical switchgear; indicate equipment designation, voltage, phase and feeder origin.
  - d. Electrical substations; indicate equipment designation, voltage, phase and feeder origin.
  - e. Safety switches, circuit breakers and portable engine disconnects: Indicate equipment designation, voltage, phase, and feeder origin.
  - f. Transformers: Indicate transformer designation, voltages, phases and feeder origin and equipment served.
  - g. Feeder cables inside pull and junction boxes and inside all switchgear at terminals indicating source and destination: Fasten with nylon ties.
  - h. Junction, Pull and Connection Boxes: Identification of systems and circuits shall indicate system voltage and identity of contained circuits on outside of box cover. Color code shall be same as conduits for pressure sensitive labels. Use self adhesive marking tape labels at exposed locations and indelible black marker at concealed boxes. All fire alarm boxes shall have covers painted red. All temperature control boxes shall have covers painted blue.
  - i. All equipment furnished in this Division of the specifications: Indicate equipment designation, voltage, phase, and feeder origin.
  - j. DC Egress lighting

- K. Install signs where indicated or most visible. Secure with at least two cadmium-plated screws. Where substrate cannot receive screws, use industrial epoxy cement to secure signs.
- L. Identify all conduits installed for future use.

**END OF SECTION 26 05 53**

## SECTION 26 29 23 – VARIABLE FREQUENCY DRIVES

### PART 1 - GENERAL

#### 1.1 WORK INCLUDES

- A. Variable Frequency Drives
  - 1. 0 HP. thru 75 HP

#### 1.2 SUBMITTALS

- A. General:
  - 1. Submittals shall be made on all items in this section and shall be in accordance with Division 01 Submittal Procedures.
- B. Product Data:
  - 1. Submit manufacturer's data on variable frequency drive (VFD) systems, including descriptive literature, operating instructions, and maintenance and repair data, full size black line (24 X 36) indicating all power and control connections to the VFD Unit.
- C. Shop Drawings:
  - 1. Submit detailed shop drawings indicating information on load side filtering for line noise control, schematic and power and control connections for a complete system. Include all unit and enclosure dimensional data with shop drawings.
  - 2. Submit manufacturer's data on variable Frequency drive systems, including descriptive literature, operating instructions, wiring diagrams and maintenance and repair data.

#### 1.3 SUMMARY

- A. Provide adjustable frequency drive system designed for continuous variable-torque (torque proportional to square speed).pump and fan duty as indicated on drawings; suitable for use on direct connected motors or motors connected by power transmission components, to pump or fan load.
- B. Coordination with the respective equipment suppliers regarding exact horsepower and control arrangements and shall furnish and install variable Frequency drives as required for a complete and properly operating system. Coordinate with the Division 26 HVAC Contractor for control requirements.

#### 1.4 QUALITY ASSURANCE

- 1. Manufacturer's Qualifications: Firms regularly engaged in manufacturer of voltage source variable Frequency drives of sizes, types and ratings required, whose products have been in satisfactory use in similar service for not less than ten (10) years.
- 2. Codes and Standards:
  - a. Electrical Code Compliance: Comply with applicable local code requirements of the authority having jurisdiction and NEC.
  - b. NEMA Compliance: Comply with applicable requirements of NEMA standards.
  - c. Variable Frequency drives shall be UL labeled or E.T.L. labeled. Variable Frequency drives shall meet I.E.E.E. 519 requirements. Variable Frequency drives shall meet National Electrical Code requirements for capacitor discharge.

## **1.5 PRODUCTS**

### **A. ACCEPTABLE MANUFACTURERS**

1. Manufacturers: Subject to compliance with the Requirements, provide new Variable Frequency Drive Units (VFD) as manufactured by one of the following:
  - a. Square D Electric Company
  - b. General Electric Company
  - c. Allen Bradley Company
  - d. ABB

## **PART 2 - EQUIPMENT**

### **2.1 GENERAL**

- A. Adjustable Frequency drive system shall be designed for continuous variable-torque (torque proportional to square speed). fan duty; suitable for use on direct connected motors or motors connected by power transmission components, to fan loads.
- B. Coordination with the respective equipment suppliers regarding exact fan horsepower and control arrangements and shall furnish and install VSDs as required for a complete and properly operating system.
- C. Adjustable Frequency drive system shall be designed for continuous operation at 480 Volts, three phase and the feeder ampacity requirements shall not exceed that as indicated on the drawings.

### **2.2 VARIABLE FREQUENCY DRIVES 0 HP. THRU 75 HP**

#### **A. General:**

1. Variable Frequency Drives (VFD) shall provide variable speed operation through the use of an adjustable frequency inverter system. The units shall be factory furnished and assembled, complete with all necessary controls, circuitry, and hardware as required to provide the functions herein specified, and shall only require field connections; from the 480 volt (nominal), 3-phase, 3-wire power source; from the control circuitry; from motor leads to load side of the variable frequency controller.
2. The VFDs shall be manufactured by reputable companies having no less than seven (7) years experience in VFD technology.

#### **B. Basic Design:**

1. Variable Frequency Power and Logic Unit shall be constructed using completely solid state components.
2. Unit shall transform 480 volts, 3 phase, 60 Hertz input power into frequency and voltage controlled 3 phase output power; suitable to provide positive speed and torque control to standard induction motors.
3. Output through a multistage process; the first stage shall convert the AC utility 480 volts, 3 phase, 60 Hertz input power to a filtered, fixed DC voltage through the use of a full wave diode bridge. This shall be done to provide a minimum input power factor of .95 throughout the speed range. Drives employing a phase controlled Silicon Controlled Rectifier (SCR) front end will not be acceptable.
4. The second stage shall convert the fixed voltage DC to an adjustable level of DC through the use of a transistorized chopper or Silicone-Controlled Rectifier. This stage may be eliminated by use of equipment using a sine-coded pulse width modulated inverter.

5. The third stage shall invert the adjustable level of filtered DC into a frequency and voltage controlled 3 phase adjustable AC output for speed control, through the use of transistorized inverters, or gate-turn-off (GTO) devices. The variable frequency output of the inverters shall be accomplished by voltage source, current source, or sine-coded pulse width modulation schemes.
  6. All stages of the VFD will not produce any electrical noise or harmonic distortion back onto the incoming AC power line that will cause any adverse affects to any electrical, electronic, digital, and electromechanical devices on the premises. Line filters or reactors shall be included and installed on each drive to eliminate any feed back onto the buildings AC electrical system.
  7. Each unit shall include an internal contactor for across the line operation and transfer control circuitry for transferring operation from the inverter to the across the line operation at a constant speed. The contactor shall be located inside the variable speed controller cabinet and manual switch control shall be capable of transferring the motor power source from the variable speed controller to a bypass contactor located within the variable speed controller. The bypass system shall include safety circuitry to insure that no damage to the variable speed control device or the driven equipment will occur due to a change of operation. All normal control functions shall occur during both variable speed and bypass mode of operation.
- C. Speed Control: Stepless throughout speed range under variable torque load on continuous basis.
- D. Adjustable Frequency Control:
1. Control shall be accomplished using a full wave diode bridge rectifier, fixed DC section, and with minimum .95 power factor.
  2. The VFD shall operate from 480V, 3-phase, 60Hz input power. Normal operation shall not be affected by variation in input voltage between 437V and 506V.
  3. The VFD shall be provided with Gate Turn Off (GTO) devices or transistors for high reliability in output power switching circuit.
- E. Control Operating Ambient Temperature Range: 32° F. to 104° F.
- F. Output Power:
1. Output frequency does not vary with load; with any input frequency variations; with plus-or-minus 10% input voltage changes; or with temperature changes within ambient specification.
  2. Output frequency adjustable in proportion to any of following:
    - a. 4-20 mA DC analog signal
    - b. 0-5 VDC analog signal
    - c. 0-10 VDC analog signal
  3. The VFD shall be inherently "soft starting" such that the motor will start at zero frequency and shall linearly ramp up to the setpoint frequency. Inrush current to the motor during starting, shall not exceed 115% of motor rated current. The VFD shall have built-in overload protection on each phase to the motor.
  4. The output shall maintain constant RMS volts per cycle within 3% of an output frequency covering a range of 3 to 60 Hz. Voltage in the three phases of the output shall be balanced within 1%. Equipment size and power output shall be sufficient for the motor to which it is connected.

5. Variable Frequency Drive unit shall be furnished with rating not less than the motor nameplate rated full load running current.
  6. Exact horsepower of the VFD shall be determined by the supplier of the VFD driven equipment.
- G. Enclosure:
1. Provide Variable Frequency Drive unit in a free-standing, NEMA-1 panel enclosure fabricated of code gauge cold-rolled steel. The door shall be flanged, gasketed and mounted on semi-concealed pinion type hinges. The entire enclosure shall be primed and finished with industrial texture paint. The electrical bus shall be copper at all connection points. The enclosure will contain all the air circulating fans and air filters that are required for ventilation and to prevent enclosure over-temperature cutouts. No external fans, condensers or heat exchangers shall be required for cooling of the unit due to cabinet heat buildup. All components and controls that are integral to the VFD enclosure shall be completely factory installed and prewired with labeled cable terminals for field connections.
- H. Provide controller with over-voltage clamp preventing damage by regenerated energy from high inertia loads or unstable motors.
- I. Control includes following:
1. Input reference clamp which prevents excessive reference signal from affecting control response.
  2. Automatic Control:
    - a. The VFD shall accept a 4 - 20 mA signal supplied from a process variable transducer, a PLC Controller, or a local Direct Digital Control (DDC) panel. The VFD control system, when in the "AUTOMATIC" mode, shall energize the motor when the Building Control System closes the enable contacts on the VFD. The motor shall be started in a controlled mode and ramped up to the speed called for by the process variable.
    - b. On a "STOP" command, the VFD will ramp the motor speed down under a controlled mode. The speed shall be infinitely varied between minimum speed and full rated speed either in direct proportion or inverse proportion to the signal from the process variable transducer, PLC Controller, or DDC panel in order to precisely match the application to the load. With nominal input power voltage and constant load, linearity and repeatability accuracy of the 3-phase outputs shall be within 1% of the process variable transducer's, PLC Controllers or DDC panel's control signal.
  3. Manual Control:
    - a. The VFD shall be able to be operated in a manual mode that is independent of any process variable transducer, PLC Controller, or DDC control signal. In manual mode, the speed will be capable of being varied from 0 to 100% speed. This will be done from a control setting on the front panel as specified hereinafter. Manual control override shall not require any programming or interior modifications to VFD. Manual control shall be possible without stopping the drive, shutting down the system or modifying the unit operating parameters or reconfiguring system hardware.
  4. The VFD shall include the following adjustable control functions:
    - a. Acceleration time adjustable from 1 to 60 sec
    - b. Deceleration time adjustable from 1 to 60 sec (separate control from the acceleration time adjustment)
    - c. Minimum motor speed adjustable from 0% to 100% of maximum motor RPM

- d. Maximum motor speed adjustable from 80% to 100% of maximum motor RPM
  - e. Output frequency range adjustable from 3 to 60 Hz
  - f. Motor current limit adjustable from 30% to full rated motor current
5. Operator's Control Panel:
- a. An operator's control panel shall be mounted on each VFD compartment door and shall include the following devices in addition to any previously specified devices:
  - b. POWER ON indicating light
  - c. VFD RUNNING indicating light
  - d. VFD SHUTDOWN ALARM indicating light
  - e. Audible alarm that will sound anytime the VFD is locked out of operation. This shall also include a set of dry isolated form C contacts for remote alarming by the owner.
  - f. ALARM SILENCER push-button switch
  - g. VFD POWER DISCONNECT switch with external interlock operating handle
  - h. EXTERNAL FUSIBLE DISCONNECT switch that will drop all incoming power to the VFD without interrupting any other piece of equipment that might be tied to the same power supply; each unit shall include one 3 pole, 600 volt, quick-make, quick-break, manually operated switch connected in series with one replaceable dual element rejection type fuse per switch pole.
  - i. START/STOP push-button mounted in unit enclosure door and with unit start/stop control circuitry factory arranged and wired for local start/stop. Labeled terminals shall be factory furnished and wired for remote control circuitry wiring connections as indicated in wiring diagrams on drawings.
  - j. MANUAL/AUTO SELECTOR switch
  - k. Manual speed control potentiometer with linear calibration. This is used when the MANUAL/AUTO mode selector switch is in the "Manual" mode.
  - l. Digital indicator with linear calibration in percent of motor rated RPM. The digital speed display shall not require the use of a tachometer generator.
  - m. Digital indicator calibrated for percent of motor rated load current in amps. The digital indicator may be same as used for the percent speed indicator, but a SELECTOR switch must then be provided.
  - n. Control cabinet locking handle.
  - o. Bypass selector switch for selection of the VFD operation of the operation of across the line starter.
- J. Provide following self-protection equipment and reliability features in all controls:
- 1. Limit-to-limit output current to 150% or inverter rating.
    - a. Current limit functions automatically preventing over-current trip due to momentary overload conditions; allowing inverter to continue operation.
  - 2. Instantaneous over-current trip safely limits output current under 50 microseconds due to phase-to-phase short circuits or severe overload conditions, with shutdown as recommended by the equipment manufacturer.
  - 3. Under-voltage trip protects inverter due to non-momentary power or phase loss, with shutdown as recommended by the equipment manufacturer.
    - a. Under-voltage trip activates automatically when line voltage drops 15% below rated input voltage.

4. Over-voltage trip protects inverter due to voltage levels in excess of its rating, with shutdown as recommended by the equipment manufacturer.
  - a. Over-voltage trip activates automatically when DC bus in controller exceeds 750 VDC.
5. Over-temperature trip protects inverter from elevated temperatures in excess of its rating.
  - a. When over-temperature trip point is reached in any section of the enclosure or in any section of the electronics in the VFD unit, a cabinet over-temperature light shall be continuously illuminated.
  - b. When over-temperature trip point is reached in the motor, a motor over-temperature light shall be continuously illuminated.
6. Automatic Reset/Restart:
  - a. When trip condition results from under-voltage, over-voltage or over-temperature, it automatically resets and inverter automatically restarts upon removal or correction of causative condition.
  - b. For safety and equipment protection, limit number of reset/restart attempts for to 3.
  - c. When in 3 attempts reset/restart is not successful, inverter shuts down safely, requiring manual restart.
  - d. When within 6 attempts successful reset/restart occurs, Auto Reset/Restart circuit reset attempts counted to 0 after approximately 2 minutes of continuous operation.
7. Short-Circuit Protection: In event of a phase-to-phase or phase-to-ground short circuit, control shuts down safely without component failure.
8. Power Interruption: When input or output power contactor is opened while control is activated, unit is not damaged.
9. Stand-Alone Operation: Provides for start-up, trouble-shooting, and operation of control without motor or any other equipment connected to inverter output.
10. START/STOP Control: Enables controller to be started or stopped by any of the following:
  - a. Contact closure
  - b. Use of motor starter or contactor in input power line
  - c. Speed control signal dropping below or rising above minimum
11. Minimum and Maximum Speed Adjustment Potentiometers:
  - a. Minimum speed adjustment potentiometer allows operating user to adjust minimum speed at which control will run motor from 0 to 25% when following 5000 ohm potentiometer.
  - b. Maximum speed adjustment potentiometer allows adjustment of maximum speed, at which control will run motor from 80 to 100% when following 5000 ohm potentiometer
12. Isolation of current and voltage signals from logic circuitry.
13. Drive Logic: Microprocessor based.
14. Dual-Safety Shut-Downs:
  - a. In event of sustained power loss, control shut down safely without component failure; on return of power system automatically returns to normal operation, when start is ON without forced deceleration and or drive fault.

- b. In event of momentary power loss; control shuts down safely without component failure; on return of power system automatically returns to normal operation, when start is ON.
  - c. An adjustable time delay relay shall be used for restart after power failure and to provide time delay on "start" after "stop" control circuitry has been activated to prevent damage to the fan, motor or variable frequency drive unit. Time delay relay shall be solid-state type with a minimum range adjustment to 2 minutes delay after energization. Set delay time as recommended by the variable frequency drive unit manufacturer.
15. The variable frequency drive shall be protected from being restarted into a motor coasting in either the forward or reverse direction to protect the components of the VFD.
  16. The VFD shall be protected from power line voltage transients resulting from the following:
    - a. Switching the primary of a line transformer
    - b. Energization or de-energization of contactors, relays, and other power equipment from the power line
    - c. Line-to-line or line-to-ground fault
    - d. Lightning
    - e. Notching from other VFDs or electronic switching power supply equipment
  17. Solid state transient protection integral to the VFD shall be provided to a minimum of 10,000 volts and 50 joules without failure. The SCR's transistors and diodes located in the converter and inverter sections of the VFD shall have a minimum peak inverse voltage rating of 1,500 volts. Surge withstand capability of power input, power output and control signal inputs and outputs shall meet or exceed American National Standards Institutes (ANSI) standard C37.90-19-8 and Institute of Electrical and Electronic Engineers (IEEE) standard 472-1974 without failure. Failure is to be defined as loss of components in the VFD including power semi-conductors, logic components and/or fuses.

### **2.3 ACCESSORIES**

- A. Door mounted interlocked disconnect switch
- B. Motor thermal overload protection with reset
- C. HAND/OFF/AUTO switch; door mounted, with manual speed control potentiometer
  1. Provide contacts for Building Control System can monitor position of HOA switch. (Reference drawings)
- D. VFD/BYPASS switch; door mounted to allow operator to bypass controller and activate motor using bypass contacts.
  1. Provide contacts for Building Control System can monitor position of switch. (Reference drawings)
- E. Smoke mode interface with terminal strips and manual speed potentiometers.

## **PART 3 - EXECUTION**

### **3.1 COORDINATION**

- A. Coordinate with Division 25 HVAC Contractor to ensure all power and control interlocks are provided and operational for complete operating system.

- B. Provide electrical and control diagrams to affected contractors showing all interlocking wiring and control input locations.

### **3.2 INSTALLATION**

- A. The Contractor shall make installation as indicated on drawings and shall install wiring and make connections as indicated in wiring diagrams on contract drawings and in accordance with the manufacturer's approved shop drawings.
- B. After installations are completed, the Contractor shall provide the services of the variable frequency drive unit manufacturer's service engineer for complete checkout, start-up, and adjustments for unit and to put unit into complete and proper operation Units shall not be energized or operated until checkout and put into operation by the service engineer. The motor shall be energized and operated through the variable frequency drive.
- C. CAUTION: DO NOT ENERGIZE THE VARIABLE FREQUENCY DRIVE UNITS WITHOUT LOAD CONNECTIONS TO MOTORS BECAUSE IT COULD CAUSE MAJOR DAMAGE TO THE VARIABLE FREQUENCY UNIT.
- D. Electrical Connections:
  - 1. Ensure drive units are wired properly, with rotation in direction indicated, designed for proper fan performance.
  - 2. Provide positive electrical equipment and motor grounding as per the latest NEC and as recommended by the VFD manufacturer.
- E. As-Built Drawings:
  - 1. The VFD unit manufacturer shall provide shop drawings for approval, which shall include complete description and specification data; complete wiring and connection diagrams for the units as furnished and as to be installed for this project, including control and power wiring as indicated in the wiring diagrams on the contract drawings; installation instruction; and instructions for operation, maintenance, servicing, and adjustments.

### **3.3 FIELD QUALITY CONTROL**

- A. After drive installation is complete, and after motor has been energized by factory trained technician, test each drive to demonstrate proper operation of unit at performance specifications.
- B. When possible, field-correct malfunctioning units; then retest to demonstrate compliance.

### **3.4 START UP & SERVICE**

- A. Manufacturer shall provide factory-supervised start-up service for each drive specified.
- B. Training:
  - 1. The VFD manufacturer shall provide complete on-site training for the Owners Operating, Maintenance, and Engineering personnel. This training shall be a minimum of 2 days and shall include a complete description on the Theory of Operation, Operation Procedures, Functional and Operating Characteristics of Specific Logic Boards, Troubleshooting, Repair and Preventative Maintenance. A simulated failure is required to be diagnosed and repaired as part of this training.
- C. Operations and Maintenance Manuals shall be provided and referenced during the instruction and training of the Owner's personnel.
- D. Guarantee:

1. Each VFD unit shall be operated for a burn-in period of 100 hours minimum at the rated load and at the maximum ambient temperature in the unit manufacturer's plant prior to shipment.
2. The equipment shall be guaranteed free of defects and completely operational for a period of three (3) years from date of acceptance of equipment by the Owner. The guarantee shall be provided with two (2) years complete parts and labor coverage and one (1) year at 50% parts and labor coverage. The guarantee shall include all required labor including shipping and travel time.

**END OF SECTION 26 29 23**