

# **CONTRACT DOCUMENTS and SPECIFICATIONS**

## **PHASE 11 WATER SYSTEM IMPROVEMENTS**

### **CONTRACT 4 BOOSTER STATION IMPROVEMENTS**

## **Rattlesnake Ridge Water District**

**Carter County, Kentucky**



**Kentucky Engineering Group, PLLC**

**P.O. Box 1034**

**Versailles, Kentucky 40383**

**November, 2017**

**KEG Project No. 15036**

**BID DOCUMENTS**

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**RATTLESNAKE RIDGE WATER DISTRICT  
GRAYSON, KENTUCKY  
PHASE 11 WATER SYSTEM IMPROVEMENTS**

ADVERTISEMENT FOR BIDS

Sealed Bids for the construction of the Phase 11 Water System Improvements Project will be received by the Rattlesnake Ridge Water District, at the office of Rattlesnake Ridge Water District, located at 3563 State Hwy. 1661, Grayson, Kentucky 41143 until **2:00 pm** local time on **Monday September 10, 2018**, at which time the Bids received will be publicly opened and read. The Project consists of constructing the following: Contract 1 – Water Main Extensions; Contract 2 – 100,000 Gallon and 75,000 Gallon Elevated Water Storage Tanks; Contract 3 – Rehabilitation of Three Water Storage Tanks; Contract 4 – Booster Station Improvements; Contract 5 – New Office Building.

Bids will be received for Contracts 1,2,3,4 and 5. Bids shall be on a unit price basis.

The Issuing Office for the Bidding Documents is: Lynn Imaging, 328 Old Vine Street, Lexington, Kentucky, 40507. The email address is info@lynnimaging.com. Prospective Bidders may examine the Bidding Documents at the Issuing Office on Mondays through Fridays between the hours of 8 am to 4 pm.

Bidding Documents also may be examined at Rattlesnake Ridge Water District, 3563 State Hwy. 1661, Grayson, Kentucky 41143 on Mondays through Fridays between the office hours of 9 am to 4 pm;

Printed copies of the Bidding Documents may be obtained from the Issuing Office, during the hours indicated above, upon a non-refundable payment of \$500 for Contract 1 and Contract 5, and \$350 for Contracts 2 thru 4 for each set. Checks for Bidding Documents shall be payable to "Lynn Imaging". Upon request and receipt of the document amount indicated above plus a non-refundable shipping charge, the Issuing Office will transmit the Bidding Documents via delivery service. The shipping charge amount will depend on the shipping method selected by the prospective Bidder. The date that the Bidding Documents are transmitted by the Issuing Office will be considered the Bidder's date of receipt of the Bidding Documents. Partial sets of Bidding Documents will not be available from the Issuing Office. Neither Owner nor Engineer will be responsible for full or partial sets of Bidding Documents, including Addenda if any, obtained from sources other than the Issuing Office.

A pre-bid conference shall be held on Thursday August 30, 2018 at 11:00 am local time at the Rattlesnake Ridge Water District Office, located at 3563 State Hwy 1661, Grayson, Kentucky 41143.

All bidders must be listed as a plan holder by the plan distributor, Lynn Imaging.

Bid security shall be furnished in accordance with the Instructions to Bidders.

Section 746 of Title VII of the Consolidated Appropriations Act of 2017 (Division A-Agriculture, Rural Development, Food and Drug Administration, and Related Agencies, Appropriations Act, 2017) and subsequent statutes mandating domestic preference applies to American Iron and Steel requirement to this project. All listed iron and steel products used in this project must be produced in the United States. The term "iron and steel products" means the following products made primarily of iron and steel: lines or unlined pipes and fittings, manhole covers and other municipal castings, hydrants, tanks, flanges, pipe clamps and restraints, valves, structural steel, reinforced precast concrete, and construction materials. The de minimis and minor components waiver {all project specific waivers as applicable} apply to this contract.

Owner: Rattlesnake Ridge Water District

By: Bill Gilbert

Title: Chairman

Date: **August 22, 2018**

+ + END OF ADVERTISEMENT FOR BIDS + +

## INSTRUCTIONS TO BIDDERS

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## ARTICLE 1 – DEFINED TERMS

- 1.01 Terms used in these Instructions to Bidders have the meanings indicated in the General Conditions and Supplementary Conditions. The term "Bidder" means one who submits a Bid directly to Owner, as distinct from a subbidder, who submits a bid to a Bidder. The term "Successful Bidder" means the lowest, qualified, responsible, and responsive Bidder to whom Owner (on the basis of Owner's evaluation as hereinafter provided) makes an award. The term "Bidding Documents" includes the Advertisement or Invitation to Bid, Instructions to Bidders, the Bid Form, and the proposed Contract Documents (including all Addenda issued prior to receipt of Bids).

## ARTICLE 2 – COPIES OF BIDDING DOCUMENTS

- 2.01 Complete sets of the Bidding Documents must be obtained from the Issuing Office in the number and format stated in the advertisement or invitation to bid. Bids from anyone not on the Engineer's Plan Holders List will not be opened.
- 2.02 Complete sets of Bidding Documents shall be used in preparing Bids; neither Owner nor Engineer assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.
- 2.03 Owner and Engineer, in making copies of Bidding Documents available on the above terms, do so only for the purpose of obtaining Bids for the Work and do not authorize or confer a license for any other use.

## ARTICLE 3 – QUALIFICATIONS OF BIDDERS

- 3.01 To demonstrate Bidder's qualifications to perform the Work, Bidder shall submit with its Bid written evidence establishing its qualifications such as financial data, previous experience, and present commitments, and the additional information listed in the Bid Form.
- 3.02 A Bidder's failure to submit required qualification information within the times indicated may disqualify Bidder from receiving an award of the Contract.
- 3.03 No requirement in this Article 3 to submit information will prejudice the right of Owner to seek additional pertinent information regarding Bidder's qualifications.
- 3.04 Bidder is advised to carefully review those portions of the Bid Form requiring Bidder's representations and certifications.

## ARTICLE 4 – SITE AND OTHER AREAS; EXISTING SITE CONDITIONS; EXAMINATION OF SITE; OWNER'S SAFETY PROGRAM; OTHER WORK AT THE SITE

- 4.01 *Site and Other Areas*
- A. The Site is identified in the Bidding Documents. By definition, the Site includes rights-of-way, easements, and other lands furnished by Owner for the use of the Contractor. Any additional lands required for temporary construction facilities, construction equipment, or storage of materials and equipment, and any access needed for such additional lands, are to be obtained and paid for by Contractor.

#### 4.02 *Existing Site Conditions*

##### A. Subsurface and Physical Conditions; Hazardous Environmental Conditions

1. If there are reports and/or additional information concerning site conditions available, they will be included as Appendices to the Bidding Documents.
2. Geotechnical Report: If a Geotechnical Report is available, it will be included as an appendix to the Bidding Documents. The Geotechnical Report describes certain select subsurface conditions that are anticipated to be encountered by Contractor during construction in specified locations.

The Conditions in the Geotechnical Report are intended to reduce uncertainty and the degree of contingency in submitted Bids. However, Bidders cannot rely solely on the said Conditions. Bids should be based on a comprehensive approach that includes an independent review and analysis of the Report, all other Contract Documents, Technical Data, other available information, and observable surface conditions. Not all potential subsurface conditions are reported.

Nothing in the report is intended to relieve Bidders of the responsibility to make their own determinations regarding construction costs, bidding strategies, and Bid prices, nor of the responsibility to select and be responsible for the means, methods, techniques, sequences, and procedures of construction, and for safety precautions and programs incident thereto.

- B. Underground Facilities: Information and data shown or indicated in the Bidding Documents with respect to existing Underground Facilities at or contiguous to the Site are set forth in the Contract Documents and are based upon information and data furnished to Owner and Engineer by owners of such Underground Facilities, including Owner, or others.
- C. Adequacy of Data: Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to subsurface conditions, other physical conditions, and Underground Facilities, and possible changes in the Bidding Documents due to differing or unanticipated subsurface or physical conditions appear in Paragraphs 5.03, 5.04, and 5.05 of the General Conditions. Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to a Hazardous Environmental Condition at the Site, if any, and possible changes in the Contract Documents due to any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work, appear in Paragraph 5.06 of the General Conditions.

#### 4.03 *Site Visit and Testing by Bidders*

- A. Bidder shall conduct the required Site visit during normal working hours, and shall not disturb any ongoing operations at the Site.
- B. Bidder is not required to conduct any subsurface testing, or exhaustive investigations of Site conditions.
- C. On request, and to the extent Owner has control over the Site, and schedule permitting, the Owner will provide Bidder access to the Site to conduct such additional examinations, investigations, explorations, tests, and studies as Bidder deems necessary for preparing and submitting a successful Bid. Owner will not have any obligation to grant such access if doing



so is not practical because of existing operations, security or safety concerns, or restraints on Owner's authority regarding the Site.

- D. Bidder shall comply with all applicable Laws and Regulations regarding excavation and location of utilities, obtain all permits, and comply with all terms and conditions established by Owner or by property owners or other entities controlling the Site with respect to schedule, access, existing operations, security, liability insurance, and applicable safety programs.
- E. Bidder shall fill all holes and clean up and restore the Site to its former condition upon completion of such explorations, investigations, tests, and studies.

#### 4.04 *Owner's Safety Program*

- A. Site visits and work at the Site may be governed by an Owner safety program. As the General Conditions indicate, if an Owner safety program exists, it will be noted in the Supplementary Conditions.

#### 4.05 *Other Work at the Site*

- A. Reference is made to Article 8 of the Supplementary Conditions for the identification of the general nature of other work of which Owner is aware (if any) that is to be performed at the Site by Owner or others (such as utilities and other prime contractors) and relates to the Work contemplated by these Bidding Documents. If Owner is party to a written contract for such other work, then on request, Owner will provide to each Bidder access to examine such contracts (other than portions thereof related to price and other confidential matters), if any.

### **ARTICLE 5 – BIDDER'S REPRESENTATIONS**

#### 5.01 It is the responsibility of each Bidder before submitting a Bid to:

- A. examine and carefully study the Bidding Documents, and any data and reference items identified in the Bidding Documents;
- B. visit the Site, conduct a thorough, alert visual examination of the Site and adjacent areas, and become familiar with and satisfy itself as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work;
- C. become familiar with and satisfy itself as to all Laws and Regulations that may affect cost, progress, and performance of the Work included but not limited to the AIS requirements as mandated and any subsequent statutes mandating domestic preference which apply to the following products made primarily of iron or steel: lined or unlined pipes and fittings, manhole covers and other municipal castings, hydrants, tanks, flanges, pipe clamps and restraints, valves, structural steel, reinforced precast concrete, and construction materials.
- D. carefully study all: (1) reports of explorations and tests of subsurface conditions at or adjacent to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Bidding Documents, especially with respect to Technical Data in such reports and drawings, and (2) reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Bidding Documents, especially with respect to Technical Data in such reports and drawings;

- E. consider the information known to Bidder itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder; and (3) Bidder's safety precautions and programs;
- F. agree, based on the information and observations referred to in the preceding paragraph, that at the time of submitting its Bid no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of its Bid for performance of the Work at the price bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents;
- G. become aware of the general nature of the work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents;
- H. promptly give Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder discovers in the Bidding Documents and confirm that the written resolution thereof by Engineer is acceptable to Bidder;
- I. determine that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance and furnishing of the Work; and
- J. agree that the submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article, that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

#### **ARTICLE 6 – PRE-BID CONFERENCE**

- 6.01 A pre-bid conference is scheduled for this project.

#### **ARTICLE 7 – INTERPRETATIONS AND ADDENDA**

- 7.01 All questions about the meaning or intent of the Bidding Documents are to be submitted to Engineer in writing via email to **jthompson@kyengr.com**. Interpretations or clarifications considered necessary by Engineer in response to such questions will be issued by Addenda delivered to all parties recorded as having received the Bidding Documents. Questions received less than seven days prior to the date for opening of Bids may not be answered. Only questions answered by Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.
- 7.02 Addenda may be issued to clarify, correct, supplement, or change the Bidding Documents.

#### **ARTICLE 8 – BID SECURITY**

- 8.01 A Bid must be accompanied by Bid security made payable to Owner in an amount of five (5) percent of Bidder's maximum Bid price (determined by adding the base bid and all alternates) and in the form of a certified check, bank money order, or a Bid bond (on the form included in

the Bidding Documents) issued by a surety meeting the requirements of Paragraphs 6.01 and 6.02 of the General Conditions.

- 8.02 The Bid security of the apparent Successful Bidder will be retained until Owner awards the contract to such Bidder, and such Bidder has executed the Contract Documents, furnished the required contract security, and met the other conditions of the Notice of Award, whereupon the Bid security will be released. If the Successful Bidder fails to execute and deliver the Contract Documents and furnish the required contract security within 15 days after the Notice of Award, Owner may consider Bidder to be in default, annul the Notice of Award, and the Bid security of that Bidder will be forfeited. Such forfeiture shall be Owner's exclusive remedy if Bidder defaults.
- 8.03 The Bid security of other Bidders that Owner believes to have a reasonable chance of receiving the award may be retained by Owner until the earlier of seven days after the Effective Date of the Contract or 91 days after the Bid opening, whereupon Bid security furnished by such Bidders will be released.
- 8.04 Bid security of other Bidders that Owner believes do not have a reasonable chance of receiving the award will be released within seven days after the Bid opening.

#### **ARTICLE 9 – CONTRACT TIMES**

- 9.01 The number of days within which, or the dates by which, the Work is to be substantially completed and ready for final payment are set forth in the Agreement.

#### **ARTICLE 10 – LIQUIDATED DAMAGES**

- 10.01 Provisions for liquidated damages, if any, for failure to timely attain Substantial Completion, or completion of the Work in readiness for final payment, are set forth in the Supplemental General Conditions and referred to in the Agreement.

#### **ARTICLE 11 – SUBSTITUTE AND "OR-EQUAL" ITEMS**

- 11.01 The Contract for the Work, if awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents, and those "or-equal" or substitute or materials and equipment subsequently approved by Engineer prior to the submittal of Bids and identified by Addendum. No item of material or equipment will be considered by Engineer as an "or-equal" or substitute unless written request for approval has been submitted by Bidder and has been received by Engineer at least 15 days prior to the date for receipt of Bids in the case of a proposed substitute and 5 days prior in the case of a proposed "or-equal". Each such request shall comply with the requirements of Paragraphs 7.04 and 7.05 of the General Conditions. Each such request shall include the Manufacturer's Certification Letter (Exhibit D) for compliance with AIS requirements and any subsequent statutes mandating domestic preference, if applicable. The burden of proof of the merit of the proposed item is upon Bidder. Engineer's decision of approval or disapproval of a proposed item will be final. If Engineer approves any such proposed item, such approval will be set forth in an Addendum issued to all prospective Bidders. Bidders shall not rely upon approvals made in any other manner. Substitutes and "or-equal" materials and equipment may be proposed by Contractor in accordance with Paragraphs 7.04 and 7.05 of the General conditions after the Effective Date of the contract.

- 11.02 All prices that Bidder sets forth in its Bid shall be based on the presumption that the Contractor will furnish the materials and equipment specified or described in the Bidding Documents, as supplemented by Addenda. Any assumptions regarding the possibility of post-Bid approvals of “or-equal” or substitution requests are made at Bidder’s sole risk.
- 11.03 If an award is made, Contractor shall be allowed to submit proposed substitutes and “or-equals” in accordance with the General Conditions.

## **ARTICLE 12 – SUBCONTRACTORS, SUPPLIERS, AND OTHERS**

- 12.01 If required by the bid documents, the Bidder shall submit to Owner a list of the Subcontractors or Suppliers proposed for the major portions of the Work. If requested by Owner, such list shall be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor, Supplier, or other individual or entity. If Owner or Engineer, after due investigation, has reasonable objection to any proposed Subcontractor, Supplier, individual, or entity, Owner may, before the Notice of Award is given, request apparent Successful Bidder to submit an acceptable substitute.
- 12.02 If apparent Successful Bidder declines to make any such substitution, Owner may award the Contract to the next lowest Bidder that proposes to use acceptable Subcontractors, Suppliers, or other individuals or entities. Declining to make requested substitutions will constitute grounds for forfeiture of the Bid security of any Bidder. Any Subcontractor, Supplier, individual, or entity so listed and against which Owner or Engineer makes no written objection prior to the giving of the Notice of Award will be deemed acceptable to Owner and Engineer subject to subsequent revocation of such acceptance as provided in Paragraph 7.06 of the General Conditions.
- 12.03 Subsequent to the submittal of the Bid, Owner may not require the Successful Bidder or Contractor to retain any Subcontractor, Supplier, or other individual or entity against which Contractor has reasonable objection.
- 12.04 The Contractor shall not award work to Subcontractor(s) in excess of the limits stated in SGC 7.06.

## **ARTICLE 13 – PREPARATION OF BID**

- 13.01 The Bid Form is included with the Bidding Documents.
  - A. All blanks on the Bid Form shall be completed in ink and the Bid Form signed in ink. Erasures or alterations shall be initialed in ink by the person signing the Bid Form. A Bid price shall be indicated for each section, Bid item, alternate, adjustment unit price item, and unit price item listed therein.
  - B. If the Bid Form expressly indicates that submitting pricing on a specific alternate item is optional, and Bidder elects to not furnish pricing for such optional alternate item, then Bidder may enter the words “No Bid” or “Not Applicable.”
- 13.02 A Bid by a corporation shall be executed in the corporate name by a corporate officer (whose title must appear under the signature), accompanied by evidence of authority to sign. The corporate address and state of incorporation shall be shown.

- 13.03 A Bid by a limited liability company shall be executed in the name of the firm by a member or other authorized person and accompanied by evidence of authority to sign. The state of formation of the firm and the official address of the firm shall be shown.
- 13.04 A Bid by an individual shall show the Bidder's name and official address.
- 13.05 A Bid by a joint venture shall be executed by an authorized representative of each joint venturer in the manner indicated on the Bid Form. The official address of the joint venture shall be shown.
- 13.06 All names shall be printed in ink below the signatures.
- 13.07 The Bid shall contain an acknowledgment of receipt of all Addenda, the numbers of which shall be filled in on the Bid Form.
- 13.08 Postal and e-mail addresses and telephone number for communications regarding the Bid shall be shown.
- 13.09 The Bid shall contain evidence of Bidder's authority and qualification to do business in the state where the Project is located, or Bidder shall covenant in writing to obtain such authority and qualification prior to award of the Contract and attach such covenant to the Bid. Bidder's state contractor license number, if any, shall also be shown on the Bid Form. 11.8. The Bid price shall include such amounts as the Bidder deems proper for overhead and profit on account of any cash allowances named in the Contract Documents as provided in Paragraph 11.02 of the General Conditions.  
  
The Bid price shall include such amounts as the Bidder deems proper for overhead and profit on account of any cash allowances named in the Contract Documents as provided in Paragraph 11.02 of the General Conditions.
- 13.10 Each Bid must be submitted on the prescribed form and accompanied by the submittals listed in the Bid Form.

#### **ARTICLE 14 – BASIS OF BID**

##### **14.01 Unit Price**

- A. Bidders shall submit a Bid on a unit price basis as set forth in the Bid Form.

#### **ARTICLE 15 – SUBMITTAL OF BID**

- 15.01 With each copy of the Bidding Documents, a Bidder is furnished one separate unbound copy of the Bid Form, and, if required, the Bid Bond Form. The unbound copy of the Bid Form is to be completed and submitted with the Bid security and the other documents required to be submitted under the terms of Article 7 of the Bid Form.
- 15.02 A Bid shall be received no later than the date and time prescribed and at the place indicated in the advertisement or invitation to bid and shall be enclosed in a plainly marked package with the Project title (and, if applicable, the designated portion of the Project for which the Bid is submitted), the name and address of Bidder, and shall be accompanied by the Bid security and other required documents. If a Bid is sent by mail or other delivery system, the sealed envelope containing the Bid shall be enclosed in a separate package plainly marked on the outside with the notation "BID ENCLOSED."

- 15.03 Bids received after the date and time prescribed for the opening of bids, or not submitted at the correct location or in the designated manner, will not be accepted and will be returned to the Bidder unopened.

#### **ARTICLE 16 – MODIFICATION AND WITHDRAWAL OF BID**

- 16.01 A Bid may be withdrawn by an appropriate document duly executed in the same manner that a Bid must be executed and delivered to the place where Bids are to be submitted prior to the date and time for the opening of Bids. Upon receipt of such notice, the unopened Bid will be returned to the Bidder.
- 16.02 If a Bidder wishes to modify its Bid prior to Bid opening, Bidder must withdraw its initial Bid in the manner specified in Paragraph 16.01 and submit a new Bid prior to the date and time for the opening of Bids.
- 16.03 If within 24 hours after Bids are opened any Bidder files a duly signed written notice with Owner and promptly thereafter demonstrates to the reasonable satisfaction of Owner that there was a material and substantial mistake in the preparation of its Bid, that Bidder may withdraw its Bid, and the Bid security will be returned. Thereafter, if the Work is rebid, that Bidder will be disqualified from further bidding on the Work.

#### **ARTICLE 17 – OPENING OF BIDS**

- 17.01 Bids will be opened at the time and place indicated in the advertisement or invitation to bid and, unless obviously non-responsive, read aloud publicly. An abstract of the amounts of the base Bids and major alternates, if any, will be made available to Bidders after the opening of Bids.

#### **ARTICLE 18 – BIDS TO REMAIN SUBJECT TO ACCEPTANCE**

- 18.01 All Bids will remain subject to acceptance for the period of time stated in the Bid Form, but Owner may, in its sole discretion, release any Bid and return the Bid security prior to the end of this period.

#### **ARTICLE 19 – EVALUATION OF BIDS AND AWARD OF CONTRACT**

- 19.01 Owner reserves the right to reject any or all Bids, including without limitation, nonconforming, nonresponsive, unbalanced, or conditional Bids. Owner will reject the Bid of any Bidder that Owner finds, after reasonable inquiry and evaluation, to not be responsible. If Bidder purports to add terms or conditions to its Bid, takes exception to any provision of the Bidding Documents, or attempts to alter the contents of the Contract Documents for purposes of the Bid, then the Owner will reject the Bid as nonresponsive; provided that Owner also reserves the right to waive all minor informalities not involving price, time, or changes in the Work.
- 19.02 If Owner awards the contract for the Work, such award shall be to the responsible Bidder submitting the lowest responsive Bid.
- 19.03 In evaluating Bids, Owner will consider whether or not the Bids comply with the prescribed requirements, and such alternates, unit prices, and other data, as may be requested in the Bid Form or prior to the Notice of Award.



- 19.04 In evaluating whether a Bidder is responsible, Owner will consider the qualifications of the Bidder and may consider the qualifications and experience of Subcontractors and Suppliers proposed for those portions of the Work for which the identity of Subcontractors and Suppliers must be submitted as provided in the Bidding Documents.
- 19.05 Owner may conduct such investigations as Owner deems necessary to establish the responsibility, qualifications, and financial ability of Bidders and any proposed Subcontractors or Suppliers.

## **ARTICLE 20 – BONDS AND INSURANCE**

- 20.01 Article 6 of the General Conditions, as may be modified by the Supplementary Conditions, sets forth Owner's requirements as to performance and payment bonds and insurance. When the Successful Bidder delivers the Agreement (executed by Successful Bidder) to Owner, it shall be accompanied by required bonds and insurance documentation.

## **ARTICLE 21 – SIGNING OF AGREEMENT**

- 21.01 When Owner issues a Notice of Award to the Successful Bidder, it shall be accompanied by the unexecuted counterparts of the Agreement along with the other Contract Documents as identified in the Agreement. Within 15 days thereafter, Successful Bidder shall execute and deliver the required number of counterparts of the Agreement (and any bonds and insurance documentation required to be delivered by the Contract Documents) to Owner. Within ten days thereafter, Owner shall deliver one fully executed counterpart of the Agreement to Successful Bidder, together with printed and electronic copies of the Contract Documents as stated in Paragraph 2.02 of the General Conditions.

## **ARTICLE 22 – NOT USED**

## **ARTICLE 23 – NOT USED**

## **ARTICLE 24 – POWER OF ATTORNEY**

- 24.01 Attorneys-in-fact who sign Bid Bonds or Contract Bonds must file with each bond a certified and effective dated copy of their power of attorney.
- 24.02 Section 746 of Title VII Consolidated Appropriations Act of 2017 (Division A- Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act, 2017) and any subsequent statutes mandating domestic preference applies an American Iron and Steel requirement to this project. All iron and steel products used in this project must be procured in the United States. "Iron and Steel Products" is defined in Section I.b.2. The de minimis and minor components waivers {add project specific waivers as applicable} apply to this contract.

## **ARTICLE 25 – LAWS AND REGULATIONS**

- 25.01 The Bidder's attention is directed to the fact that all applicable State Laws, municipal ordinance, and the rules and regulations of all authorities having jurisdiction over construction of the Project shall apply to the Contract throughout, and they will be deemed to be included in the Contract the same as though herein written out in full.

**ARTICLE 26 – SAFETY STANDARDS AND ACCIDENT PREVENTION**

26.01 With respect to all Work performed under this contract, the Contractor shall:

- A. Comply with the safety standards provisions of applicable laws, building and construction codes and the "Manual of Accident Prevention in Construction" published by the Associated General Contractors of America, the requirements of the Occupational Safety and Health Act of 1970 (Public Law 91-596), and the requirements of Title 29 of the Code of Federal Regulations, Section 1518 as published in the "Federal Register", Volume 36, No. 75, Saturday, April 17, 1971.
- B. Exercise every precaution at all times for the prevention of accidents and the protection of persons (including employees) and property.
- C. Maintain at his/her office or other well-known place at the job site, all articles necessary for giving first aid to the injured, and shall make standing arrangements for the immediate removal to a hospital or doctor's care of persons (including employees), who may be injured on the job site before the employer has made a standing arrangement for removal of injured persons to a hospital or a doctor's care.

**ARTICLE 27 – WAGE RATE REQUIREMENTS**

27.01 If the contract price is in excess of \$100,000, provisions of the Contract Work Hours and Safety Standards Act at 29 CFD 5.5(b) apply.



General Decision Number: KY180139 06/22/2018 KY139

Superseded General Decision Number: KY20170139

State: Kentucky

Construction Type: Heavy

Counties: Bell, Breathitt, Carter, Clay, Elliott, Floyd, Harlan, Jackson, Knott, Lawrence, Lee, Leslie, Letcher, Magoffin, Martin, Morgan, Owsley, Perry and Wolfe Counties in Kentucky.

HEAVY CONSTRUCTION PROJECTS (including sewer/water construction).

Note: Under Executive Order (EO) 13658, an hourly minimum wage of \$10.35 for calendar year 2018 applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least \$10.35 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in calendar year 2018. The EO minimum wage rate will be adjusted annually. Please note that this EO applies to the above-mentioned types of contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but it does not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60). Additional information on contractor requirements and worker protections under the EO is available at [www.dol.gov/whd/govcontracts](http://www.dol.gov/whd/govcontracts).

Modification Number	Publication Date
0	01/05/2018
1	06/22/2018

CARP0064-007 05/01/2015

	Rates	Fringes
CARPENTER (Form Work Only).....	\$ 27.50	16.06
-----		
ELEC0369-004 09/05/2016		

	Rates	Fringes
LINE CONSTRUCTION		
Equipment Operator.....	\$ 32.27	20%+5.46
Groundman.....	\$ 21.29	20%+5.46
Lineman.....	\$ 36.12	20%+5.46
-----		
ENGI0181-011 07/01/2016		

	Rates	Fringes
POWER EQUIPMENT OPERATOR		
GROUP 1.....	\$ 31.05	14.65
GROUP 2.....	\$ 28.28	14.65
GROUP 4.....	\$ 27.97	14.65

#### OPERATING ENGINEER CLASSIFICATIONS

GROUP 1 - Bulldozer; Crane; Drill; Grader/Blade; Mechanic;  
Scraper

GROUP 2 - Bobcat/Skid Steer/Skid Loader; Forklift

GROUP 4 - Oiler

Operators on cranes with booms 150 feet and over (including jib) shall receive \$1.00 above Group 1 rate; 250 feet and over including jib shall receive \$1.50 above Class 1 rate. Combination Rate: All crane operators operating cranes, where the length of the boom in combination with the length of the piling leads equal or exceeds 150 feet, shall receive \$1.00 above the Group 1 rate.

Employees assigned to work below ground level are to be paid 10% above basic wage rate. This does not apply to open cut work.

-----  
IRON0782-010 08/01/2017

	Rates	Fringes
IRONWORKER (Reinforcing & Structural)		
Projects over \$20,000,000.00.....	\$ 27.09	20.66
Projects under \$20,000,000.00.....	\$ 28.32	23.00

-----  
\* LAB00189-014 07/01/2017

	Rates	Fringes
LABORER		
Concrete Saw (Hand Held/Walk Behind).....	\$ 24.47	12.21
Concrete Worker.....	\$ 24.22	12.21

-----  
\* LAB01445-001 07/01/2017

	Rates	Fringes
LABORER		
Airtrack Driller.....	\$ 24.04	13.29

-----  
SUKY2011-016 06/25/2014

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER...	\$ 21.60	10.35
ELECTRICIAN.....	\$ 32.35	2.18
LABORER: Common or General.....	\$ 21.36	9.39
LABORER: Flagger.....	\$ 18.31	8.89
LABORER: Pipelayer.....	\$ 20.15	8.92
OPERATOR:		
Backhoe/Excavator/Trackhoe.....	\$ 25.97	10.25
OPERATOR: Loader.....	\$ 30.35	0.00
-----		

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

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Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at [www.dol.gov/whd/govcontracts](http://www.dol.gov/whd/govcontracts).

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

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

a survey rate (weighted average rate) or a union average rate (weighted union average rate).

#### Union Rate Identifiers

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

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

#### Survey Rate Identifiers

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

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

#### Union Average Rate Identifiers

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

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current

negotiated/CBA rate of the union locals from which the rate is based.

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WAGE DETERMINATION APPEALS PROCESS

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

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

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

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

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

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

Wage and Hour Administrator  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

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

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

Administrative Review Board  
U.S. Department of Labor

200 Constitution Avenue, N.W.  
Washington, DC 20210

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

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END OF GENERAL DECISION

**BID FORM**

**RATTLESNAKE RIDGE WATER DISTRICT**

**2016 WATER SYSTEM IMPROVEMENTS (15036)**

**CONTRACT 4 –BOOSTER STATION IMPROVEMENTS**

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**ARTICLE 1 – BID RECIPIENT**

- 1.01 This Bid is submitted to:

***Rattlesnake Ridge Water District***

***3563 State HWY 1661***

***Grayson, Kentucky 41143***

- 1.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

**ARTICLE 2 – BIDDER’S ACKNOWLEDGEMENTS**

- 2.01 Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for 90 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

**ARTICLE 3 – BIDDER’S REPRESENTATIONS**

- 3.01 In submitting this Bid, Bidder represents that:

- A. Bidder has examined and carefully studied the Bidding Documents, and any data and reference items identified in the Bidding Documents, and hereby acknowledges receipt of the following Addenda:

<u>Addendum No.</u>	<u>Addendum, Date</u>
_____	_____
_____	_____
_____	_____
_____	_____

- B. Bidder has visited the Site, conducted a thorough, alert visual examination of the Site and adjacent areas, and become familiar with and satisfied itself as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
- C. Bidder is familiar with and has satisfied itself as to all Laws and Regulations that may affect cost, progress, and performance of the Work and including all AIS requirements.
- D. Bidder has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or adjacent to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings, and (2) reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings.
- E. Bidder has considered the information known to Bidder itself; information commonly known to contractors doing business in the locality of the Site; information and

observations obtained from visits to the Site; the Bidding Documents; and any Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder; and (3) Bidder's safety precautions and programs.

- F. Bidder agrees, based on the information and observations referred to in the preceding paragraph, that no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the price bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents.
- G. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.
- H. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and confirms that the written resolution thereof by Engineer is acceptable to Bidder.
- I. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance and furnishing of the Work.
- J. The submission of this Bid constitutes an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article, and that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

#### **ARTICLE 4 – BIDDER'S CERTIFICATION**

##### **4.01 Bidder certifies that:**

- A. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation;
- B. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid;
- C. Bidder has not solicited or induced any individual or entity to refrain from bidding; and
- D. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 4.01.D:
  - 1. "corrupt practice" means the offering, giving, receiving, or soliciting of any thing of value likely to influence the action of a public official in the bidding process;
  - 2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Owner, (b) to establish bid prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;
  - 3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish bid prices at artificial, non-competitive levels; and

4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

#### ARTICLE 5 – BASIS OF BID

- 5.01 Bidder will complete the Work in accordance with the Contract Documents for the following price(s):

Item No.	Description	Unit	Estimated Quantity	Bid Unit Price	Bid Price
1	Renovation of Diamond Ridge Pump Station	LS	1		
2	Renovation of Rattlesnake Ridge (KY 986) Pump Station	LS	1		
3	Big Run Prefabricated Pump Station	LS	1		
4	Renovation of KY 504 Pump Station	LS	1		
5	New RTU and tank level transmitter at Diamond Ridge Tank	LS	1		
6	New RTU at KY 7 Tank	LS	1		
7	New RTU at Gregoryville Tank	LS	1		
8	New Radio's for RTU at Various Tank and Pump Station Sites	EA	7		
9	New RTU and tank level transmitter at KY 504 West Tank	LS	1		
10	New RTU and tank level transmitter at KY 504 East Tank	LS	1		
<b>Total of All Unit Price Bid Items</b>					<b>\$</b>

Bidder acknowledges that (1) each Bid Unit Price includes an amount considered by Bidder to be adequate to cover Contractor's overhead and profit for each separately identified item, and (2) estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all unit price Bid items will be based on actual quantities, determined as provided in the Contract Documents.

**Total Bid Price**

\$ \_\_\_\_\_

#### ARTICLE 6 – TIME OF COMPLETION

- 6.01 Bidder agrees that the Work will be substantially complete within 120 calendar days after the date when the Contract Times commence to run as provided in Paragraph 4.01 of the General

EJCDC® C-410, Bid Form for Construction Contracts.

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Conditions, and will be completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions within 150 calendar days after the date when the Contract Times commence to run.

- 6.02 Bidder accepts the provisions of the Agreement as to liquidated damages. Contractor and Owner recognize that time is of the essence of this Agreement and that Owner will suffer financial loss if the Work is not completed within the times specified in Paragraph 6.01 above, plus any extensions thereof allowed in accordance with Article 15 of the General Conditions. The parties also recognize the delays, expense, and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty), Contractor shall pay Owner \$750 for each day that expires after the time specified in Paragraph 6.01 for Substantial Completion until the Work is substantially complete. After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Time or any proper extension thereof granted by Owner, Contractor shall pay Owner \$750 for each day that expires after the time specified in Paragraph 6.01 for completion and readiness for final payment until the Work is completed and ready for final payment.

## ARTICLE 7 – ATTACHMENTS TO THIS BID

- 7.01 The following documents are submitted with and made a condition of this Bid:
- A. Required Bid security SECTION 00430 EJCDC C-430;
  - B. List of Proposed Subcontractors;
  - C. List of Proposed Suppliers;
  - D. List of Project References;
  - E. Evidence of authority to do business in the state of the Project; or a written covenant to obtain such license within the time for acceptance of Bids;
  - F. Contractor's License No.:            [or] Evidence of Bidder's ability to obtain a State Contractor's License and a covenant by Bidder to obtain said license within the time for acceptance of Bids;
  - G. Required Bidder Qualification Statement with supporting data; and
  - H. If Bid amount exceeds \$10,000, signed Compliance Statement (RD 400-6). Refer to specific equal opportunity requirements set forth in paragraph 18.10 of the General Conditions;
  - I. If Bid amount exceeds \$25,000, signed Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transactions (AD-1048);
  - J. If Bid amount exceeds \$100,000, signed RD Instruction 1940-Q, Exhibit A-1, Certification for Contracts, Grants, and Loans. Refer to paragraph 18.11 of the General Conditions;
  - K. Manufacturer's Certification Letter (Exhibit D) on any approved "or equal" or substitute request to ensure compliance with AIS requirements and any subsequent statutes mandating domestic preference

**ARTICLE 8 – DEFINED TERMS**

8.01 The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

**ARTICLE 9 – BID SUBMITTAL**

BIDDER: *[Indicate correct name of bidding entity]*

By:

*[Signature]* \_\_\_\_\_

*[Printed name]* \_\_\_\_\_

*(If Bidder is a corporation, a limited liability company, a partnership, or a joint venture, attach evidence of authority to sign.)*

Attest:

*[Signature]* \_\_\_\_\_

*[Printed name]* \_\_\_\_\_

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

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

Address for giving notices:

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

Telephone Number: \_\_\_\_\_

Fax Number: \_\_\_\_\_

Contact Name and e-mail address: \_\_\_\_\_

\_\_\_\_\_  
 Bidder's License No.: \_\_\_\_\_

*(where applicable)*

*NOTE TO USER: Use in those states or other jurisdictions where applicable or required.*

## QUALIFICATIONS STATEMENT

**THE INFORMATION SUPPLIED IN THIS DOCUMENT IS CONFIDENTIAL TO THE EXTENT  
PERMITTED BY LAWS AND REGULATIONS**

**1. SUBMITTED BY:**

Official Name of Firm: \_\_\_\_\_

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

**2. SUBMITTED TO:** \_\_\_\_\_

**3. SUBMITTED FOR:** \_\_\_\_\_

Owner: Rattlesnake Ridge Water District

Project Name: Phase 11 Water System Improvements Project Contract 4 –

Booster Station Improvements  
 \_\_\_\_\_  
 \_\_\_\_\_

**TYPE OF WORK:** Renovation and Replacement of various booster pump stations  
 \_\_\_\_\_

**4. CONTRACTOR'S CONTACT INFORMATION**

Contact Person: \_\_\_\_\_

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

Phone: \_\_\_\_\_

Email: \_\_\_\_\_

**5. AFFILIATED COMPANIES:**

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

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

\_\_\_\_\_

\_\_\_\_\_

**6. TYPE OF ORGANIZATION:**

☐ SOLE PROPRIETORSHIP

Name of Owner: \_\_\_\_\_

Doing Business As: \_\_\_\_\_

Date of Organization: \_\_\_\_\_

☐ PARTNERSHIP

Date of Organization: \_\_\_\_\_

Type of Partnership: \_\_\_\_\_

Name of General Partner(s): \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

☐ CORPORATION

State of Organization: \_\_\_\_\_

Date of Organization: \_\_\_\_\_

Executive Officers:

- President: \_\_\_\_\_

- Vice President(s): \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

- Treasurer: \_\_\_\_\_

- Secretary: \_\_\_\_\_

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☐ LIMITED LIABILITY COMPANY

State of Organization:

---

Date of Organization:

---

Members:

---



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☐ JOINT VENTURE

Sate of Organization:

---

Date of Organization:

---

Form of Organization:

---

Joint Venture Managing Partner

- Name:

---

- Address:

---



---



---

Joint Venture Managing Partner

- Name:

---

- Address:

---



---

Joint Venture Managing Partner

- Name:

---

- Address:

---



**7. LICENSING**

Jurisdiction: \_\_\_\_\_

Type of License: \_\_\_\_\_

License Number: \_\_\_\_\_

Jurisdiction: \_\_\_\_\_

Type of License: \_\_\_\_\_

License Number: \_\_\_\_\_

**8. CERTIFICATIONS**

CERTIFIED BY: \_\_\_\_\_

Disadvantage Business Enterprise: \_\_\_\_\_

Minority Business Enterprise: \_\_\_\_\_

Woman Owned Enterprise: \_\_\_\_\_

Small Business Enterprise: \_\_\_\_\_

Other ( \_\_\_\_\_ ): \_\_\_\_\_

**9. BONDING INFORMATION**

Bonding Company: \_\_\_\_\_

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

Bonding Agent: \_\_\_\_\_

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

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

Phone: \_\_\_\_\_

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Aggregate Bonding Capacity: \_\_\_\_\_

Available Bonding Capacity as of date of this submittal: \_\_\_\_\_

## 10. FINANCIAL INFORMATION

Financial Institution: \_\_\_\_\_

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

Account Manager: \_\_\_\_\_

Phone: \_\_\_\_\_

INCLUDE AS AN ATTACHMENT AN AUDITED BALANCE SHEET FOR EACH OF THE  
LAST 3 YEARS

## 11. CONSTRUCTION EXPERIENCE:

Current Experience:

List on **Schedule A** all uncompleted projects currently under contract (If Joint Venture list each participant's projects separately).

Previous Experience:

List on **Schedule B** all projects completed within the last 5 Years (If Joint Venture list each participant's projects separately).

Has firm listed in Section 1 ever failed to complete a construction contract awarded to it?

☐ YES ☐ NO

If YES, attach as an Attachment details including Project Owner's contact information.

Has any Corporate Officer, Partner, Joint Venture participant or Proprietor ever failed to complete a construction contract awarded to them in their name or when acting as a principal of another entity?

☐ YES ☐ NO

If YES, attach as an Attachment details including Project Owner's contact information.

Are there any judgments, claims, disputes or litigation pending or outstanding involving the firm listed in Section 1 or any of its officers (or any of its partners if a partnership or any of the individual entities if a joint venture)?

☐ YES ☐ NO

If YES, attach as an Attachment details including Project Owner's contact information.

## 12. SAFETY PROGRAM:

Name of Contractor's Safety Officer: \_\_\_\_\_

Include the following as attachments:

Provide as an Attachment Contractor's (and Contractor's proposed Subcontractors and Suppliers furnishing or performing Work having a value in excess of 10 percent of the total amount of the Bid) OSHA No. 500- Log & Summary of Occupational Injuries & Illnesses for the past 5 years.

Provide as an Attachment Contractor's (and Contractor's proposed Subcontractors and Suppliers furnishing or performing Work having a value in excess of 10 percent of the total amount of the Bid) list of all OSHA Citations & Notifications of Penalty (monetary or other) received within the last 5 years (indicate disposition as applicable) - IF NONE SO STATE.

Provide as an Attachment Contractor's (and Contractor's proposed Subcontractors and Suppliers furnishing or performing Work having a value in excess of 10 percent of the total amount of the Bid) list of all safety citations or violations under any state all received within the last 5 years (indicate disposition as applicable) - IF NONE SO STATE.

Provide the following for the firm listed in Section V (and for each proposed Subcontractor furnishing or performing Work having a value in excess of 10 percent of the total amount of the Bid) the following (attach additional sheets as necessary):

Workers' compensation Experience Modification Rate (EMR) for the last 5 years:

YEAR	_____	EMR	_____
YEAR	_____	EMR	_____
YEAR	_____	EMR	_____
YEAR	_____	EMR	_____
YEAR	_____	EMR	_____

Total Recordable Frequency Rate (TRFR) for the last 5 years:

YEAR	_____	TRFR	_____
YEAR	_____	TRFR	_____
YEAR	_____	TRFR	_____
YEAR	_____	TRFR	_____

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YEAR

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

TRFR

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

Total number of man-hours worked for the last 5 Years:

YEAR

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

TOTAL NUMBER OF MAN-HOURS

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

YEAR

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

TOTAL NUMBER OF MAN-HOURS

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

YEAR

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

TOTAL NUMBER OF MAN-HOURS

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

YEAR

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

TOTAL NUMBER OF MAN-HOURS

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

YEAR

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

TOTAL NUMBER OF MAN-HOURS

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

Provide Contractor's (and Contractor's proposed Subcontractors and Suppliers furnishing or performing Work having a value in excess of 10 percent of the total amount of the Bid) Days Away From Work, Days of Restricted Work Activity or Job Transfer (DART) incidence rate for the particular industry or type of Work to be performed by Contractor and each of Contractor's proposed Subcontractors and Suppliers) for the last 5 years:

YEAR

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

DART

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

YEAR

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

DART

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

YEAR

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

DART

\_\_\_\_\_  
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YEAR

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\_\_\_\_\_

DART

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

YEAR

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

DART

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

### 13. EQUIPMENT:

MAJOR EQUIPMENT:

List on **Schedule C** all pieces of major equipment available for use on Owner's Project.

I HEREBY CERTIFY THAT THE INFORMATION SUBMITTED HERewith, INCLUDING ANY ATTACHMENTS, IS TRUE TO THE BEST OF MY KNOWLEDGE AND BELIEF.

NAME OF ORGANIZATION: \_\_\_\_\_

BY: \_\_\_\_\_

TITLE: \_\_\_\_\_

DATED: \_\_\_\_\_

NOTARY ATTEST:

SUBSCRIBED AND SWORN TO BEFORE ME

THIS \_\_\_\_\_ DAY OF \_\_\_\_\_, 20\_\_

NOTARY PUBLIC - STATE OF \_\_\_\_\_

MY COMMISSION EXPIRES: \_\_\_\_\_

#### REQUIRED ATTACHMENTS

1. Schedule A (Current Experience).
2. Schedule B (Previous Experience).
3. Schedule C (Major Equipment).
4. Audited balance sheet for each of the last 3 years for firm named in Section 1.
5. Evidence of authority for individuals listed in Section 7 to bind organization to an agreement.
6. Resumes of officers and key individuals (including Safety Officer) of firm named in Section 1.
7. Required safety program submittals listed in Section 13.
8. Additional items as pertinent.

## SCHEDULE A

### CURRENT EXPERIENCE

Project Name	Owner's Contact Person	Design Engineer	Contract Date	Type of Work	Status	Cost of Work
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				

## SCHEDULE B

PREVIOUS EXPERIENCE (Include ALL Projects Completed within last 5 years)

Project Name	Owner's Contact Person	Design Engineer	Contract Date	Type of Work	Status	Cost of Work
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				

## SCHEDULE B

PREVIOUS EXPERIENCE (Include ALL Projects Completed within last 5 years)

Project Name	Owner's Contact Person	Design Engineer	Contract Date	Type of Work	Status	Cost of Work
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				





## BID BOND

Any singular reference to Bidder, Surety, Owner or other party shall be considered plural where applicable.

BIDDER (*Name and Address*):

SURETY (*Name, and Address of Principal Place of Business*):

OWNER (*Name and Address*): Rattlesnake Ridge Water District  
3563 State Hwy. 1661  
Grayson, Kentucky 41143

BID

Bid Due Date:

Description: Phase 11 -Water System Improvements – Contract 4 – Booster Station Improvements

BOND

Bond Number:

Date:

Penal sum

(Figures) (Words)

Surety and Bidder, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Bid Bond to be duly executed by an authorized officer, agent, or representative.

**~~SURETY~~**

(Seal)

**Bidder's Name and Corporate Seal**

By:

Signature (Attach Power of Attorney)

Print Name

Title

Attest:

Signature

Title

*Note: Addresses are to be used for giving any required notice.*

*Provide execution by any additional parties, such as joint venturers, if necessary.*

1. Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to pay to Owner upon default of Bidder the penal sum set forth on the face of this Bond. Payment of the penal sum is the extent of Bidder's and Surety's liability. Recovery of such penal sum under the terms of this Bond shall be Owner's sole and exclusive remedy upon default of Bidder.
2. Default of Bidder shall occur upon the failure of Bidder to deliver within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents.
3. This obligation shall be null and void if:
  - 3.1 Owner accepts Bidder's Bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents, or
  - 3.2 All Bids are rejected by Owner, or
  - 3.3 Owner fails to issue a Notice of Award to Bidder within the time specified in the Bidding Documents (or any extension thereof agreed to in writing by Bidder and, if applicable, consented to by Surety when required by Paragraph 5 hereof).
4. Payment under this Bond will be due and payable upon default of Bidder and within 30 calendar days after receipt by Bidder and Surety of written notice of default from Owner, which notice will be given with reasonable promptness, identifying this Bond and the Project and including a statement of the amount due.
5. Surety waives notice of any and all defenses based on or arising out of any time extension to issue Notice of Award agreed to in writing by Owner and Bidder, provided that the total time for issuing Notice of Award including extensions shall not in the aggregate exceed 120 days from the Bid due date without Surety's written consent.
6. No suit or action shall be commenced under this Bond prior to 30 calendar days after the notice of default required in Paragraph 4 above is received by Bidder and Surety and in no case later than one year after the Bid due date.
7. Any suit or action under this Bond shall be commenced only in a court of competent jurisdiction located in the state in which the Project is located.
8. Notices required hereunder shall be in writing and sent to Bidder and Surety at their respective addresses shown on the face of this Bond. Such notices may be sent by personal delivery, commercial courier, or by United States Registered or Certified Mail, return receipt requested, postage pre-paid, and shall be deemed to be effective upon receipt by the party concerned.
9. Surety shall cause to be attached to this Bond a current and effective Power of Attorney evidencing the authority of the officer, agent, or representative who executed this Bond on behalf of Surety to execute, seal, and deliver such Bond and bind the Surety thereby.
10. This Bond is intended to conform to all applicable statutory requirements. Any applicable requirement of any applicable statute that has been omitted from this Bond shall be deemed to be included herein as if set forth at length. If any provision of this Bond conflicts with any applicable statute, then the provision of said statute shall

govern and the remainder of this Bond that is not in conflict therewith shall continue in full force and effect.

11. The term "Bid" as used herein includes a Bid, offer, or proposal as applicable.

## COMPLIANCE STATEMENT

This statement relates to a proposed contract with Rattlesnake Ridge Water District

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(Name of borrower or grantee)

who expects to finance the contract with assistance from either the Rural Housing Service (RHS), Rural Business-Cooperative Service (RBS), or the Rural Utilities Service (RUS) or their successor agencies, United States Department of Agriculture (whether by a loan, grant, loan insurance, guarantee, or other form of financial assistance). I am the undersigned bidder or prospective contractor, I represent that:

1. ☐ I have, ☐ have not, participated in a previous contract or subcontract subject to Executive Order 11246 (regarding equal employment opportunity) or a preceding similar Executive Order.
2. If I have participated in such a contract or subcontract, ☐ I have, ☐ have not, filed all compliance reports that have been required to file in connection with the contract or subcontract.

If the proposed contract is for \$50,000 or more and I have 50 or more employees, I also represent that:

3. ☐ I have, ☐ have not previously had contracts subject to the written affirmative action programs requirements of the Secretary of Labor.
4. If I have participated in such a contract or subcontract, ☐ I have, ☐ have not developed and placed on file at each establishment affirmative action programs as required by the rules and regulations of the Secretary of Labor.

I understand that if I have failed to file any compliance reports that have been required of me, I am not eligible and will not be eligible to have my bid considered or to enter into the proposed contract unless and until I make an arrangement regarding such reports that is satisfactory to either the RHS, RBS or RUS, or to the office where the reports are required to be filed.

I also certify that I do not maintain or provide for my employees any segregated facilities at any of my establishments, and that I do not permit my employees to perform their services at any location, under my control, where segregated facilities are maintained. I certify further that I will not maintain or provide for my employees any segregated facilities at any of my establishments, and that I will not permit my employees to perform their services at any location, under my control, where segregated facilities are maintained. I agree that a breach of this certification is a violation of the Equal Opportunity clause in my contract. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, restrooms and wash rooms, restaurants and other eating areas time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive or are in fact segregated on the basis of race, creed, color, or national origin, because of habit, local custom, or otherwise. I further agree that (except where I have obtained identical certifications for proposed subcontractors for specific time periods) I will obtain identical certifications from proposed subcontractors prior to the award of subcontracts exceeding \$10,000 which are not exempt from the provisions of the Equal Opportunity clause; that I will retain such certifications in my files; and that I will forward the following notice to such proposed subcontractors (except where the proposed subcontractors have submitted identical certifications for specific time periods): (See Reverse).

---

According to the Paperwork Reduction Act of 1995, an agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays the valid OMB control number. The valid OMB control number for this information collection is 0575-0018. The time required to complete this information collection is estimated to average 10 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

---

**NOTICE TO PROSPECTIVE SUBCONTRACTORS OF REQUIREMENTS FOR  
CERTIFICATIONS OF NON-SEGREGATED FACILITIES**

A certification of Nonsegregated Facilities, as required by the May 9, 1967, order (32F.R. 7439, may 19, 1967) on Elimination of Segregated Facilities, by the Secretary of Labor, must be submitted prior to the award of a subcontract exceeding \$ 10,000 which is not exempt from the provisions of the Equal Opportunity clause. The certification may be submitted either for each subcontract or for all subcontracts during a period (i.e., quarterly, semiannually, or annually).

NOTE: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001.

Date \_\_\_\_\_

\_\_\_\_\_  
*(Signature of Bidder or Prospective Contractor)*

\_\_\_\_\_  
*Address (including Zip Code)*

CERTIFICATION FOR CONTRACTS, GRANTS AND LOANS

The undersigned certifies, to the best of his or her knowledge and belief, that:

1. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant or Federal loan, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant or loan.

2. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant or loan, the undersigned shall complete and submit Standard Form - LLL, "Disclosure of Lobbying Activities," in accordance with its instructions.

3. The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including contracts, subcontracts, and subgrants under grants and loans) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

\_\_\_\_\_  
(name)

\_\_\_\_\_  
(date)

\_\_\_\_\_  
(title)

oOo

## U.S. DEPARTMENT OF AGRICULTURE

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### **Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transactions**

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This certification is required by the regulations implementing Executive Order 12549, Debarment and Suspension, 7 CFR part 3017, Section 3017.510, Participants' responsibilities. The regulations were published as Part IV of the January 30, 1989, Federal Register (pages 4722-4733). Copies of the regulations may be obtained by contacting the Department of Agriculture agency with which this transaction originated.

#### **(BEFORE COMPLETING CERTIFICATION, READ INSTRUCTIONS ON REVERSE)**

- (1) The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.
- (2) Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

---

Organization Name

PR/Award Number or Project Name

---

Name(s) and Title(s) of Authorized Representative(s)

---

Signature(s)

Date



#### **Instructions for Certification**

1. By signing and submitting this form, the prospective lower tier participant is providing the certification set out on the reverse side in accordance with these instructions.
2. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.
3. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.
4. The terms "covered transaction," "debarred," "suspended," "ineligible," "lower tier covered transaction," "participant," "person," "primary covered transaction," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations.
5. The prospective lower tier participant agrees by submitting this form that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.
6. The prospective lower tier participant further agrees by submitting this form that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transaction," without modification, in all lower tier covered transaction and in all solicitations for lower tier covered transactions.
7. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the Nonprocurement List.
8. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of a participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.
9. Except for transactions authorized under paragraph 5 of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

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**NOTICE OF AWARD**

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Date of Issuance:

Owner: Rattlesnake Ridge Water District Owner's Contract No.:  
Engineer: Kentucky Engineering Group, PLLC Engineer's Project No.: 15043  
Project: Phase 11 Water System Improvements Contract Name: Contract 4 – Booster Station Improvements

Bidder:

Bidder's Address:

**TO BIDDER:**

You are notified that Owner has accepted your Bid dated [ ] for the above Contract, and that you are the Successful Bidder and are awarded a Contract for:

Phase 11 Water System Improvements – Contract 4 – Booster Stations Improvements .

The Contract Price of the awarded Contract is: \$

[ 0 ] unexecuted counterparts of the Agreement accompany this Notice of Award, and one copy of the Contract Documents accompanies this Notice of Award, or has been transmitted or made available to Bidder electronically. *[revise if multiple copies accompany the Notice of Award]*

☒ a set of the Drawings will be delivered separately from the other Contract Documents.

You must comply with the following conditions precedent within 15 days of the date of this Notice of Award:

1. Deliver to Owner [ 5 ] counterparts of the Agreement, fully executed by Bidder.
2. Deliver with the executed Agreement(s) the Contract security *[e.g., performance and payment bonds]* and insurance documentation as specified in the Instructions to Bidders and General Conditions, Articles 2 and 6.
3. Other conditions precedent (if any):

Failure to comply with these conditions within the time specified will entitle Owner to consider you in default, annul this Notice of Award, and declare your Bid security forfeited.

Within ten days after you comply with the above conditions, Owner will return to you one fully executed counterpart of the Agreement, together with any additional copies of the Contract Documents as indicated in Paragraph 2.02 of the General Conditions.

---

Owner: Rattlesnake Ridge Water District

Authorized Signature

By:

Title:

Copy: Engineer

This document has important legal consequences; consultation with an attorney is encouraged with respect to its use or modification. This document should be adapted to the particular circumstances of the contemplated Project and the controlling Laws and Regulations.

## **AGREEMENT BETWEEN OWNER AND CONTRACTOR FOR CONSTRUCTION CONTRACT (STIPULATED PRICE)**

Prepared by



Issued and Published Jointly by



Endorsed by



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## INTRODUCTION

This Agreement between Owner and Contractor for Construction Contract (Stipulated Price) ("Agreement") has been prepared for use with the Suggested Instructions to Bidders for Construction Contracts ("Instructions to Bidders") (EJCDC® C-200, 2013 Edition); the Suggested Bid Form for Construction Contracts ("Bid Form") (EJCDC® C 410, 2013 Edition); and the Standard General Conditions of the Construction Contract ("General Conditions") (EJCDC® C-700, 2013 Edition). Their provisions are interrelated, and a change in one may necessitate a change in the others. See also the Guide to the Preparation of Supplementary Conditions (EJCDC® C-800, 2013 Edition), and the Commentary on the 2013 EJCDC Construction Documents (EJCDC® C-001, 2013 Edition).

In construction contracting, as a general matter the "agreement" is the legal instrument executed (signed) by the project owner and the construction contractor, binding the parties to the terms of the contract. See CSI Project Delivery Practice Guide (2011), Section 11.1.2, p. 210, and CSI Construction Specification Practice Guide (2011), Section 5.1, p. 75. This EJCDC Agreement form serves that basic function, by identifying the parties and Contract Documents, and establishing the Contract Price and Contract Times. This Agreement form is specifically intended for stipulated price (fixed price) contracts—that is, contracts in which Owner and Contractor identify specific lump sums and unit prices as Contractor's compensation for performing the Work. For construction contracts in which the Contract Price is primarily based on costs incurred during construction, users should select EJCDC® C-525, Agreement between Owner and Contractor for Construction Contract (Cost-Plus).

This Agreement form is drafted to be flexible enough to be used on projects that are competitively bid, and for public and private contracts that are negotiated or awarded through a proposal process or otherwise. On competitively bid projects, the following documentary information would typically be made available to bidders:

- Bidding Requirements, which include the Advertisement or invitation to bid, the Instructions to Bidders, and the Bid Form that is suggested or prescribed, all of which provide information and guidance for all Bidders, and Bid Form supplements (if any) such as Bid Bond and Qualifications Statement.
- Contract Documents, which include the Agreement, performance and payment bonds, the General Conditions, the Supplementary Conditions, the Drawings, and the Specifications.
- Documents referred to in the Supplementary Conditions or elsewhere as being of interest to bidders for reference purposes, but which are not Contract Documents.

Together, the Bidding Requirements and the Contract Documents are referred to as the Bidding Documents. (The terms "Bidding Documents," "Bidding Requirements," and "Contract Documents" are defined in Article 1 of the General Conditions.) The Bidding Requirements are not Contract Documents because much of their substance pertains to the relationships prior to the award of the Contract and has little effect or impact thereafter. Many contracts are awarded without even going through a bidding process, and thus have no Bidding Requirements, illustrating that the bidding items are typically superfluous to the formation of a binding and comprehensive construction contract. In some cases, however, a bid or proposal will contain numerous line items and their prices; in such case the actual bid or proposal document may be attached as an exhibit to the Agreement to avoid extensive rekeying.

Suggested provisions are accompanied by “Notes to User” and bracketed notes and prompts to assist in preparing the Agreement. The provisions have been coordinated with the other forms produced by EJCDC. Much of the language should be usable on most projects, but modifications and additional provisions will often be necessary. When modifying the suggested language or writing additional provisions, the user must check the other documents thoroughly for conflicts and coordination of terms, and make appropriate revisions in all affected documents.

All parties involved in construction projects benefit significantly from a standardized approach in the location of subject matter throughout the documents. Experience confirms the danger of addressing the same subject matter in more than one location; doing so frequently leads to confusion and unanticipated legal consequences. When preparing documents for a construction project, careful attention should be given to the guidance provided in EJCDC® N-122/AIA® A521, Uniform Location of Subject Matter (2012 Edition), available at no charge from the EJCDC website, [www.ejcdc.org](http://www.ejcdc.org), and from the websites of EJCDC’s sponsoring organizations.

CSI MasterFormat™ (50-Division format) designates Document “00 52 XX” for various forms of the owner-contractor agreement. If this format is used, the first page of the Agreement would be numbered 00 52 13-1 (or other appropriate third pair of numbers, in accordance with MasterFormat™).

Instructions and restrictions regarding the use of this document are set out in the License Agreement that accompanied the document at the time of purchase. To prepare the Agreement for inclusion in a Project Manual or for use in a specific contractual engagement, (1) remove the cover pages and this Introduction, (2) fill in Project-specific information and make revisions to the Agreement, following the guidance in the Notes to Users and bracketed notes and prompts, and the advice of legal counsel, and (3) delete the Notes to Users and bracketed notes and prompts.

Owner and Contractor hereby agree as follows:

A. Contractor and Owner recognize that time is of the essence as stated in Paragraph 4.01 above and that Owner will suffer financial and other losses if the Work is not completed and Milestones not achieved within the times specified in Paragraph 4.02 above, plus any extensions thereof allowed in accordance with the Contract. The parties also recognize the delays, expense, and difficulties involved in proving in a legal or arbitration proceeding the

actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty):

1. Substantial Completion: Contractor shall pay Owner \$ 750 for each day that expires after the time (as duly adjusted pursuant to the Contract) specified in Paragraph 4.02.A above for Substantial Completion until the Work is substantially completed.

*Finally, note that Paragraph 4.04.B above does not refer to fines or penalties. In the typical case, fines and penalties are linked to Substantial Completion, and are not applicable to delays in final completion of the Work.*

## ARTICLE 5 – CONTRACT PRICE

5.01 Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents the amounts that follow, subject to adjustment under the Contract:

- A. For all Work, at the prices stated in Contractor's Bid, attached hereto as an exhibit.

## ARTICLE 6 – PAYMENT PROCEDURES

6.01 *Submittal and Processing of Payments*

- A. Contractor shall submit Applications for Payment in accordance with Article 15 of the General Conditions. Applications for Payment will be processed by Engineer as provided in the General Conditions.

6.02 *Progress Payments; Retainage*

- A. Owner shall make progress payments on account of the Contract Price on the basis of Contractor's Applications for Payment on or about the TBD day of each month during performance of the Work as provided in Paragraph 6.02.A.1 below, provided that such Applications for Payment have been submitted in a timely manner and otherwise meet the requirements of the Contract. All such payments will be measured by the Schedule of Values established as provided in the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no Schedule of Values, as provided elsewhere in the Contract.

1. Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below but, in each case, less the aggregate of payments previously made and less such amounts as Owner may withhold, including but not limited to liquidated damages, in accordance with the Contract

- a. 95 percent of Work completed (with the balance being retainage). If the Work has been 50 percent completed as determined by Engineer, and if the character and progress of the Work have been satisfactory to Owner and Engineer, then as long as the character and progress of the Work remain satisfactory to Owner and Engineer, there will be no additional retainage; and
- b. 100 percent of cost of materials and equipment not incorporated in the Work (with the balance being retainage).

- B. Upon Substantial Completion, Owner shall pay an amount sufficient to increase total payments to Contractor to 95 percent of the Work completed, less such amounts set off by Owner pursuant to Paragraph 15.01.E of the General Conditions, and less 5



percent of Engineer's estimate of the value of Work to be completed or corrected as shown on the punch list of items to be completed or corrected prior to final payment.

#### 6.03 *Final Payment*

- A. Upon final completion and acceptance of the Work in accordance with Paragraph 15.06 of the General Conditions, Owner shall pay the remainder of the Contract Price as recommended by Engineer as provided in said Paragraph 15.06.

### ARTICLE 7 – INTEREST

- 7.01 All amounts not paid when due shall bear interest at the rate of 3.5 percent per annum.

### ARTICLE 8 – CONTRACTOR'S REPRESENTATIONS

- 8.01 In order to induce Owner to enter into this Contract, Contractor makes the following representations:

- A. Contractor has examined and carefully studied the Contract Documents, and any data and reference items identified in the Contract Documents.
- B. Contractor has visited the Site, conducted a thorough, alert visual examination of the Site and adjacent areas, and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
- C. Contractor is familiar with and is satisfied as to all Laws and Regulations that may affect cost, progress, and performance of the Work.
- D. Contractor has considered the information known to Contractor itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Contract Documents; and the Site-related reports and drawings identified in the Contract Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor; and (3) Contractor's safety precautions and programs.
- E. Based on the information and observations referred to in the preceding paragraph, Contractor agrees that no further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract.
- F. Contractor is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Contract Documents.
- G. Contractor has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.
- H. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.
- I. Contractor's entry into this Contract constitutes an incontrovertible representation by Contractor that without exception all prices in the Agreement are premised upon performing and furnishing the Work required by the Contract Documents.

## ARTICLE 9 – CONTRACT DOCUMENTS

### 9.01 *Contents*

- A. The Contract Documents consist of the following:
  - 1. This Agreement (pages 1 to 10, inclusive).
  - 2. Performance bond (pages 1 to     , inclusive).
  - 3. Payment bond (pages 1 to     , inclusive).
  - 4. Other bonds.
    - a.      (pages      to     , inclusive).
  - 5. General Conditions (pages 1 to 73, inclusive).
  - 6. Supplementary Conditions (pages 1 to 9, inclusive).
  - 7. Specifications as listed in the table of contents of the Project Manual.
  - 8. Drawings (not attached but incorporated by reference) consisting of 6 sheets with each sheet bearing the following general title: CONTRACT 4 – BOOSTER STATION IMPROVEMENTS.
  - 9. Addenda (numbers      to     , inclusive).
  - 10. Exhibits to this Agreement (enumerated as follows):
    - a. Contractor's Bid (pages 1 to     , inclusive).
  - 11. The following which may be delivered or issued on or after the Effective Date of the Contract and are not attached hereto:
    - a. Change Orders
- B. The documents listed in Paragraph 9.01.A are attached to this Agreement (except as expressly noted otherwise above).
- C. There are no Contract Documents other than those listed above in this Article 9.
- D. The Contract Documents may only be amended, modified, or supplemented as provided in the General Conditions.

## ARTICLE 10 – MISCELLANEOUS

### 10.01 *Terms*

- A. Terms used in this Agreement will have the meanings stated in the General Conditions and the Supplementary Conditions.

### 10.02 *Assignment of Contract*

- A. Unless expressly agreed to elsewhere in the Contract, no assignment by a party hereto of any rights under or interests in the Contract will be binding on another party hereto without the written consent of the party sought to be bound; and, specifically but without limitation, money that may become due and money that is due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an

assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.

#### 10.03 *Successors and Assigns*

- A. Owner and Contractor each binds itself, its successors, assigns, and legal representatives to the other party hereto, its successors, assigns, and legal representatives in respect to all covenants, agreements, and obligations contained in the Contract Documents.

#### 10.04 *Severability*

- A. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation shall be deemed stricken, and all remaining provisions shall continue to be valid and binding upon Owner and Contractor, who agree that the Contract Documents shall be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.

#### 10.05 *Contractor's Certifications*

- A. Contractor certifies that it has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Contract. For the purposes of this Paragraph 10.05:
  1. "corrupt practice" means the offering, giving, receiving, or soliciting of any thing of value likely to influence the action of a public official in the bidding process or in the Contract execution;
  2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process or the execution of the Contract to the detriment of Owner, (b) to establish Bid or Contract prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;
  3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish Bid prices at artificial, non-competitive levels; and
  4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

#### 10.06 *Other Provisions*

- A. Owner stipulates that if the General Conditions that are made a part of this Contract are based on EJCDC® C-700, Standard General Conditions for the Construction Contract, published by the Engineers Joint Contract Documents Committee®, and if Owner is the party that has furnished said General Conditions, then Owner has plainly shown all modifications to the standard wording of such published document to the Contractor, through a process such as highlighting or "track changes" (redline/strikeout), or in the Supplementary Conditions.

IN WITNESS WHEREOF, Owner and Contractor have signed this Agreement.

This Agreement will be effective on \_\_\_\_\_ (which is the Effective Date of the Contract).

OWNER:

CONTRACTOR:

\_\_\_\_\_  
Rattlesnake Ridge Water District

\_\_\_\_\_

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

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

Title: Chairman

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

*(If Contractor is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.)*

Attest: \_\_\_\_\_

Attest: \_\_\_\_\_

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

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

Address for giving notices:

Address for giving notices:

\_\_\_\_\_  
3563 State Hwy. 1661

\_\_\_\_\_

\_\_\_\_\_  
Grayson, Kentucky 41143

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

License No.: \_\_\_\_\_  
*(where applicable)*

*(If Owner is a corporation, attach evidence of authority to sign. If Owner is a public body, attach evidence of authority to sign and resolution or other documents authorizing execution of this Agreement.)*

**NOTICE TO PROCEED**

---

Owner:	Rattlesnake Ridge Water District	Owner's Contract No.:	N/A
Contractor:		Contractor's Project No.:	
Engineer:	Kentucky Engineering Group, PLLC	Engineer's Project No.:	15036
Project:	Phase 11 – Water System Improvements	Contract Name:	Contract 4 – Booster Station Improvements
		Effective Date of Contract:	

---

**TO CONTRACTOR:**

Owner hereby notifies Contractor that the Contract Times under the above Contract will commence to run on [REDACTED], 20[REDACTED]. [see Paragraph 4.01 of the General Conditions]

On that date, Contractor shall start performing its obligations under the Contract Documents. No Work shall be done at the Site prior to such date. In accordance with the Agreement, [the date of Substantial Completion is \_\_\_\_\_, and the date of readiness for final payment is \_\_\_\_\_] **or** [the number of days to achieve Substantial Completion is \_\_\_\_\_, and the number of days to achieve readiness for final payment is \_\_\_\_\_].

Before starting any Work at the Site, Contractor must comply with the following:

*[Note any access limitations, security procedures, or other restrictions]*

---

Owner: Rattlesnake Ridge Water District

Authorized Signature

By:

Title: Chairman

Date Issued:

Copy: Engineer

## SECTION 00600

### INSURANCE CERTIFICATE

Certificate of Insurance shall be provided in accordance with:

#### OWNER'S MINIMUM INSURANCE REQUIREMENTS

The Contractor at its expense shall procure and shall maintain the insurance required in this Contract and to be provided by the Contractor. The Contractor shall require each subcontractor to procure and maintain the insurance required by this Contract and to be provided by subcontractors. At a minimum, the following insurance Limits shall be procured:

General Liability – Commercial General Liability

Limits of Insurance -      \$2,000,000 general aggregate  
    \$2,000,000 products & completed operations aggregate  
    \$1,000,000 personal & advertising  
    \$1,000,000 each occurrence

Automobile Liability – All Owned, Non-owned & Hired vehicles

Limits of Liability - \$1,000,000 per accident

Excess or Umbrella Liability

Limits of Liability - \$2,000,000

Workmen's Compensation – Statutory Coverage in each state of operations or “all states” coverage

Limits of Liability -      \$100,000 each accident bodily injury  
    \$500,000 policy limit bodily injury by disease  
    \$100,000 each employee bodily injury by disease

Description of Operations

Rattlesnake Ridge Water District and Kentucky Engineering Groups, PLLC must be added to the Commercial General Liability policy as an additional insured by Standard Endorsements CG 2010(11-85) and CG 2037 or their equivalents.

All policies, except workers compensation, shall include a waiver of subrogation.

Certificate Holder

Must list:                      Rattlesnake Ridge Water District  
    P.O. Box 475  
    Grayson, Kentucky 41143

Cancellation

Thirty (30) days prior written notice is required.

Builders Risk/Installation Floater

May be required in an amount equal to the contract. If above ground structures are involved in the Contract, this is required.

END OF SECTION



## PERFORMANCE BOND

CONTRACTOR *(name and address):*

SURETY *(name and address of principal place of business):*

OWNER *(name and address):*

Rattlesnake Ridge Water District  
3563 State Hwy. 1661  
Grayson, Kentucky 41143

### CONSTRUCTION CONTRACT

Effective Date of the Agreement:

Amount:

Description *(name and location)*: Phase 11 Water System Improvements – Contract 4 Booster Stations Improvements

### BOND

Bond Number:

Date *(not earlier than the Effective Date of the Agreement of the Construction Contract)*:

Amount:

Modifications to this Bond Form: ☐ None ☐ See Paragraph 16

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Performance Bond to be duly executed by an authorized officer, agent, or representative.

### CONTRACTOR AS PRINCIPAL

### SURETY

\_\_\_\_\_  
Contractor's Name and Corporate Seal

\_\_\_\_\_  
Surety's Name and Corporate Seal

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

By: \_\_\_\_\_  
Signature *(attach power of attorney)*

\_\_\_\_\_  
Print Name

\_\_\_\_\_  
Print Name

\_\_\_\_\_  
Title

\_\_\_\_\_  
Title

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

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

EJCDC® C-610, Performance Bond

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and American Society of Civil Engineers. All rights reserved. 1 of 3

Title

Title

***Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.***



1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.

2. If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Paragraph 3.

3. If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond shall arise after:

3.1 The Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor, and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Paragraph 3.1 shall be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor, and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default;

3.2 The Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and

3.3 The Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

4. Failure on the part of the Owner to comply with the notice requirement in Paragraph 3.1 shall not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

5. When the Owner has satisfied the conditions of Paragraph 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

5.1 Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;

5.2 Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;

5.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract,

arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owners concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Paragraph 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

5.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor, and with reasonable promptness under the circumstances:

5.4.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or

5.4.2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

6. If the Surety does not proceed as provided in Paragraph 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Paragraph 5.4, and the Owner refuses the payment or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

7. If the Surety elects to act under Paragraph 5.1, 5.2, or 5.3, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication for:

7.1 the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;

7.2 additional legal, design professional, and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Paragraph 5; and

7.3 liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

8. If the Surety elects to act under Paragraph 5.1, 5.3, or 5.4, the Surety's liability is limited to the amount of this Bond.

9. The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price shall not be reduced

or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors, and assigns.

10. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.

11. Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this paragraph are void or prohibited by law, the minimum periods of limitations available to sureties as a defense in the jurisdiction of the suit shall be applicable.

12. Notice to the Surety, the Owner, or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears.

13. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

#### 14. Definitions

14.1 Balance of the Contract Price: The total amount payable by the Owner to the Contractor under the Construction

Contract after all proper adjustments have been made including allowance for the Contractor for any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

14.2 Construction Contract: The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.

14.3 Contractor Default: Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.

14.4 Owner Default: Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

14.5 Contract Documents: All the documents that comprise the agreement between the Owner and Contractor.

15. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

16. Modifications to this Bond are as follows:

## PAYMENT BOND

CONTRACTOR *(name and address):*

SURETY *(name and address of principal place of business):*

OWNER *(name and address)*

Rattlesnake Ridge Water District

3563 State Hwy. 1661

Grayson, KY 41143

### CONSTRUCTION CONTRACT

Effective Date of the Agreement:

Amount:

Description *(name and location)*: Phase 11 Water System Improvements – Contract 4 Booster Stations Improvements

### BOND

Bond Number:

Date *(not earlier than the Effective Date of the Agreement of the Construction Contract)*:

Amount:

Modifications to this Bond Form: ☐ None ☐ See Paragraph 18

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Payment Bond to be duly executed by an authorized officer, agent, or representative.

### CONTRACTOR AS PRINCIPAL

### SURETY

\_\_\_\_\_  
Contractor's Name and Corporate Seal

\_\_\_\_\_  
Surety's Name and Corporate Seal

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

By: \_\_\_\_\_  
Signature *(attach power of attorney)*

\_\_\_\_\_  
Print Name

\_\_\_\_\_  
Print Name

\_\_\_\_\_  
Title

\_\_\_\_\_  
Title

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

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

\_\_\_\_\_  
Title

\_\_\_\_\_  
Title

**Notes:** (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner to pay for labor, materials, and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.
2. If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies, and holds harmless the Owner from claims, demands, liens, or suits by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.
3. If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Paragraph 13) of claims, demands, liens, or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, and tendered defense of such claims, demands, liens, or suits to the Contractor and the Surety.
4. When the Owner has satisfied the conditions in Paragraph 3, the Surety shall promptly and at the Surety's expense defend, indemnify, and hold harmless the Owner against a duly tendered claim, demand, lien, or suit.
5. The Surety's obligations to a Claimant under this Bond shall arise after the following:
  - 5.1 Claimants who do not have a direct contract with the Contractor,
    - 5.1.1 have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and
    - 5.1.2 have sent a Claim to the Surety (at the address described in Paragraph 13).
  - 5.2 Claimants who are employed by or have a direct contract with the Contractor have sent a Claim to the Surety (at the address described in Paragraph 13).
6. If a notice of non-payment required by Paragraph 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Paragraph 5.1.1.
7. When a Claimant has satisfied the conditions of Paragraph 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:
  - 7.1 Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and
  - 7.2 Pay or arrange for payment of any undisputed amounts.
  - 7.3 The Surety's failure to discharge its obligations under Paragraph 7.1 or 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Paragraph 7.1 or 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.
8. The Surety's total obligation shall not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Paragraph 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.
9. Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.
10. The Surety shall not be liable to the Owner, Claimants, or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to or give notice on behalf of Claimants, or otherwise have any obligations to Claimants under this Bond.

11. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.
12. No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Paragraph 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.
13. Notice and Claims to the Surety, the Owner, or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.
14. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.
15. Upon requests by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.
16. **Definitions**
  - 16.1 **Claim:** A written statement by the Claimant including at a minimum:
    1. The name of the Claimant;
    2. The name of the person for whom the labor was done, or materials or equipment furnished;
    3. A copy of the agreement or purchase order pursuant to which labor, materials, or equipment was furnished for use in the performance of the Construction Contract;
    4. A brief description of the labor, materials, or equipment furnished;
    5. The date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
  - 16.2 **Claimant:** An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials, or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond shall be to include without limitation in the terms of "labor, materials, or equipment" that part of the water, gas, power, light, heat, oil, gasoline, telephone service, or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials, or equipment were furnished.
  - 16.3 **Construction Contract:** The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.
  - 16.4 **Owner Default:** Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.
  - 16.5 **Contract Documents:** All the documents that comprise the agreement between the Owner and Contractor.
6. The total amount earned by the Claimant for labor, materials, or equipment furnished as of the date of the Claim;
7. The total amount of previous payments received by the Claimant; and
8. The total amount due and unpaid to the Claimant for labor, materials, or equipment furnished as of the date of the Claim.
17. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.
18. Modifications to this Bond are as follows:



## Contractor's Application for Payment No.

Application Period:		Application Date:	
To (Owner):	From (Contractor):	Via (Engineer):	
Project:	Contract:	Kentucky Engineering Group, PLLC	
Owner's Contract No.:	Contractor's Project No.:	Engineer's Project No.:	
N/A		15036	

### Application For Payment

#### Change Order Summary

Approved Change Orders				
Number	Additions	Deductions		
TOTALS				
NET CHANGE BY				
CHANGE ORDERS				

1. ORIGINAL CONTRACT PRICE..... \$ \_\_\_\_\_

2. Net change by Change Orders..... \$ \_\_\_\_\_

3. Current Contract Price (Line 1 ± 2)..... \$ \_\_\_\_\_

4. TOTAL COMPLETED AND STORED TO DATE  
(Column F total on Progress Estimates)..... \$ \_\_\_\_\_

5. RETAINAGE:

a.     X     \_\_\_\_\_ Work Completed..... \$ \_\_\_\_\_

b.     X     \_\_\_\_\_ Stored Material..... \$ \_\_\_\_\_

c. Total Retainage (Line 5.a + Line 5.b)..... \$ \_\_\_\_\_

6. AMOUNT ELIGIBLE TO DATE (Line 4 - Line 5.c)..... \$ \_\_\_\_\_

7. LESS PREVIOUS PAYMENTS (Line 6 from prior Application)..... \$ \_\_\_\_\_

8. AMOUNT DUE THIS APPLICATION..... \$ \_\_\_\_\_

9. BALANCE TO FINISH, PLUS RETAINAGE  
(Column G total on Progress Estimates + Line 5.c above)..... \$ \_\_\_\_\_

\$ \_\_\_\_\_

\$ \_\_\_\_\_

\$ \_\_\_\_\_

\$ \_\_\_\_\_

\$ \_\_\_\_\_

\$ \_\_\_\_\_

\$ \_\_\_\_\_

\$ \_\_\_\_\_

\$ \_\_\_\_\_

<b>Contractor's Certification</b> The undersigned Contractor certifies, to the best of its knowledge, the following: (1) All previous progress payments received from Owner on account of Work done under the Contract have been applied on account to discharge Contractor's legitimate obligations incurred in connection with the Work covered by prior Applications for Payment; (2) Title to all Work, materials and equipment incorporated in said Work, or otherwise listed in or covered by this Application for Payment, will pass to Owner at time of payment free and clear of all Liens, security interests, and encumbrances (except such as are covered by a bond acceptable to Owner indemnifying Owner against any such Liens, security interest, or encumbrances); and (3) All the Work covered by this Application for Payment is in accordance with the Contract Documents and is not defective.		Payment of:     \$ _____ <div style="text-align: center;">(Line 8 or other - attach explanation of the other amount)</div>	
<b>Contractor Signature</b> By: _____		is recommended by: _____ <div style="text-align: center;">Kentucky Engineering Group, PLLC     (Date)</div>	
Date: _____		Payment of:     \$ _____ <div style="text-align: center;">(Line 8 or other - attach explanation of the other amount)</div>	
By: _____		is approved by: _____ <div style="text-align: center;">Trimble County Water District No.1     (Date)</div>	
By: _____		Approved by: _____ <div style="text-align: center;">Rural Development     (Date)</div>	

**Change Order No.** \_\_\_\_\_

Date of Issuance:

Effective Date:

Owner: Rattlesnake Ridge Water District

Owner's Contract No.:

Contractor:

Contractor's Project No.:

Engineer: Kentucky Engineering Group, PLLC

Engineer's Project No.: 15036

Project: Phase 11 Water System Improvements

Contract Name: Contract 4

The Contract is modified as follows upon execution of this Change Order:

Description:

Attachments: *[List documents supporting change]*

<b>CHANGE IN CONTRACT PRICE</b>	<b>CHANGE IN CONTRACT TIMES</b> <i>[note changes in Milestones if applicable]</i>
Original Contract Price:  \$ _____	Original Contract Times: Substantial Completion: _____ Ready for Final Payment: _____ days or dates
[Increase] [Decrease] from previously approved Change Orders No. ____ to No. ____:  \$ _____	[Increase] [Decrease] from previously approved Change Orders No. ____ to No. ____: Substantial Completion: _____ Ready for Final Payment: _____ days
Contract Price prior to this Change Order:  \$ _____	Contract Times prior to this Change Order: Substantial Completion: _____ Ready for Final Payment: _____ days or dates
[Increase] [Decrease] of this Change Order:  \$ _____	[Increase] [Decrease] of this Change Order: Substantial Completion: _____ Ready for Final Payment: _____ days or dates
Contract Price incorporating this Change Order:  \$ _____	Contract Times with all approved Change Orders: Substantial Completion: _____ Ready for Final Payment: _____ days or dates

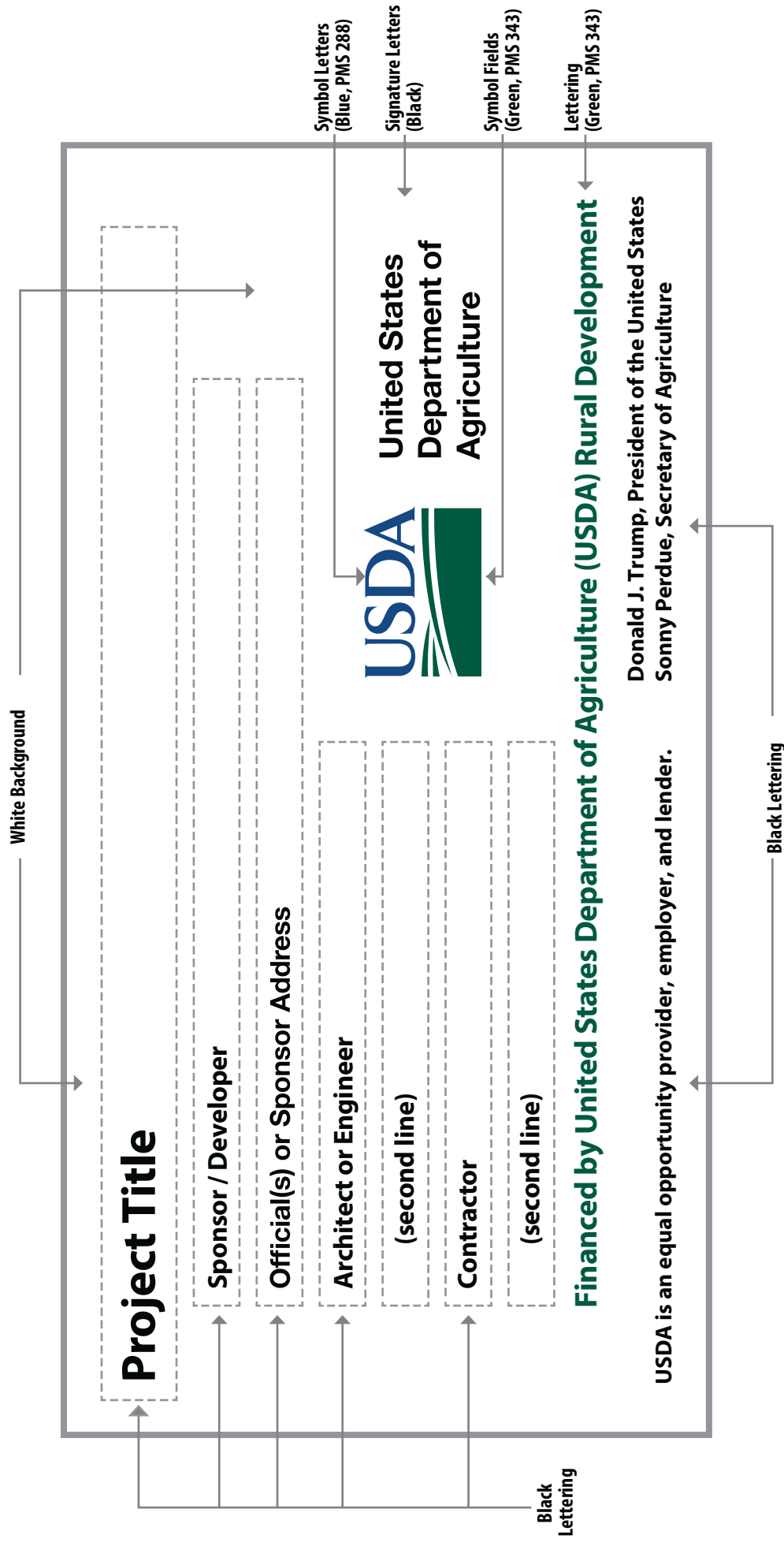
<b>RECOMMENDED:</b>	<b>ACCEPTED:</b>	<b>ACCEPTED:</b>
By: _____ Engineer (if required)	By: _____ Owner (Authorized Signature)	By: _____ Contractor (Authorized Signature)
Title: _____	Title: _____	Title: _____
Date: _____	Date: _____	Date: _____

Approved by Funding Agency (if applicable)

By: \_\_\_\_\_ Date: \_\_\_\_\_  
Title: \_\_\_\_\_

# TEMPORARY CONSTRUCTION SIGN FOR RURAL DEVELOPMENT PROJECTS

Recommended Fonts: Helvetica, Arial, or Myriad Pro



**SIGN DIMENSIONS** : 1200 mm x 2400 mm x 19 mm (approx. 4' x 8' x 3/4")  
**PLYWOOD PANEL (APA RATED A-B GRADE—EXTERIOR)**



## CERTIFICATE OF SUBSTANTIAL COMPLETION

Owner: Rattlesnake Ridge Water District  
Contractor:  
Engineer: Kentucky Engineering Group, PLLC  
Project: Phase 11 Water System Improvements

Owner's Contract No.:  
Contractor's Project No.:  
Engineer's Project No.: 15036  
Contract Name: Contract No.4

**This [preliminary] [final] Certificate of Substantial Completion applies to:**

☐ All Work ☐ The following specified portions of the Work:

### Date of Substantial Completion

The Work to which this Certificate applies has been inspected by authorized representatives of Owner, Contractor, and Engineer, and found to be substantially complete. The Date of Substantial Completion of the Work or portion thereof designated above is hereby established, subject to the provisions of the Contract pertaining to Substantial Completion. The date of Substantial Completion in the final Certificate of Substantial Completion marks the commencement of the contractual correction period and applicable warranties required by the Contract.

A punch list of items to be completed or corrected is attached to this Certificate. This list may not be all-inclusive, and the failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract.

The responsibilities between Owner and Contractor for security, operation, safety, maintenance, heat, utilities, insurance, and warranties upon Owner's use or occupancy of the Work shall be as provided in the Contract, except as amended as follows: *[Note: Amendments of contractual responsibilities recorded in this Certificate should be the product of mutual agreement of Owner and Contractor; see Paragraph 15.03.D of the General Conditions.]*

Amendments to Owner's responsibilities: ☐ None  
☐ As follows

Amendments to Contractor's responsibilities: ☐ None  
☐ As follows:

The following documents are attached to and made a part of this Certificate: *[punch list; others]*

This Certificate does not constitute an acceptance of Work not in accordance with the Contract Documents, nor is it a release of Contractor's obligation to complete the Work in accordance with the Contract.

<b>EXECUTED BY ENGINEER:</b>  By: _____ (Authorized signature)  Title: _____  Date: _____	<b>RECEIVED:</b>  By: _____ Owner (Authorized Signature)  Title: _____  Date: _____	<b>RECEIVED:</b>  By: _____ Contractor (Authorized Signature)  Title: _____  Date: _____
--	--	---

**CERTIFICATE OF OWNER'S ATTORNEY AND AGENCY CONCURRENCE**

## CERTIFICATE OF OWNER'S ATTORNEY

PROJECT NAME: Phase 11 Water System Improvements – Contract 4-Booster Stations Improvements

CONTRACTOR NAME:

I, the undersigned, \_\_\_\_\_, the duly authorized and acting legal representative of \_\_\_\_\_, do hereby certify as follows: I have examined the attached Contract(s) and performance and payment bond(s) and the manner of execution thereof, and I am of the opinion that each of the aforesaid agreements is adequate and has been duly executed by the proper parties thereto acting through their duly authorized representatives; that said representatives have full power and authority to execute said agreements on behalf of the respective parties named thereon; and that the foregoing agreements constitute valid and legally binding obligations upon the parties executing the same in accordance with the terms, conditions, and provisions thereof.

\_\_\_\_\_  
Name

\_\_\_\_\_  
Date

## AGENCY CONCURRENCE

As lender or insurer of funds to defray the costs of this Contract, and without liability for any payments thereunder, the Agency hereby concurs in the form, content, and execution of this Agreement.

\_\_\_\_\_  
Agency Representative

\_\_\_\_\_  
Date

\_\_\_\_\_  
Name

UNITED STATES DEPARTMENT OF AGRICULTURE  
Rural Utilities Service  
**KENTUCKY BULLETIN 1780-2**

**SUBJECT:** Guidance for Implementation of American Iron and Steel (AIS).

**TO:** Applicants, Consulting Engineers, Contractors, and Manufacturers

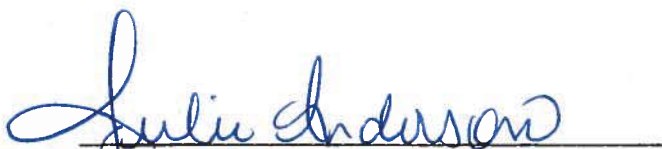
**EFFECTIVE DATE:** Date of approval.

**INSTRUCTIONS:** This is a new Bulletin and does not replace any existing Kentucky Bulletin.

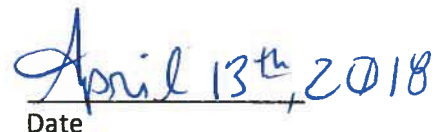
**AVAILABILITY:** This Bulletin, as well as any RD or RUS instructions, regulations, or forms referenced in this Bulletin are available at any RD State Office or Area Office. The State Office staff is familiar with the use of the documents and can answer specific questions or RD requirements.

The basic concept of this new requirement is that all iron and steel products used in projects funded by RUS WEP must be produced in the United States. Iron and steel products are defined on page 14 of this Bulletin.

**PURPOSE:** This Bulletin provides information and guidance to effected parties regarding the AIS Requirements mandated by Section 746 of Title VII Consolidated Appropriations Act of 2017 (Division A-Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act, 2017) and subsequent statues mandating domestic preference.



Julie Anderson  
State Engineer  
Water and Environmental Programs



Date

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1. BACKGROUND

- A. Section 746 of Title VII Consolidated Appropriations Act of 2017 (Division A- Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act, 2017) and subsequent statutes mandating domestic preference. It applies a new American Iron and Steel (AIS) requirement on the Rural Development (RD) WEP program.
- B. Statutory Language: SEC 746 Division A Title VII the Consolidated Appropriations Act of 2017.  
(1) No Federal funds made available for this fiscal year for the rural water, waste water, waste disposal, and solid waste management programs authorized by sections 306, 306A, 306C, 306D, and 310B of the Consolidated Farm and Rural Development Act (7 USC 1926 et seq.) shall be used for a project for the construction, alteration, maintenance, or repair of a public water or wastewater system unless all of the iron and steel products used in the project are produced in the United States.  
(2) In this section, the term "iron and steel products" means the following products made primarily of iron or steel: lined or unlined pipe flanges, manhole covers, and other municipal castings, hydrants, tanks, flanges, pipe clamps and restraints, valves, structural steel, reinforced precast concrete, and construction materials.

2. APPLICABILITY

- A. The requirements of AIS apply only to projects that construct, alter, enlarge, extend, maintain, repair or otherwise improve rural water, sanitary sewage, solid waste disposal, and storm wastewater disposal facilities.
- B. The requirements apply to projects using funds from RD WEP. Any amount of funding from this program requires compliance with the AIS requirements. Use of funds from this program is not allowed unless the requirements for AIS are met for the entire project. Projects that leverage funds from other funding sources are also subject to the requirements.
- C. The requirements apply in the United States as defined in Section 746 (g) of the statute and therefore do not apply to projects located in Puerto Rico, the Virgin Islands, or Western Pacific Territories.
- D. The requirements apply to any used iron and steel products to be constructed in the project.
- E. The requirements do not apply to projects for which any funds were obligated on or before May 5, 2017. The requirements therefore do not apply to subsequent obligation of funds for projects which had an initial obligation of funds on or before May 5, 2017.
- F. The requirements do not apply to contracts which were executed prior to or on May 5, 2017, regardless of date of obligation.

- G. The requirements do not apply to projects for which contracts were executed and/or construction is already underway and/or completed prior to applying to USDA for funding.
  - H. The requirements do not apply to products primarily composed of iron and/or steel (composed of more than 50%) if they are not listed in the statute.
  - I. The requirements do not apply to raw materials used in the production of iron or steel such as iron ore, limestone, scrap iron and scrap steel.
  - J. The requirements do not apply to any items that are at the construction site temporarily, such as scaffolding, trench boxes, and equipment temporarily used or stored on site.
  - K. The requirements do not apply when the sole purpose of the loan and/or grant is to fund non-construction activities such as capacity/connection fees or the acquisition of a system.
  - L. The requirements supersede any regulation on full and open competition stated in 7 CFR 1780.70 (b) and 2 CFR Part 200.319. For example, if an iron and steel product that is compliant with AIS is made by only one manufacturer, provided documentation is submitted and verified, sole source procurement of said product may be used.
  - M. The requirements only apply to the final product as delivered to the work site and incorporated into the project. The need for compliance of an item with AIS depends on whether or not the final assembled product is listed. Components of a final product, even if they are listed, do not need to comply with the AIS requirements. In the case of an assembled product where the primary component is not listed in the 2017 Consolidated Appropriations Act and includes components/appurtenances that are specifically listed, said assembled product is not subject to AIS (e.g. pump assembly).
3. IMPLEMENTATION (Agency, Owner, Engineer, Contractor, manufacturer's et al)
- A. There are several parties involved in compliance with the AIS requirement and some requirements are specific to a party.
  - B. The parties that have one or more responsibilities under AIS include: the Agency funding recipients under the Water and Waste Disposal Loan and Grant program and Guaranteed Loan Program, consulting engineers, construction contractors, suppliers, distributors, manufacturers; lenders under the Guaranteed Loan Program; and grantees under 306C and ECWAG programs.

4. OWNER RESPONSIBILITIES:

- A. Sign loan resolutions, grant agreements and letters of intent to meet conditions which include AIS language, accepting AIS requirements in those documents and in the letter of conditions.
- B. Sign Agreement for Engineering Services, executed construction contracts and all other appropriate and necessary documents which include AIS language.
- C. Acknowledge responsibility for compliance with AIS requirements by signing change orders (i.e. C-941 of EJCDC or RD Form 1924-7) and partial payment estimates (i.e. C-602 of EJCDC or RD Form 1924-18).
- D. Obtain the certification letters from the Engineer once substantial completion has been achieved and maintain this documentation for the life of the loan.
- E. In special cases where the Owner provides its' own engineering and/or construction services, provide copies of Engineer's Certification Letter (Exhibit B) and Contractor's Certification Letter (Exhibit C) to the Agency. Manufacturer's Certification Letter (Exhibit D) must be obtained by the Owner for each AIS qualifying product. All certification letters must be kept in the Engineer's project file and on site during construction. For Owner Construction (Force Account), all AIS clauses from Section 11 must be included in the Agreement for Engineering Services.

5. ENGINEER RESPONSIBILITIES

- A. Costs of compliance with AIS should be included in the engineering fees (if appropriate) and in Engineer's opinions of probable project costs.
- B. Develop the initial AIS Materials List (Exhibit J) for each contract using project specifications and include the initial qualifying list with the bid documents. An excel version that will compute all totals can be obtained from the RD State Office that can be used as a working copy.
- C. Include AIS language (Section 11) in the Agreement for Engineering Services.
- D. Plans, specifications, bidding documents and bid addenda must include required AIS language (Section 12). For any AIS products specified by brand names, obtain a Manufacturer's Certification Letter (Exhibit D) from the manufacturer to verify the products comply with AIS.
- E. Certify that plans, specifications, and bidding documents comply with AIS and commit that bid addenda, executed contracts and change orders will comply with AIS and submit Engineer's Certification Letter (Exhibit B) to the Agency prior to authorization to advertise for bids.

- F. Provide a copy of the Manufacturer's Certification Letter (Exhibit D) on any specified brand name AIS products in the plans, specifications and bidding documents including any bid addenda to the Contractor.
- G. Coordinate with the Contractor(s) to compile a complete AIS Materials List (Exhibit J) for each contract, sign and date, and provide a copy to the Agency in the construction contract(s).
- H. Review shop drawings and change orders to ensure compliance with AIS. For shop drawings under consideration for any brand name, equal and/or substitute, any iron and steel products subject to AIS, obtain the Manufacturer's Certification Letter (Exhibit D) from the Contractor to verify the products comply with AIS.
- I. Keep all certification letters (including those from the Engineer, Contractor, and any manufacturer providing AIS products) in the Engineer's project file.
- J. Review AIS Materials List (Exhibit J) submitted with each invoice to verify accuracy and sign and date.
- K. For any change order under consideration for any AIS products, obtain a Manufacturer's Certification Letter (Exhibit D) from party submitting the change proposal to ensure compliance with AIS.
- L. Acknowledge responsibility for compliance with AIS requirements by signing change orders (i.e. C-941 of EJCDC or RD Form 1927-7) and partial pay estimates (i.e. C-620 of EJCDC or RD Form 1924-18).
- M. Upon substantial completion of project, obtain the Contractor's Certification Letter (Exhibit C) and a complete and final AIS Materials List (Exhibit J) to submit to the RD State Engineer. Obtain copies of any/all manufacturers' certification letters for all AIS products used in the project to be kept in the Owner's project file.
- N. Resident project representative (RPR) reports must include verification, either by picture or written statement, that an item subject to AIS was installed and was in compliance with requirements.

6. CONTRACTOR RESPONSIBILITIES

- A. Review the Engineer's AIS Materials List (Exhibit J) prior to bid preparation.
- B. Bid submittal with a request for consideration from a proposed equal or substitute should also include a Manufacturer's Certification Letter (see Exhibit D) to verify the products comply with AIS.
- C. Upon award of the contract, obtain copies of any and all manufacturers' certification letters from the Engineer for brand name products specified by the Engineer.



- D. Work with the Engineer to compile a complete AIS Materials List (Exhibit J) for each contract as bid.
- E. Shop drawing submittals for proposed equals, substitutes, and any iron and steel product subject to AIS, provide a Manufacturer's Certification Letter (Exhibit D) to verify the product complies with AIS.
- F. Prior to construction, ensure that copies of any and all manufacturers' certification letters, including those from others (e.g. Engineer, Owner, etc.), for any AIS products to be used in the project are in the project file on site prior to installation.
- G. Pay request must have an updated AIS Materials List (Exhibit J) submitted with each pay request. All columns must be filled out completely as applicable. Do not complete columns under "De Minimis Materials Only" for qualifying materials. Sign and date. An excel version that will compute all totals can be obtained from the RD State Office that can be used as a working copy.
- H. Change orders for any AIS products must include a Manufacturer's Certification Letter (Exhibit D) to the Engineer to verify the products comply with AIS.
- I. Acknowledge responsibility for compliance with AIS requirement by signing change orders (i.e. C-941 of EJCDC or RD Form 1924-7) and partial pay estimates (C-620 of EJCDC or RD Form 1924-18).
- J. Keep all manufacturer certification letters (including those from the Engineer, Contractor and any manufacturer providing AIS products) on site during construction in the construction project file.
- K. Upon substantial completion of the project, provide Contractor's Certification Letter (Exhibit C) to the Engineer that all iron and steel products installed comply with AIS

7. MANUFACTURER, SUPPLIER, DISTRIBUTOR RESPONSIBILITIES

- A. If iron and steel products are produced in the United States as defined in this Bulletin, prepare (applicable to manufacturers and fabricators) or obtain (applicable to suppliers, distributors, vendors, etc.) Manufacturer's Certification Letters (Exhibit D) and make available upon request to Engineer, Contractor, etc.

8. RESPONSIBILITIES UNDER THE GUARANTEED LOAN PROGRAM

AIS applies to projects funded by Section 306A- Guaranteed Loan Program

- A. Lenders are responsible to ensure that loan recipients comply with AIS requirements.
- B. Loan recipients are ultimately responsible for compliance with AIS requirements.

9. ECWAG

- A. If construction contracts were awarded and/or executed or construction began prior to application, these projects are not subject to AIS (Section 2).
- B. If construction contracts were awarded and/or executed or construction began during the application process, these projects are subject to AIS.

10. AGREEMENT BETWEEN OWNER AND ENGINEER (EJCDC E-500) PROVISIONS

- A. Article 5.01.A: Add the following "Opinions of probable cost and any revisions thereof should reflect compliance with American Iron and Steel (AIS) requirements mandated in the Consolidated Appropriations Act of 2017 and any subsequent mandating domestic preferences."
- B. Add paragraph 5.03.B: "Opinions of total project cost and any revisions thereof should reflect compliance with AIS and any subsequent statutes mandating domestic preference."
- C. Add paragraph A.1.03.A.13: "Services required to determine and certify that to the best of the Engineer's knowledge and belief that all iron and steel products referenced in engineering analysis, the plans, specifications, bidding documents, and associated bid addenda requiring design revisions are either produced in the US or are subject to approved waiver. Services required to determine to the best of the Engineer's knowledge and belief that approved substitutes, equals, and all iron and steel products proposed in the shop drawings, change orders and partial payment estimates are either produced in the US, or are subject of an approved waiver. The de minimis and minor components waiver {add project specific waivers if applicable} apply to this contract."
- D. Add paragraph A.1.04.A.10: "Provide copies of all manufacturers' certification letters to the Bidders on brand name iron and steel products along with plans, specifications and bidding documents. Manufacturers' certification letters are to be included in the bidding documents and must be kept in the Engineer's project file and in site during construction."
- E. Add paragraph A.1.04.11: "Provide copies of all manufacturers' certification letters to the Contractor on any brand name iron and steel products along with the plans, specifications, bidding documents. Including any bid addenda and change orders. Manufacturers' certification letters must be kept in the Engineer's project file for the duration of construction."
- F. Add paragraph A.1.04.12: "Develop AIS Materials list (Exhibit J) for bidding purposes and finalize with the Contractor for tracking. Review updated AIS Materials list for accuracy each month and include in each pay request. An excel version that will compute all totals can be obtained from the RD State Office that can be used as a working copy."

- G. Modify A.1.05.A.17: Add the following prior to the first sentence "Review and approve, or take other appropriate action, with respect to shop drawings, samples, and other required Contractor submittals to ensure compliance with AIS requirements and any subsequent statutes mandating domestic preference. Any iron and steel products included in any submittal by the Contractor, must include the Manufacturer's Certification Letter (Exhibit D) to verify the products were produced in the U.S. Copies of these letters must be kept in the Engineer's project file and on site during construction."
- H. Article A.1.05.A.18: Add the following at the end of the paragraph as amended by Kentucky Bulletin 1780-1 "Prior to approval of any substitute "or equal" obtain the Manufacturer's Certification Letter (Exhibit D) to verify the products were produced in the U.S. Manufacturers' certification letters must be kept in Engineer's project file and on site during construction to ensure compliance with AIS requirements and any subsequent statutes mandating domestic preference, if applicable."
- I. Add subparagraph A.1.05.A.19.d: "Receive and review all manufacturers' certification letters for materials required to comply with AIS and any subsequent statutes mandating domestic preference to verify the products were procured in the U.S. Manufacturers' certification letters must be kept in the Engineer's project file on site during construction."
- J. Add subparagraph (c) to the end of A.1.05.A.20: (c) Review change proposals to ensure compliance with AIS requirements and any subsequent statutes mandating domestic preference."
- K. Add item "a" as a deliverable under paragraph A.1.05.A.25: (s) Obtain the Contractor's Certification Letter (Exhibit C) and copies of manufacturers' certification letters for all AIS used in the project. Upon substantial completion, provide copies of Engineer's, Contractor's, and all manufacturers' certification letters to the Owner. Attach Contractor's Certification Letter (Exhibit C) and a final AIS Materials List (Exhibit J) with letter of substantial completion and submit it to the Agency."
- L. Add the following language to B.2.02: "Owners are ultimately responsible for compliance with AIS and any subsequent statutes mandating domestic preference and will be responsible for the following:
  - 1. Signing loan resolutions, grant agreements and letter of intent to meet conditions which include AIS language, accepting AIS requirements in those documents and in the letter of conditions.
  - 2. Signing change orders (i.e. C-941 of EJCDC or RD Form 1924-7) and partial pay estimates (C-620 of EJCDC or RD Form 1924-18) and thereby acknowledging responsibility for compliance with AIS requirements.
  - 3. Obtaining all certification letters from the Engineer upon substantial completion of the project and maintaining this documentation for the life of the loan.

4. Where the Owner provides their own engineering and/or construction services, provide copies of Engineer's, and Contractor's certification letters to the Agency, and obtain all manufacturers' certification letters as required. All certification letters must be kept in the Engineer's project file and on site during construction. For Owner Construction (Force Account), all clauses from Section 11 must be included in the Agreement or Engineering Services.
5. Where the Owner directly procures AIS products, including AIS clauses in the procurement contracts and obtaining manufacturers' certification letters and providing copies to consulting engineers and contractors.

M. Add subparagraph D.1.01.C.11.g: "(g) Maintain all manufacturers' certification letters in the project file and on site during construction to ensure compliance with AIS requirements and any subsequent statutes mandating domestic preference, as applicable."

N. Add the following at the end of D.1.01.c.11b: Daily reports should document installation of an AIS material and verify by picture or statement on the report that the manufacturer was the same as that listed on the AIS materials list and complied with AIS requirements.

11. BIDDING AND CONSTRUCTION CONTRACT DOCUMENTS (EJCDC C-SERIES, 2013)

A. Advertisement for Bids (C-111)

Add at the end of C-111 prior to the Owner's name: "Section 746 of Title VII of the Consolidated Appropriations Act of 2017 (Division A- Agriculture, Rural Development, Food and Drug Administration, and Related Agencies, Appropriations Act, 2017) and subsequent statutes mandating domestic preference applies to American Iron and Steel requirement to this project. All listed iron and steel products used in this project must be produced in the United States. The term "iron and steel products" means the following products made primarily of iron and steel: lines or unlined pipes and fittings, manhole covers and other municipal castings, hydrants, tanks, flanges, pipe clamps and restraints, valves, structural steel, reinforced precast concrete, and construction materials. The de minimis and minor components waiver {all project specific waivers as applicable} apply to this contract."

B. Instruction to Bidders (C-200)

1. Article 5.01.C: Delete the semicolon at the end of the article and insert the following "included but not limited to the AIS requirements as mandated and any subsequent statutes mandating domestic preference which apply to the following products made primarily of iron or steel: lined or unlined pipes and fittings, manhole covers and other municipal castings, hydrants, tanks, flanges, pipe clamps and restraints, valves, structural steel, reinforced precast concrete, and construction materials.
2. Article 11.01: Modify article as previously amended by Kentucky Bulletin 1780-1 by inserting the following sentence after "Each such request shall comply with the requirements of Paragraphs 7.04 and 7.05 of the General Conditions. Each such request shall include the Manufacturer's Certification Letter (Exhibit D) for compliance with AIS requirements and any subsequent statutes mandating domestic preference, if applicable.

3. Article 24.02: Add paragraph 24.02:Section 746 of Title VII Consolidated Appropriations Act of 2017 (Division A- Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act, 2017) and any subsequent statues mandating domestic preference applies an American Iron and Steel requirement to this project. All iron and steel products used in this project must be procured in the United States. "Iron and Steel Products" is defined in Section 1.b.2. The de minimis and minor components waivers {add project specific waivers as applicable} apply to this contract."
- C. Bid Form (C-410)
1. Article 3.01.C: Add language at the end of the sentence "...and including all AIS requirements.
  2. Article 7.01: Add 7.01.K "Manufacturer's Certification Letter (Exhibit D) on any approved "or equal" or substitute request to ensure compliance with AIS requirements and any subsequent statutes mandating domestic preference.
- D. Supplementary General Conditions (C-800)
1. SC 1.01.A.51: "Manufacture's Certification Letter (Exhibit D) is documentation provided by the manufacturer, supplier, distributor, vendor, fabricator, etc. to various entities stating that the AIS products to be used in the project are produced in the U.S. in accordance with the AIS requirements.
  2. SC 1.01.A.52: "AIS refers to requirements mandated by Section 746 Title VII of the Consolidated Appropriation s Act of 2017 and any subsequent statutes mandating domestic preference. "Iron and Steel Products" is defined in Section 1.b.2.
  3. SC 7.03: Add sentence "all iron and steel must meet AIS requirements.
  4. SC 7.04.B.1: "Contractor shall include the Manufacturer's Certification Letter (Exhibit D) for compliance with AIS requirements to support data, if applicable. In addition, Contractor shall maintain an updated AIS Materials List (Exhibit J), to ensure that for de minimis waiver, cost is less than 5% of total materials cost for project and for minor components waiver, the cost of the non-domestically produced component is less than 5% of the total materials cost of the product." An excel version that will compute all totals can be obtained from the RD State Office that can be used as a working copy.
  5. SC 7.05.A.3.a4: "4) comply with AIS by providing the Manufacturer's Certification Letter (Exhibit D), if applicable.
  6. SC 7.11.A: Modify by inserting the following after "written interpretations and clarifications,"; "Manufacturer's Certification Letter (Exhibit D) is documentation provided by the manufacturer, supplier, distributor, vendor, fabricator, etc. to various entities stating that the iron and steel products to be used in the project are produced in the U.S. in accordance with AIS requirements.
  7. SC 7.16.A.1.e: "e. obtain the Manufacturer's Certification Letter (Exhibit D) for any item in the submittal subject to AIS requirements and include the certificate in the submittal.
  8. SC 7.16.D.9: "Engineer's review and approval of shop drawings or sample shall include review of compliance with AIS requirements, as applicable."

9. SC 7.17.E: "Contractor shall certify upon substantial completion that all work and materials has complied with AIS requirements as mandated and any subsequent statutes mandating domestic preference. Contractor shall provide Contractor's Certification Letter (Exhibit C) to Owner.
10. SC 10.10.A: "A: Services required to determine and certify that, to the best of the Engineer's knowledge and belief, all iron and steel products referenced in the engineering analysis, the plans, specifications, bidding documents, and associated bid addenda requiring design revisions are either produced in the U.S. or are the subject of an approved waiver. Services required to determine, to the best of the Engineer's knowledge and belief, that approved substitutes, equals, and all iron and steel products proposed in the shop drawings, change orders, and partial pay estimates are either produced in the U.S. or are the subject of an approved waiver under the Consolidate Appropriations Act of 2017.
11. SC 11.06.A.1: Modify by inserting the following sentence after "within 15 days after the submittal of the change proposal..." "Include supporting data (project name, name of manufacturer, city and state where the product was manufactured, description of product, signature of authorized manufacturer's representative) in the Manufacturer's Certification Letter (Exhibit D), as applicable."
12. SC 14.03G: Installation of materials that are non-compliant with AIS requirements shall be considered defective work.
13. SC 15.01.B.4: "4. By submitting materials for payment, Contractor is certifying that the submitted materials are compliant with AIS requirements. Manufacturers' Certification letter for Materials satisfy this certification. Refer to Manufacturer's Certification Letter provided in these Contract Documents.
14. SC 15.01.D.2: An updated AIS Materials List (See Exhibit J) included in these contract documents must be dated and signed and submitted with each pay request prior to payment being authorized. An excel version that will compute all totals can be obtained from the RD State Office that can be used as a working copy.
15. SC 15.01.C.2d: "d. The materials presented for payment comply with AIS requirements.
16. SC 15.03.A: Modify by adding the following "Services required to determine and certify that, to the best of the Contractor's knowledge and belief, all substitutes, equals, and iron and steel products proposed in the shop drawings, change orders, and partial payment estimates are produced in the U.S. or are the subject of an approved waiver. Services required to certify that, to the best of the Contractor's knowledge, all those products installed for the project are either produced in the U.S. or are the subject of an approved waiver.
17. SC19.14: Section 746 of Title VII of the Consolidated Appropriations Act of 2017 (Division A- Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act, 2017) and any subsequent statutes mandating domestic preference applies in AIS requirement to this project. All iron and steel products used in this project must be produced in the U.S. The term "iron and steel products" is defined in Section 1.b.2. The de minimis and minor components waivers {add project specific waivers as applicable} apply to this contract."



18. SC 19.15: add Definitions:

"Assistance recipient" is the entity that received funding assistance from programs required to comply with AIS requirements in the Consolidated Appropriations Act of 2017 and any subsequent statutes mandating domestic preference. This term includes owner and/or applicant.

"Certifications" means the following:

- *Manufacturers'* certification is the documentation provided by the manufacturer or fabricator to various entities stating that the iron and steel products to be used in the project are produced in the U.S. in accordance with AIS requirements. If items are purchased via a supplier, distributor, vendor, etc. vs. direct from the manufacturer or fabricator directly, then the supplier, distributor, vendor, etc. will be responsible for obtaining and providing these certification letters to the parties purchasing the product.
- *Engineer's* certification is documentation that plans, specifications, and bidding documents comply with AIS.
- *Contractors'* certification is documentation submitted upon substantial completion of the project that all iron and steel products installed were produced in the U.S.

"Coating" means a covering that is applied to the surface of an object. If a coating is applied to the external surface of a domestic iron or steel component, and the application takes place outside of the U.S., said product will be considered a compliant product under the AIS requirements. Any coating processes that are applied to the external surface of iron and steel components that would otherwise be AIS compliant would not disqualify the product from meeting the AIS requirements regardless of where the coating processes occur, provided that final assembly of the product occurs in the U.S. This exemption only applies to coatings on the *external surface* of iron and steel products, such as the lining of lined pipes. All manufacturing processes for lined pipes, including the application of pipe lining, must occur in U.S. for the product to be compliant with AIS requirements.

"Contractor" is the individual or entity with which the applicant has contracted (or is expected to) to perform construction services (or for water and waste projects funded by the programs which are subject to AIS requirements). This includes bidders and/or contractors that have received an award from the applicant and any party having a direct contractual relationship with the owner/applicant. A general contractor is often referred to as the prime contractor.

"Construction materials" are those articles, materials, or supplies made primarily of iron and steel, that are permanently incorporated into the project, not included mechanical and/or electrical components, equipment and systems. Some of these products may overlap with what is also considered "structural steel".

*Note:* Mechanical and electrical components, equipment, and systems are not considered construction materials. See definition of mechanical and electrical equipment.

"De minimis incidental components" are various miscellaneous low-cost components that are essential for, but incidental to, the construction and are incorporated into the physical structure of the project. Examples of incidental components could include small washers, screws, fasteners (such as "off the shelf" nuts and bolts, miscellaneous wire, corner bead, ancillary tube, signage, trash bins, door hardware etc. Costs for de minimis incidental components cumulatively may comprise no more than a total of five percent of the total cost of the materials used in and incorporated into a project. The cost of an individual item may not exceed one percent of the total cost of the materials used in and incorporated into a project.

"Engineer" is an individual or entity with which the owner has contracted to perform engineering/architectural services for water and waste projects funded by the programs subject to AIS requirements.

"Iron and Steel Products" are defined as the following products made primarily of iron and steel: lined or unlined pipes and fittings, manhole covers and other municipal castings, hydrants, tanks, flanges, pipe clamps and restraints, valves, structural steel, reinforced precast concrete, and construction materials. Only items on the above list made of primarily iron or steel, permanently incorporated into the project must be produced in the U.S. For example; trench boxes, scaffolding or equipment, which are removed from the project site upon completion of the project, are not required to be made of U.S. Iron or Steel.

"Manufacturers" meaning supplier, fabricator, distributor, materialman, or vendor is an entity with which the applicant, general contractor or with any subcontractor has contracted to furnish materials or equipment to be incorporated in the project by the applicant, contractor or subcontractor.

"Manufacturing processes" are processes such as melting, refining, forming, rolling, drawing, finishing, and fabricating. Further, if a domestic iron and steel product is taken out of the U.S. for any part of the manufacturing process, it becomes foreign source material. However, raw materials such as iron ore, limestone, and iron and steel scrap are not covered by the AIS requirements, and the material(s), if any, being applied as coating are similarly not covered. Non-iron or steel components of an iron and steel product may come from non-U.S. sources. For example, for products such as valves and hydrants, the individual non-iron and steel components do not have to be of domestic origin. Raw materials, such as iron ore, limestone, scrap iron, and scrap steel, can come from non-U.S. sources.



"Mechanical equipment" is typically that which has motorized parts and/or is powered by a motor. "Electrical equipment" is typically any machine powered by electricity and included components that are part of the electrical distribution system. AIS does not apply to mechanical equipment.

"Minor components" are components within an iron or steel product otherwise compliant with the AIS requirements. This is different from the de minimis definition where de minimis pertains to the entire project and the minor component definition pertains to a single product. This waiver would allow non-domestically produced miscellaneous minor components comprising up to five percent of the total material cost of an otherwise domestically produced iron and steel product to be used. However, unless a separate waiver for a product has been approved, all other iron and steel components in said product must still meet the AIS requirements. This waiver does not exempt the whole product from the AIS requirements. Only minor components within said product and the iron or steel components of the product must be produced domestically. Valves and hydrants are also subject to the cost ceiling requirements described here. Examples of minor components could include items such as pins and springs in valves/hydrants, bands/straps in couplings, and other low cost items such as small fasteners etc.

"Municipal castings" are cast iron and steel infrastructure products that are melted and cast. They typically provide access, protection, or housing for components incorporated into utility owned drinking water, storm water, wastewater, and solid waste infrastructure.

"National Office" refers to the office responsible for the oversight and administration of the program nationally. The National Office sets policy, develops program regulations, and provides training and technical assistance to help the state offices administer the program. The National Office is located in Washington, D.C.

"Owner" is the individual or entity with which the general contractor has contracted regarding the work, and which has agreed to pay the general contractor for the performance of the work pursuant to the terms of the contract for water and waste projects funded by the programs subject to AIS requirement. For the purpose of this Bulletin, the term is synonymous with the term "applicant" as defined in 7 CFR 1780.7 (a) (1), (2), and (3), and is an entity receiving financial assistance from the programs subject to AIS requirements.

"Primarily iron or steel" is defined as a product made of greater than 50 percent iron or steel, measured by cost. The cost should be based on the material costs. An exception to this definition is reinforced precast concrete (see Definition). All technical specifications and applicable industry standards (e.g. NIST, NSF, AWWA) must be met. If a product is determined to be less than 50 percent iron and steel, the AIS requirements do not apply.

For example, the cost of a fire hydrant includes:

1. The cost of materials used for the iron portion of the fire hydrant (e.g. bonnet, body, and shoe); and
2. The cost to pour and cast and create those components (e.g. labor and energy).

Not included in the cost are:

1. The additional material costs for the non-iron and steel internal working of the hydrant (e.g. stem, coupling, valve, seals, etc.); and
2. The cost to assemble the internal workings into the hydrant body.

"Produced in the United States" means that the production in the United States of the iron or steel products used in the project requires that all manufacturing processes must take place in the United States, with the exception of metallurgical processes involving refinement of steel additives.

"Project" is the total undertaking to be accomplished for the applicant by consulting engineers, general contractors, and others, including the planning, study, design, construction, testing, commissioning, and start-up of which the work to be performed under the contract is a part. A project includes all activity that an applicant is undertaking to be financed in whole or part by programs subject to AIS requirements. The intentional splitting of projects to separate into smaller contracts or obligations to avoid AIS requirements is prohibited.

"Reinforced Precast Concrete" may not consist of at least 50 percent iron or steel, but the reinforcing bar and wire must be produced in the United States and meet the same standards for any other iron or steel product. Additionally, the casting of the concrete product must take place in the United States. The cement and other raw materials used in concrete production are not required to be of domestic origin. If the reinforced concrete is cast at the construction site, the reinforcing bar and wire are considered to be a construction material and must be produced in the United States.

"Steel" means an alloy that includes at least 50 percent iron between 0.02 and 2 percent carbon, and may include other elements. Metallic elements such as chromium, nickel, molybdenum, manganese, and silicon may be added during the melting of steel for the purpose of enhancing properties such as corrosion resistance, hardness, or strength. The definition of steel covers carbon steel, alloy steel, stainless steel, tool steel, and other specialty steels.

"Structural steel" is rolled flanged shapes, having at least one dimension of their cross-section three inches or greater, which are used in the construction of bridges, buildings, ships, railroad rolling stock, and for numerous other constructional purposes. Such shapes are designated as wide-flange shapes, standard I beams, channels, angles, tees, and zees. Other shapes include but are not limited to, H-piles, sheet piling, tie plates, cross ties, and those for other special purposes.

"United States" means each of the several states, the District of Columbia, and each Federally Recognized Indian Tribe.

## 12. PURCHASE OF EQUIPMENT AND MATERIALS

Irrespective of who purchases AIS products, owner, contractor or other parties must ensure that the products were produced in the United States as defined in this Bulletin. It is the manufacturers' responsibility to provide manufacturers' certification letters to ensure compliance with AIS requirements. The AIS requirements supersede any regulation on full and open free competition stated in 7 CFR 1780.70(b) and (d) and 2 CFR Part 200.319. For example, if an iron and steel product that is compliant with AIS is made by only one manufacturer, sole source procurement of said product may be used.

## 13. WAIVER PROCESS

### A. General

Each entity that receives financial assistance for the construction, alteration, maintenance, or repair of water and waste infrastructure from programs mandated to comply with the statute, must use iron and steel products produced in the United States. A waiver is a legal document granting a project an exception to AIS requirements, to use iron and steel products of non-domestic origin specified in the waiver(s). More than one waiver could be applied to a project.

Any funding recipient subject to AIS requirements are eligible to apply for waivers as outlined in the statute which states:

"A waiver may be granted by the Secretary of Agriculture or designee, if one or more of the following conditions are met:

1. Applying the American Iron and Steel requirements of the Act would be inconsistent with the public interest;
2. Iron and Steel products are not produced in the United States in sufficient and reasonably available quantities or of satisfactory quality; or
3. Inclusion of iron and steel products produced in the United States will increase the overall cost of the project by more than 25 percent."

Until a waiver is granted by USDA, the AIS requirement stands except with respect to municipalities covered by international agreements (see Section 17).

One public interest waiver has been granted by the Secretary of Agriculture or designee that addresses: (1) de minimis items and (2) minor components. This waiver is national in scope and applies to all projects. The term de minimis applies to products when they occur as a de minimis incidental components as intended for assistance recipients to use for their projects. The term minor components applies to minor components within an iron and/or steel product and is intended for manufacturers to certify that their products comply with AIS requirements. For definitions of de minimis and minor components see Definitions.

B. Application

To request a project specific waiver, proper and sufficient documentation must be provided by the assistance recipient (see Exhibit H).

To apply for a waiver under condition one (public interest), applicants and their consulting engineers must demonstrate definitive impacts on the community if a specified product is not utilized. Information must be submitted to the National Office (via [ESEEngineering@wdc.usda.gov](mailto:ESEEngineering@wdc.usda.gov)), copy to the RD State Engineer and approved by the Administrator of RUS. Public interest waivers national in scope will be identified and approved by the Administrator of RUS.

To apply for a waiver under special condition two (quality or quantity), applicants and their consulting engineers must submit information outlined in Exhibit I and J to the National Office (via [ESEEngineering@wdc.usda.gov](mailto:ESEEngineering@wdc.usda.gov)).

All waiver applications must be submitted to National Office. If RD State Office receives any waiver requests, the request must be submitted to National Office for approval.

C. Timing

Waivers should be submitted prior to and no later than the submission of final plans, specifications, and bidding documents for any iron and steel products of known foreign origin. All waiver requests must be approved by the Agency prior to authorization to advertise for bids. In the event that a waiver is requested during construction such as via change order, it must be approved by the Agency prior to installation.

D. Evaluation by USDA

After receiving an application for a waiver of the AIS requirements, USDA National Office will publish the request on its website for 15 days and receive informal comment. National Office will evaluate whether the application adequately documents the statutory basis cited for the waiver. The Secretary or designee will determine whether or not to grant the waiver.

Approved and disapproved waivers will be posted on the USDA AIS website.

For project specific waivers where EPA and USDA are co-funding and the applicant has already submitted a request to and received an approval waiver from EPA, USDA will review said waiver for the co-funded project. Applicants/owners or their representatives are required to submit approved waiver to EESEngineerig@wdc.usda.gov for USDA RD review and concurrence.

All approved waivers must be included in the bidding documents, any bid addenda, change orders, and partial estimates. All information presented in waiver requests are subject to verification. Waiver requests deliberately containing false information will be rejected.

14. MONITORING

In order to comply with the Executive Order 13788 "Buy American, Hire American", dated April 18, 2017, and AIS requirements, monitoring activities will be completed by the State Office and/or National Office.

15. NON-COMPLIANCE

No Federal funds made available for the rural water, waste water, waste disposal, and solid waste management programs authorized by sections 306, 306A, 306C, 306D, 306E, and 310B of the Consolidated Farm and Rural Development Act (7 U.S.C. 1926 et seq.) shall be used for a project for the construction, alteration, maintenance, or repair of a public utility system unless all of the iron and steel products used in the project are produced in the United States.

Noncompliance occurs when funds are used from these programs for construction, alteration, maintenance, or repair using non-domestic iron or steel products and the product is not covered by either a project-specific or a national waiver. Loan and grant recipients should avoid non-compliance at all times as it is a violation of a Federal statute.

Process for Noncompliance

- (1) Identify the noncompliant product.
- (2) The loan or grant recipient notifies appropriate USDA RD State or National Office contact.
- (3) If USDA RD State Office is notified, the Program Director will notify the National Office, Director of EES.
- (4) USDA will apply remedies for noncompliance as per 2 CFR 200 338-342.

16. INTERNATIONAL AGREEMENTS

The AIS requirements apply in a manner consistent with United States obligations under international agreements. In a few cases where such an agreement exists between a loan and/or grant recipient and an international entity, the recipient is under the obligation to determine the applicability of the AIS requirements and document the actions taken to comply with these requirements.

17. USE OF EXHIBITS

The following explains the purpose of each Exhibit to this Bulletin:

- A. AMERICAN IRON AND STEEL: Exhibit A is to be read by the RD Specialist at the pre-construction and signed by all parties subject to the AIS requirements on the project. Signature of this form will serve as certification of advisement and acknowledgement of the AIS requirements.
- B. ENGINEER'S CERTIFICATION OF COMPLIANCE: Exhibit B consists of a letter to be completed and signed by the consulting engineer certifying that he/she will ensure that plans, specifications, bidding documents, and associated bid addenda, executed contracts and change orders for this project will comply with the AIS requirements. This certification letter is to be submitted to the Agency for approval prior to the Advertisement for Bids and must be kept in the engineer's project file and on-site during construction.
- C. GENERAL (PRIME) CONTRACTOR'S CERTIFICATION OF COMPLIANCE  
Exhibit C consists of a letter to be completed and signed by the general contractor certifying that he/she will ensure that all iron and steel products installed for this project, comply with the AIS requirements. This includes not only installation and/or construction by their own company, but any and all subcontractors and manufacturers their company has contracted with on this project. This certification letter is to be submitted upon substantial completion of the project to the project engineer.
- D. EXAMPLE OF A MANUFACTURER'S CERTIFICATION LETTER OF COMPLIANCE: Exhibit D is an example of a letter to be completed and signed by the manufacturer certifying that he/she will ensure that all iron and steel products and/or materials shipped or provided for the subject project are in full compliance with the AIS requirements. This includes listing each individual item/product/material provided to the project and providing the location of this/these item(s) being manufactured, including assembly. All manufacturers' certification letters must be kept in the engineer's project file and on site during construction.
- E. EXAMPLES OF MUNICIPAL CASTINGS: Exhibit E provides a sample list of iron and steel products that are subject to the AIS requirements. This list is not exhaustive and is meant only to provide examples. A unique list should be completed for each specific project/contract.



- F. **EXAMPLES OF CONSTRUCTION MATERIALS:** Exhibit F provides a sample list of construction materials that are subject to the AIS requirements. This list is not exhaustive and is meant only to provide examples.
- G. **EXAMPLES OF NON-CONSTRUCTION MATERIALS:** Exhibit G provides a sample list of items that are not subject to AIS requirements. This list is not exhaustive and is meant only to provide examples.
- H. **INFORMATIONAL CHECKLIST FOR PROJECT SPECIFIC WAIVER REQUEST:** Exhibit I is a checklist that is to be completed by the applicant and/or consulting engineer to help ensure that all appropriate and necessary information is submitted with the request to USDA. This checklist should not be used for public interest waiver. It is for informational purposes only and does not need to be included as part of the waiver application. Project specific waivers may be requested if one or more of the following conditions applies: (1) The iron and/or steel products are not produced in the United States in sufficient and reasonably available quantities and of satisfactory quality; (2) The inclusion of iron and/or steel products produced in the United States will increase the overall cost of the project by more than 25 percent. All approved waivers must be included in the bidding documents, any bid addenda, change orders, and partial estimates. All information presented in waiver requests are subject to evaluation. Waiver requests deliberately containing false information will be rejected.
- I. **EXAMPLE COST TABLE FOR A PROJECT COST WAIVER:** Exhibit I is an example of a table that must be included with any cost based project waiver request. Information included in the table; product reference in the specification, brief description of the product, quantity, unit, unit price and two costs of the item: (1) cost of an AIS compliant product and (2) cost of a non-domestic product. The total cost for all items will be part of the evaluation. Waiver requests deliberately containing false information in order to receive a project cost waiver will be rejected.
- J. **AIS MATERIALS TRACKING:** Exhibit J is a spreadsheet to track all AIS products, de minimis components, and minor components. An updated list must be signed and dated and submitted to the Engineer by the Contractor with each pay request. Once reviewed for accuracy, the signed and updated list must be submitted to the Agency with each pay request. If an AIS qualifying or de minimis material is delivered more than once, a new line will be required for each delivery of that material. An excel version that will compute all totals can be obtained from the RD State Office that can be used as a working copy.

**AMERICAN IRON AND STEEL COMPLIANCE STATEMENT**

"Section 746 of Title VII of the Consolidated Appropriations Act of 2017 (Division A- Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act, 2017) and subsequent statutes mandating domestic preference applies an American Iron and Steel requirement to this project.

All parties are required to comply with these requirements and to ensure that all iron and steel products used on this project are produced in the United States. The term "iron and steel products" means the following products made of primarily iron or steel: lined or unlined pipes and fittings, manhole covers and other municipal castings, hydrants, tanks, flanges, pipe clamps and restraints, valves, structural steel, reinforced precast concrete, and construction materials."

\_\_\_\_\_  
**RD Specialist Signature**

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

\_\_\_\_\_  
**Printed Name**

\_\_\_\_\_  
**Borrower Signature or Approved Representative**

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

\_\_\_\_\_  
**Printed Name**

\_\_\_\_\_  
**Engineer's Signature**

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

\_\_\_\_\_  
**Printed Name**

\_\_\_\_\_  
**Contractor's Signature**

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

\_\_\_\_\_  
**Printed Name**



**ENGINEER'S CERTIFICATION LETTER**

DATE:

RE: APPLICANT  
PROJECT NAME  
CONTRACT NUMBER

I hereby certify that to the best of my knowledge and belief, iron and steel products referenced in the Plans, Specifications, and Bidding Documents for this project comply with Section 746 of Title VII of the Consolidated Appropriations Act of 2017 and any subsequent statutes mandating domestic preference or are the subject of a waiver approved by the Secretary of Agriculture or designee. This certification is not intended to be a warranty in any way, but rather the designer's professional opinion that to the best of their knowledge, the products comply.

I hereby commit that to the best of my ability, all iron and steel products that will be referenced in the Bid Addenda, Executed contracts, and Change Orders will comply with Section 746 of the Title VII of the Consolidated Appropriations Act, 2017 and any subsequent statutes mandating domestic preference or are/will be the subject of a waiver approved by the Secretary of Agriculture or designee.

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Name of Engineering Firm (Print)

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By Authorized Representative (Signature)

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Title

This document is to be submitted prior to Agency authorization for Advertisement for Bids.

**CONTRACTOR'S CERTIFICATION LETTER**

DATE:

**RE: APPLICANT  
PROJECT NAME  
CONTRACT NUMBER**

I hereby certify that, to the best of my knowledge and belief, all iron and steel products installed for this project by my company and by any and all subcontractors and manufacturers my company has contracted with for this project, comply with Section 746 of Title VII of the Consolidated Appropriations Act of 2017 and any subsequent statutes mandating domestic preference or are the subject of a waiver approved by the Secretary of Agriculture or designee.

---

Name of Construction Company (Print)

---

By Authorized Representative (Signature)

---

Title

This certification is to be submitted upon completion of the project to the project engineer.

**MANUFACTURER'S CERTIFICATION LETTER**

Date:

Company Name:

Company Address:

Subject: AIS Step Certification for Project (X), Owner's Name, and Contract Number

I, (company representative), certify that the (melting, bending, galvanizing, cutting, etc.) processes for (manufacturing or fabricating) the following products and/or material shipped or provided for the subject project is in full compliance with the mandated AIS requirements.

Item, Products and/or Materials, and location of delivery (City, State)

- 1.
- 2.
- 3.

Such process for AIS took place in the following location:

---

City, State

This certification is to be submitted upon request to interested parties (e.g. municipalities, consulting engineers, general contractors, etc.)

If any of the above compliance statements change while providing materials to this project, please immediately notify the person(s) who is requesting to use your product(s).

---

Authorized Company Representative

(Note: Authorized signature shall be manufacturer's representative and not the materials distributor or supplier)

**EXAMPLES OF MUNICIPAL CASTINGS** *(includes but not limited to):*

Access Hatches  
Ballast Screen  
Benches (Iron or Steel)  
Bollards  
Cast Bases  
Cast Iron Hinged Hatches, Square and Rectangular  
Cast Iron Riser Rings  
Catch Basin Inlet  
Cleanout/Monument Boxes  
Construction Covers and Frames  
Curb Corner Guards  
Curb Openings  
Detectable Warning Plates  
Downspout Shoes (Boot, Inlet)  
Drainage Grates, Frames and Curb Inlets  
Inlets  
Junction Boxes  
Lampposts  
Manhole Covers, Rings and Frames, Risers  
Meter Boxes  
Service Boxes  
Steel Hinged Hatches, Square and Rectangular  
Steel Riser Rings  
Trash Receptacles  
Tree Grates  
Tree Guards  
Trench Grates  
Valve Boxes, Covers and Risers

**EXAMPLES OF CONSTRUCTION MATERIALS (included but not limited to)**

Wire rod, bar, angles  
Concrete reinforcing bar, wire, wire cloth  
Wire rope and cables  
Tubing  
Framing  
Joists  
Trusses  
Fasteners (i.e., nuts and bolts)  
Welding rods  
Decking  
Grating  
Railings  
Stairs  
Access ramps  
Fire escapes  
Ladders  
Wall panels  
Dome structures  
Roofing  
Ductwork  
Surface drains  
Cable hanging systems  
Manhole steps  
Fencing and fence tubing  
Guardrails  
Doors  
Stationary screens

**EXAMPLES OF NON-CONSTRUCTION MATERIALS-** (includes but not limited to):

(Note: includes appurtenances necessary for their intended use and operation and are not subject to AIS requirements)

Pumps

Motors

Gear Reducers

Drives (including variable frequency drives (VFD's)

Electric/pneumatic/manual accessories used to operate valves (such as electric valve actuators).

Mixers

Gates (e.g. sluice and slide gates)

Motorized screens (such as traveling screens)

Blowers/aeration equipment

Compressors

Meters (flow and water meters)

Sensors

Controls and switches

Supervisory control data acquisition (SCADA)

Membrane filtration systems (includes RO package plants)

Filters

Clarifier arms and clarifier mechanisms

Rakes

Grinders

Disinfection systems

Presses (including belt presses)

Conveyors

Cranes

HVAC (excluding network)

Water heaters

Heat exchangers

Generators

Cabinetry and housing (such as electrical boxes/enclosures)

Lighting fixtures

Electrical conduit

Emergency life systems

Metal office furniture

Shelving

Laboratory equipment

Analytical instrumentation

Dewatering equipment

**INFORMATIONAL CHECKLIST FOR PROJECT SPECIFIC WAIVER REQUEST**

Please reference the specifications of the product.

Information	<input type="checkbox"/>	Note
<b>General</b> <ul style="list-style-type: none"> <li>• Waiver request includes the following information:               <ul style="list-style-type: none"> <li>— Description of the foreign and domestic construction materials</li> <li>— Unit of measure</li> <li>— Quantity</li> <li>— Price</li> <li>— Date that product is needed (e.g. time of delivery or availability)</li> <li>— Location of the construction project</li> <li>— Name and address of the proposed supplier</li> <li>— A detailed justification for the use of foreign construction materials</li> </ul> </li> <li>• Waiver request was submitted according to the instructions in the memorandum</li> <li>• Assistance recipient made a good faith effort to solicit bids for domestic iron and steel products, as demonstrated by language in requests for proposals, contracts, and communications with the prime</li> </ul>		
<b>Cost Waiver Requests</b> <ul style="list-style-type: none"> <li>• Waiver request includes the following information:               <ul style="list-style-type: none"> <li>— Comparison of overall cost of project with domestic iron and steel products to overall cost of project with foreign iron and steel products (Exhibit J)</li> <li>— Relevant excerpts from the bid documents used by the contractors to complete the comparison</li> <li>— Supporting documentation indicating that the contractor made a reasonable survey of the market, such as a description of the process for identifying suppliers and a list of contacted suppliers</li> </ul> </li> </ul>		
<b>Availability Waiver Requests</b> <ul style="list-style-type: none"> <li>• Waiver request includes the following supporting documentation necessary to demonstrate the availability, quantity, and/or quality of the materials for which the waiver is requested:               <ul style="list-style-type: none"> <li>— Supplier information or pricing information from a reasonable number of domestic suppliers indicating availability/delivery date for construction materials</li> <li>— Documentation of the assistance recipient's efforts to find available domestic sources, such as a description of the process for identifying suppliers and a list of contacted suppliers.</li> <li>— Date that product is needed (e.g. time of delivery or availability) to provide justification</li> <li>— Relevant excerpts from project plans, specifications, and permits indicating the required quantity and quality of construction materials</li> </ul> </li> <li>• Waiver request includes a statement from the prime contractor and/or supplier confirming the non-availability of the domestic construction materials for which the waiver is sought</li> <li>• Has the State received other waiver requests for the materials described in this waiver request, for comparable projects?</li> </ul>		

### EXAMPLE COST TABLE FOR A PROJECT COST WAIVER

[illegible]

**TOTAL COST:**

**\$0.00**

**\$0.00**





# STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

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## ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

### 1.01 *Defined Terms*

- A. Wherever used in the Bidding Requirements or Contract Documents, a term printed with initial capital letters, including the term's singular and plural forms, will have the meaning indicated in the definitions below. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.
1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.
  2. *Agreement*—The written instrument, executed by Owner and Contractor, that sets forth the Contract Price and Contract Times, identifies the parties and the Engineer, and designates the specific items that are Contract Documents.
  3. *Application for Payment*—The form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.
  4. *Bid*—The offer of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.
  5. *Bidder*—An individual or entity that submits a Bid to Owner.
  6. *Bidding Documents*—The Bidding Requirements, the proposed Contract Documents, and all Addenda.
  7. *Bidding Requirements*—The advertisement or invitation to bid, Instructions to Bidders, Bid Bond or other Bid security, if any, the Bid Form, and the Bid with any attachments.
  8. *Change Order*—A document which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, or other revision to the Contract, issued on or after the Effective Date of the Contract.
  9. *Change Proposal*—A written request by Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment in Contract Price or Contract Times, or both; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; challenging a set-off against payments due; or seeking other relief with respect to the terms of the Contract.
  10. *Claim*—(a) A demand or assertion by Owner directly to Contractor, duly submitted in compliance with the procedural requirements set forth herein: seeking an adjustment of Contract Price or Contract Times, or both; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; contesting Engineer's decision regarding a Change Proposal; seeking resolution of a contractual issue that Engineer has declined to address; or seeking other relief with respect to the terms of the Contract; or (b) a demand or assertion by Contractor directly to Owner, duly submitted in compliance with the procedural requirements set forth herein, contesting Engineer's decision

regarding a Change Proposal; or seeking resolution of a contractual issue that Engineer has declined to address. A demand for money or services by a third party is not a Claim.

11. *Constituent of Concern*—Asbestos, petroleum, radioactive materials, polychlorinated biphenyls (PCBs), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to (a) the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. §§9601 et seq. (“CERCLA”); (b) the Hazardous Materials Transportation Act, 49 U.S.C. §§5101 et seq.; (c) the Resource Conservation and Recovery Act, 42 U.S.C. §§6901 et seq. (“RCRA”); (d) the Toxic Substances Control Act, 15 U.S.C. §§2601 et seq.; (e) the Clean Water Act, 33 U.S.C. §§1251 et seq.; (f) the Clean Air Act, 42 U.S.C. §§7401 et seq.; or (g) any other federal, state, or local statute, law, rule, regulation, ordinance, resolution, code, order, or decree regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.
12. *Contract*—The entire and integrated written contract between the Owner and Contractor concerning the Work.
13. *Contract Documents*—Those items so designated in the Agreement, and which together comprise the Contract.
14. *Contract Price*—The money that Owner has agreed to pay Contractor for completion of the Work in accordance with the Contract Documents. .
15. *Contract Times*—The number of days or the dates by which Contractor shall: (a) achieve Milestones, if any; (b) achieve Substantial Completion; and (c) complete the Work.
16. *Contractor*—The individual or entity with which Owner has contracted for performance of the Work.
17. *Cost of the Work*—See Paragraph 13.01 for definition.
18. *Drawings*—The part of the Contract that graphically shows the scope, extent, and character of the Work to be performed by Contractor.
19. *Effective Date of the Contract*—The date, indicated in the Agreement, on which the Contract becomes effective.
20. *Engineer*—The individual or entity named as such in the Agreement.
21. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but does not change the Contract Price or the Contract Times.
22. *Hazardous Environmental Condition*—The presence at the Site of Constituents of Concern in such quantities or circumstances that may present a danger to persons or property exposed thereto. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated in the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, does not establish a Hazardous Environmental Condition.



23. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
24. *Liens*—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.
25. *Milestone*—A principal event in the performance of the Work that the Contract requires Contractor to achieve by an intermediate completion date or by a time prior to Substantial Completion of all the Work.
26. *Notice of Award*—The written notice by Owner to a Bidder of Owner's acceptance of the Bid.
27. *Notice to Proceed*—A written notice by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work.
28. *Owner*—The individual or entity with which Contractor has contracted regarding the Work, and which has agreed to pay Contractor for the performance of the Work, pursuant to the terms of the Contract.
29. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor's plan to accomplish the Work within the Contract Times.
30. *Project*—The total undertaking to be accomplished for Owner by engineers, contractors, and others, including planning, study, design, construction, testing, commissioning, and start-up, and of which the Work to be performed under the Contract Documents is a part.
31. *Project Manual*—The written documents prepared for, or made available for, procuring and constructing the Work, including but not limited to the Bidding Documents or other construction procurement documents, geotechnical and existing conditions information, the Agreement, bond forms, General Conditions, Supplementary Conditions, and Specifications. The contents of the Project Manual may be bound in one or more volumes.
32. *Resident Project Representative*—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative or "RPR" includes any assistants or field staff of Resident Project Representative.
33. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and that establish the standards by which such portion of the Work will be judged.
34. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements for Engineer's review of the submittals and the performance of related construction activities.
35. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.
36. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information that are specifically prepared or assembled by or for Contractor and

submitted by Contractor to illustrate some portion of the Work. Shop Drawings, whether approved or not, are not Drawings and are not Contract Documents.

37. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements, and such other lands furnished by Owner which are designated for the use of Contractor.
38. *Specifications*—The part of the Contract that consists of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable to the Work.
39. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work.
40. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms “substantially complete” and “substantially completed” as applied to all or part of the Work refer to Substantial Completion thereof.
41. *Successful Bidder*—The Bidder whose Bid the Owner accepts, and to which the Owner makes an award of contract, subject to stated conditions.
42. *Supplementary Conditions*—The part of the Contract that amends or supplements these General Conditions.
43. *Supplier*—A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or a Subcontractor.
44. *Technical Data*—Those items expressly identified as Technical Data in the Supplementary Conditions, with respect to either (a) subsurface conditions at the Site, or physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities) or (b) Hazardous Environmental Conditions at the Site. If no such express identifications of Technical Data have been made with respect to conditions at the Site, then the data contained in boring logs, recorded measurements of subsurface water levels, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical or environmental report prepared for the Project and made available to Contractor are hereby defined as Technical Data with respect to conditions at the Site under Paragraphs 5.03, 5.04, and 5.06.
45. *Underground Facilities*—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including but not limited to those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, fiber optic transmissions, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.
46. *Unit Price Work*—Work to be paid for on the basis of unit prices.
47. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the

result of performing or providing all labor, services, and documentation necessary to produce such construction; furnishing, installing, and incorporating all materials and equipment into such construction; and may include related services such as testing, start-up, and commissioning, all as required by the Contract Documents.

48. *Work Change Directive*—A written directive to Contractor issued on or after the Effective Date of the Contract, signed by Owner and recommended by Engineer, ordering an addition, deletion, or revision in the Work.

## 1.02 Terminology

- A. The words and terms discussed in the following paragraphs are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.

B. *Intent of Certain Terms or Adjectives:*

1. The Contract Documents include the terms “as allowed,” “as approved,” “as ordered,” “as directed” or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” “satisfactory,” or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Article 10 or any other provision of the Contract Documents.

C. *Day:*

1. The word “day” means a calendar day of 24 hours measured from midnight to the next midnight.

D. *Defective:*

1. The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:
  - a. does not conform to the Contract Documents; or
  - b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or
  - c. has been damaged prior to Engineer’s recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 15.03 or 15.04).

E. *Furnish, Install, Perform, Provide:*

1. The word “furnish,” when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.

2. The word “install,” when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.
  3. The words “perform” or “provide,” when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.
  4. If the Contract Documents establish an obligation of Contractor with respect to specific services, materials, or equipment, but do not expressly use any of the four words “furnish,” “install,” “perform,” or “provide,” then Contractor shall furnish and install said services, materials, or equipment complete and ready for intended use.
- F. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

## ARTICLE 2 – PRELIMINARY MATTERS

### 2.01 *Delivery of Bonds and Evidence of Insurance*

- A. *Bonds*: When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.
- B. *Evidence of Contractor’s Insurance*: When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each named insured and additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract), the certificates and other evidence of insurance required to be provided by Contractor in accordance with Article 6.
- C. *Evidence of Owner’s Insurance*: After receipt of the executed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor, with copies to each named insured and additional insured (as identified in the Supplementary Conditions or otherwise), the certificates and other evidence of insurance required to be provided by Owner under Article 6.

### 2.02 *Copies of Documents*

- A. Owner shall furnish to Contractor four printed copies of the Contract (including one fully executed counterpart of the Agreement), and one copy in electronic portable document format (PDF). Additional printed copies will be furnished upon request at the cost of reproduction.
- B. Owner shall maintain and safeguard at least one original printed record version of the Contract, including Drawings and Specifications signed and sealed by Engineer and other design professionals. Owner shall make such original printed record version of the Contract available to Contractor for review. Owner may delegate the responsibilities under this provision to Engineer.

### 2.03 *Before Starting Construction*

- A. *Preliminary Schedules*: Within 10 days after the Effective Date of the Contract (or as otherwise specifically required by the Contract Documents), Contractor shall submit to Engineer for timely review:

1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract;
2. a preliminary Schedule of Submittals; and
3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

#### 2.04 *Preconstruction Conference; Designation of Authorized Representatives*

- A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.03.A, procedures for handling Shop Drawings, Samples, and other submittals, processing Applications for Payment, electronic or digital transmittals, and maintaining required records.
- B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit and receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

#### 2.05 *Initial Acceptance of Schedules*

- A. At least 10 days before submission of the first Application for Payment a conference, attended by Contractor, Engineer, and others as appropriate, will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.03.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.
  1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.
  2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.
  3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to the component parts of the Work.

#### 2.06 *Electronic Transmittals*

- A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may transmit, and shall accept, Project-related correspondence, text, data, documents, drawings, information, and graphics, including but not limited to Shop Drawings and other submittals, in electronic media or digital format, either directly, or through access to a secure Project website.

- B. If the Contract does not establish protocols for electronic or digital transmittals, then Owner, Engineer, and Contractor shall jointly develop such protocols.
- C. When transmitting items in electronic media or digital format, the transmitting party makes no representations as to long term compatibility, usability, or readability of the items resulting from the recipient's use of software application packages, operating systems, or computer hardware differing from those used in the drafting or transmittal of the items, or from those established in applicable transmittal protocols.

### **ARTICLE 3 – DOCUMENTS: INTENT, REQUIREMENTS, REUSE**

#### **3.01 *Intent***

- A. The Contract Documents are complementary; what is required by one is as binding as if required by all.
- B. It is the intent of the Contract Documents to describe a functionally complete project (or part thereof) to be constructed in accordance with the Contract Documents.
- C. Unless otherwise stated in the Contract Documents, if there is a discrepancy between the electronic or digital versions of the Contract Documents (including any printed copies derived from such electronic or digital versions) and the printed record version, the printed record version shall govern.
- D. The Contract supersedes prior negotiations, representations, and agreements, whether written or oral.
- E. Engineer will issue clarifications and interpretations of the Contract Documents as provided herein.

#### **3.02 *Reference Standards***

- A. Standards Specifications, Codes, Laws and Regulations
  - 1. Reference in the Contract Documents to standard specifications, manuals, reference standards, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard specification, manual, reference standard, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Contract if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.
  - 2. No provision of any such standard specification, manual, reference standard, or code, or any instruction of a Supplier, shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees, from those set forth in the part of the Contract Documents prepared by or for Engineer. No such provision or instruction shall be effective to assign to Owner, Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the part of the Contract Documents prepared by or for Engineer.



### 3.03 *Reporting and Resolving Discrepancies*

#### A. *Reporting Discrepancies:*

1. *Contractor's Verification of Figures and Field Measurements:* Before undertaking each part of the Work, Contractor shall carefully study the Contract Documents, and check and verify pertinent figures and dimensions therein, particularly with respect to applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy that Contractor discovers, or has actual knowledge of, and shall not proceed with any Work affected thereby until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract Documents issued pursuant to Paragraph 11.01.
2. *Contractor's Review of Contract Documents:* If, before or during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) actual field conditions, (c) any standard specification, manual, reference standard, or code, or (d) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 7.15) until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract Documents issued pursuant to Paragraph 11.01.
3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

#### B. *Resolving Discrepancies:*

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the part of the Contract Documents prepared by or for Engineer shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between such provisions of the Contract Documents and:
  - a. the provisions of any standard specification, manual, reference standard, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference as a Contract Document); or
  - b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

### 3.04 *Requirements of the Contract Documents*

- A. During the performance of the Work and until final payment, Contractor and Owner shall submit to the Engineer all matters in question concerning the requirements of the Contract Documents (sometimes referred to as requests for information or interpretation—RFIs), or relating to the acceptability of the Work under the Contract Documents, as soon as possible after such matters arise. Engineer will be the initial interpreter of the requirements of the Contract Documents, and judge of the acceptability of the Work thereunder.
- B. Engineer will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract

Documents. Engineer's written clarification, interpretation, or decision will be final and binding on Contractor, unless it appeals by submitting a Change Proposal, and on Owner, unless it appeals by filing a Claim.

- C. If a submitted matter in question concerns terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work under the Contract Documents, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, then Engineer will promptly give written notice to Owner and Contractor that Engineer is unable to provide a decision or interpretation. If Owner and Contractor are unable to agree on resolution of such a matter in question, either party may pursue resolution as provided in Article 12.

### 3.05 *Reuse of Documents*

- A. Contractor and its Subcontractors and Suppliers shall not:
  - 1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media editions, or reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer; or
  - 2. have or acquire any title or ownership rights in any other Contract Documents, reuse any such Contract Documents for any purpose without Owner's express written consent, or violate any copyrights pertaining to such Contract Documents.
- B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

## **ARTICLE 4 – COMMENCEMENT AND PROGRESS OF THE WORK**

### 4.01 *Commencement of Contract Times; Notice to Proceed*

- A. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Contract or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Contract. In no event will the Contract Times commence to run later than the sixtieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Contract, whichever date is earlier.

### 4.02 *Starting the Work*

- A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work shall be done at the Site prior to such date.

### 4.03 *Reference Points*

- A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or



requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

#### 4.04 *Progress Schedule*

- A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.05 as it may be adjusted from time to time as provided below.
  - 1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.05) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times.
  - 2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 11.
- B. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, or during any appeal process, except as permitted by Paragraph 16.04, or as Owner and Contractor may otherwise agree in writing.

#### 4.05 *Delays in Contractor's Progress*

- A. If Owner, Engineer, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Times and Contract Price. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
- B. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delay, disruption, or interference caused by or within the control of Contractor. Delay, disruption, and interference attributable to and within the control of a Subcontractor or Supplier shall be deemed to be within the control of Contractor.
- C. If Contractor's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault of and beyond the control of Owner, Contractor, and those for which they are responsible, then Contractor shall be entitled to an equitable adjustment in Contract Times. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this paragraph. Causes of delay, disruption, or interference that may give rise to an adjustment in Contract Times under this paragraph include but are not limited to the following:
  - 1. severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;
  - 2. abnormal weather conditions;
  - 3. acts or failures to act of utility owners (other than those performing other work at or adjacent to the Site by arrangement with the Owner, as contemplated in Article 8); and
  - 4. acts of war or terrorism.
- D. Delays, disruption, and interference to the performance or progress of the Work resulting from the existence of a differing subsurface or physical condition, an Underground Facility

that was not shown or indicated by the Contract Documents, or not shown or indicated with reasonable accuracy, and those resulting from Hazardous Environmental Conditions, are governed by Article 5.

- E. Paragraph 8.03 governs delays, disruption, and interference to the performance or progress of the Work resulting from the performance of certain other work at or adjacent to the Site.
- F. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of Contractor.
- G. Contractor must submit any Change Proposal seeking an adjustment in Contract Price or Contract Times under this paragraph within 30 days of the commencement of the delaying, disrupting, or interfering event.

## **ARTICLE 5 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS**

### **5.01 *Availability of Lands***

- A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work.
- B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which permanent improvements are to be made and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.
- C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

### **5.02 *Use of Site and Other Areas***

- A. *Limitation on Use of Site and Other Areas:*
  - 1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for (a) damage to the Site; (b) damage to any such other adjacent areas used for Contractor's operations; (c) damage to any other adjacent land or areas; and (d) for injuries and losses sustained by the owners or occupants of any such land or areas; provided that such damage or injuries result from the performance of the Work or from other actions or conduct of the Contractor or those for which Contractor is responsible.
  - 2. If a damage or injury claim is made by the owner or occupant of any such land or area because of the performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 7.12, or otherwise;

(b) promptly attempt to settle the claim as to all parties through negotiations with such owner or occupant, or otherwise resolve the claim by arbitration or other dispute resolution proceeding, or at law; and (c) to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claim, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused directly or indirectly, in whole or in part by, or based upon, Contractor's performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible.

- B. *Removal of Debris During Performance of the Work:* During the progress of the Work the Contractor shall keep the Site and other adjacent areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.
- C. *Cleaning:* Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site and adjacent areas all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.
- D. *Loading of Structures:* Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent structures or land to stresses or pressures that will endanger them.

### 5.03 *Subsurface and Physical Conditions*

- A. *Reports and Drawings:* The Supplementary Conditions identify:
  - 1. those reports known to Owner of explorations and tests of subsurface conditions at or adjacent to the Site;
  - 2. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities); and
  - 3. Technical Data contained in such reports and drawings.
- B. *Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely upon the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:
  - 1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and

procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or

2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions, or information.

#### 5.04 *Differing Subsurface or Physical Conditions*

A. *Notice by Contractor:* If Contractor believes that any subsurface or physical condition that is uncovered or revealed at the Site either:

1. is of such a nature as to establish that any Technical Data on which Contractor is entitled to rely as provided in Paragraph 5.03 is materially inaccurate; or
2. is of such a nature as to require a change in the Drawings or Specifications; or
3. differs materially from that shown or indicated in the Contract Documents; or
4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except with respect to an emergency) until receipt of a written statement permitting Contractor to do so.

B. *Engineer's Review:* After receipt of written notice as required by the preceding paragraph, Engineer will promptly review the subsurface or physical condition in question; determine the necessity of Owner's obtaining additional exploration or tests with respect to the condition; conclude whether the condition falls within any one or more of the differing site condition categories in Paragraph 5.04.A above; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the subsurface or physical condition in question and the need for any change in the Drawings or Specifications; and advise Owner in writing of Engineer's findings, conclusions, and recommendations.

C. *Owner's Statement to Contractor Regarding Site Condition:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the subsurface or physical condition in question, addressing the resumption of Work in connection with such condition, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations, in whole or in part.

D. *Possible Price and Times Adjustments:*

1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, or both, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, causes an increase or

decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

- a. such condition must fall within any one or more of the categories described in Paragraph 5.04.A;
  - b. with respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03; and,
  - c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:
    - a. Contractor knew of the existence of such condition at the time Contractor made a commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract, or otherwise; or
    - b. the existence of such condition reasonably could have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas expressly required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such commitment; or
    - c. Contractor failed to give the written notice as required by Paragraph 5.04.A.
  3. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment shall be set forth in a Change Order.
  4. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the subsurface or physical condition in question.

#### 5.05 *Underground Facilities*

- A. *Contractor's Responsibilities:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or adjacent to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:
  1. Owner and Engineer do not warrant or guarantee the accuracy or completeness of any such information or data provided by others; and
  2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:
    - a. reviewing and checking all information and data regarding existing Underground Facilities at the Site;
    - b. locating all Underground Facilities shown or indicated in the Contract Documents as being at the Site;

- c. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and
  - d. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.
- B. *Notice by Contractor:* If Contractor believes that an Underground Facility that is uncovered or revealed at the Site was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, then Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer.
- C. *Engineer's Review:* Engineer will promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the Underground Facility in question; determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Underground Facility; and advise Owner in writing of Engineer's findings, conclusions, and recommendations. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.
- D. *Owner's Statement to Contractor Regarding Underground Facility:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the Underground Facility in question, addressing the resumption of Work in connection with such Underground Facility, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations in whole or in part.
- E. *Possible Price and Times Adjustments:*
  - 1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, or both, to the extent that any existing Underground Facility at the Site that was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:
    - a. Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated the existence or actual location of the Underground Facility in question;
    - b. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03;
    - c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times; and
    - d. Contractor gave the notice required in Paragraph 5.05.B.



2. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment shall be set forth in a Change Order.
3. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.

#### 5.06 *Hazardous Environmental Conditions at Site*

##### A. *Reports and Drawings:* The Supplementary Conditions identify:

1. those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; and
2. Technical Data contained in such reports and drawings.

##### B. *Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely on the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or
2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or
3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions or information.

##### C. Contractor shall not be responsible for removing or remediating any Hazardous Environmental Condition encountered, uncovered, or revealed at the Site unless such removal or remediation is expressly identified in the Contract Documents to be within the scope of the Work.

##### D. Contractor shall be responsible for controlling, containing, and duly removing all Constituents of Concern brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible, and for any associated costs; and for the costs of removing and remediating any Hazardous Environmental Condition created by the presence of any such Constituents of Concern.

##### E. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required

by Paragraph 7.15); and (3) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 5.06.F. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous Environmental Condition, and impose a set-off against payments to account for the associated costs.

- F. Contractor shall not resume Work in connection with such Hazardous Environmental Condition or in any affected area until after Owner has obtained any required permits related thereto, and delivered written notice to Contractor either (1) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (2) specifying any special conditions under which such Work may be resumed safely.
- G. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, then within 30 days of Owner's written notice regarding the resumption of Work, Contractor may submit a Change Proposal, or Owner may impose a set-off.
- H. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work, following the contractual change procedures in Article 11. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 8.
- I. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition (1) was not shown or indicated in the Drawings, Specifications, or other Contract Documents, identified as Technical Data entitled to limited reliance pursuant to Paragraph 5.06.B, or identified in the Contract Documents to be included within the scope of the Work, and (2) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.I shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- J. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the failure to control, contain, or remove a Constituent of Concern brought to the Site by Contractor or by anyone for whom Contractor is responsible, or to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this



Paragraph 5.06.J shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

- K. The provisions of Paragraphs 5.03, 5.04, and 5.05 do not apply to the presence of Constituents of Concern or to a Hazardous Environmental Condition uncovered or revealed at the Site.

## ARTICLE 6 – BONDS AND INSURANCE

### 6.01 *Performance, Payment, and Other Bonds*

- A. Contractor shall furnish a performance bond and a payment bond, each in an amount at least equal to the Contract Price, as security for the faithful performance and payment of all of Contractor's obligations under the Contract. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 15.08, whichever is later, except as provided otherwise by Laws or Regulations, the Supplementary Conditions, or other specific provisions of the Contract. Contractor shall also furnish such other bonds as are required by the Supplementary Conditions or other specific provisions of the Contract.
- B. All bonds shall be in the form prescribed by the Contract except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (as amended and supplemented) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. A bond signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority shall show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.
- C. Contractor shall obtain the required bonds from surety companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds in the required amounts.
- D. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or its right to do business is terminated in any state or jurisdiction where any part of the Project is located, or the surety ceases to meet the requirements above, then Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the bond and surety requirements above.
- E. If Contractor has failed to obtain a required bond, Owner may exclude the Contractor from the Site and exercise Owner's termination rights under Article 16.
- F. Upon request, Owner shall provide a copy of the payment bond to any Subcontractor, Supplier, or other person or entity claiming to have furnished labor or materials used in the performance of the Work.

### 6.02 *Insurance—General Provisions*

- A. Owner and Contractor shall obtain and maintain insurance as required in this Article and in the Supplementary Conditions.
- B. All insurance required by the Contract to be purchased and maintained by Owner or Contractor shall be obtained from insurance companies that are duly licensed or

authorized, in the state or jurisdiction in which the Project is located, to issue insurance policies for the required limits and coverages. Unless a different standard is indicated in the Supplementary Conditions, all companies that provide insurance policies required under this Contract shall have an A.M. Best rating of A-VII or better.

- C. Contractor shall deliver to Owner, with copies to each named insured and additional insured (as identified in this Article, in the Supplementary Conditions, or elsewhere in the Contract), certificates of insurance establishing that Contractor has obtained and is maintaining the policies, coverages, and endorsements required by the Contract. Upon request by Owner or any other insured, Contractor shall also furnish other evidence of such required insurance, including but not limited to copies of policies and endorsements, and documentation of applicable self-insured retentions and deductibles. Contractor may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.
- D. Owner shall deliver to Contractor, with copies to each named insured and additional insured (as identified in this Article, the Supplementary Conditions, or elsewhere in the Contract), certificates of insurance establishing that Owner has obtained and is maintaining the policies, coverages, and endorsements required of Owner by the Contract (if any). Upon request by Contractor or any other insured, Owner shall also provide other evidence of such required insurance (if any), including but not limited to copies of policies and endorsements, and documentation of applicable self-insured retentions and deductibles. Owner may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.
- E. Failure of Owner or Contractor to demand such certificates or other evidence of the other party's full compliance with these insurance requirements, or failure of Owner or Contractor to identify a deficiency in compliance from the evidence provided, shall not be construed as a waiver of the other party's obligation to obtain and maintain such insurance.
- F. If either party does not purchase or maintain all of the insurance required of such party by the Contract, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage.
- G. If Contractor has failed to obtain and maintain required insurance, Owner may exclude the Contractor from the Site, impose an appropriate set-off against payment, and exercise Owner's termination rights under Article 16.
- H. Without prejudice to any other right or remedy, if a party has failed to obtain required insurance, the other party may elect to obtain equivalent insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and the Contract Price shall be adjusted accordingly.
- I. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor or Contractor's interests.
- J. The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor's liability under the indemnities granted to Owner and other individuals and entities in the Contract.

### 6.03 *Contractor's Insurance*

- A. *Workers' Compensation:* Contractor shall purchase and maintain workers' compensation and employer's liability insurance for:
  - 1. claims under workers' compensation, disability benefits, and other similar employee benefit acts.
  - 2. United States Longshoreman and Harbor Workers' Compensation Act and Jones Act coverage (if applicable).
  - 3. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees (by stop-gap endorsement in monopolist worker's compensation states).
  - 4. Foreign voluntary worker compensation (if applicable).
- B. *Commercial General Liability—Claims Covered:* Contractor shall purchase and maintain commercial general liability insurance, covering all operations by or on behalf of Contractor, on an occurrence basis, against:
  - 1. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees.
  - 2. claims for damages insured by reasonably available personal injury liability coverage.
  - 3. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom.
- C. *Commercial General Liability—Form and Content:* Contractor's commercial liability policy shall be written on a 1996 (or later) ISO commercial general liability form (occurrence form) and include the following coverages and endorsements:
  - 1. Products and completed operations coverage:
    - a. Such insurance shall be maintained for three years after final payment.
    - b. Contractor shall furnish Owner and each other additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract) evidence of continuation of such insurance at final payment and three years thereafter.
  - 2. Blanket contractual liability coverage, to the extent permitted by law, including but not limited to coverage of Contractor's contractual indemnity obligations in Paragraph 7.18.
  - 3. Broad form property damage coverage.
  - 4. Severability of interest.
  - 5. Underground, explosion, and collapse coverage.
  - 6. Personal injury coverage.
  - 7. Additional insured endorsements that include both ongoing operations and products and completed operations coverage through ISO Endorsements CG 20 10 10 01 and CG 20 37 10 01 (together); or CG 20 10 07 04 and CG 20 37 07 04 (together); or their equivalent.

8. For design professional additional insureds, ISO Endorsement CG 20 32 07 04, "Additional Insured—Engineers, Architects or Surveyors Not Engaged by the Named Insured" or its equivalent.
- D. *Automobile liability*: Contractor shall purchase and maintain automobile liability insurance against claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance, or use of any motor vehicle. The automobile liability policy shall be written on an occurrence basis.
  - E. *Umbrella or excess liability*: Contractor shall purchase and maintain umbrella or excess liability insurance written over the underlying employer's liability, commercial general liability, and automobile liability insurance described in the paragraphs above. Subject to industry-standard exclusions, the coverage afforded shall follow form as to each and every one of the underlying policies.
  - F. *Contractor's pollution liability insurance*: Contractor shall purchase and maintain a policy covering third-party injury and property damage claims, including clean-up costs, as a result of pollution conditions arising from Contractor's operations and completed operations. This insurance shall be maintained for no less than three years after final completion.
  - G. *Additional insureds*: The Contractor's commercial general liability, automobile liability, umbrella or excess, and pollution liability policies shall include and list as additional insureds Owner and Engineer, and any individuals or entities identified in the Supplementary Conditions; include coverage for the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of all such additional insureds; and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby (including as applicable those arising from both ongoing and completed operations) on a non-contributory basis. Contractor shall obtain all necessary endorsements to support these requirements.
  - H. *Contractor's professional liability insurance*: If Contractor will provide or furnish professional services under this Contract, through a delegation of professional design services or otherwise, then Contractor shall be responsible for purchasing and maintaining applicable professional liability insurance. This insurance shall provide protection against claims arising out of performance of professional design or related services, and caused by a negligent error, omission, or act for which the insured party is legally liable. It shall be maintained throughout the duration of the Contract and for a minimum of two years after Substantial Completion. If such professional design services are performed by a Subcontractor, and not by Contractor itself, then the requirements of this paragraph may be satisfied through the purchasing and maintenance of such insurance by such Subcontractor.
  - I. *General provisions*: The policies of insurance required by this Paragraph 6.03 shall:
    1. include at least the specific coverages provided in this Article.
    2. be written for not less than the limits of liability provided in this Article and in the Supplementary Conditions, or required by Laws or Regulations, whichever is greater.
    3. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed, or renewal refused until at least 10 days prior written notice has been given to Contractor. Within three days of receipt of any such written notice, Contractor shall provide a copy of the notice to Owner, Engineer, and each other insured under the policy.

4. remain in effect at least until final payment (and longer if expressly required in this Article) and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work as a warranty or correction obligation, or otherwise, or returning to the Site to conduct other tasks arising from the Contract Documents.
  5. be appropriate for the Work being performed and provide protection from claims that may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable.
- J. The coverage requirements for specific policies of insurance must be met by such policies, and not by reference to excess or umbrella insurance provided in other policies.

#### 6.04 *Owner's Liability Insurance*

- A. In addition to the insurance required to be provided by Contractor under Paragraph 6.03, Owner, at Owner's option, may purchase and maintain at Owner's expense Owner's own liability insurance as will protect Owner against claims which may arise from operations under the Contract Documents.
- B. Owner's liability policies, if any, operate separately and independently from policies required to be provided by Contractor, and Contractor cannot rely upon Owner's liability policies for any of Contractor's obligations to the Owner, Engineer, or third parties.

#### 6.05 *Property Insurance*

- A. *Builder's Risk:* Unless otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain builder's risk insurance upon the Work on a completed value basis, in the amount of the full insurable replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:
  1. include the Owner and Contractor as named insureds, and all Subcontractors, and any individuals or entities required by the Supplementary Conditions to be insured under such builder's risk policy, as insureds or named insureds. For purposes of the remainder of this Paragraph 6.05, Paragraphs 6.06 and 6.07, and any corresponding Supplementary Conditions, the parties required to be insured shall collectively be referred to as "insureds."
  2. be written on a builder's risk "all risk" policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire; lightning; windstorm; riot; civil commotion; terrorism; vehicle impact; aircraft; smoke; theft; vandalism and malicious mischief; mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; flood; collapse; explosion; debris removal; demolition occasioned by enforcement of Laws and Regulations; water damage (other than that caused by flood); and such other perils or causes of loss as may be specifically required by the Supplementary Conditions. If insurance against mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; or flood, are not commercially available

under builder's risk policies, by endorsement or otherwise, such insurance may be provided through other insurance policies acceptable to Owner and Contractor.

3. cover, as insured property, at least the following: (a) the Work and all materials, supplies, machinery, apparatus, equipment, fixtures, and other property of a similar nature that are to be incorporated into or used in the preparation, fabrication, construction, erection, or completion of the Work, including Owner-furnished or assigned property; (b) spare parts inventory required within the scope of the Contract; and (c) temporary works which are not intended to form part of the permanent constructed Work but which are intended to provide working access to the Site, or to the Work under construction, or which are intended to provide temporary support for the Work under construction, including scaffolding, form work, fences, shoring, falsework, and temporary structures.
  4. cover expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects).
  5. extend to cover damage or loss to insured property while in temporary storage at the Site or in a storage location outside the Site (but not including property stored at the premises of a manufacturer or Supplier).
  6. extend to cover damage or loss to insured property while in transit.
  7. allow for partial occupation or use of the Work by Owner, such that those portions of the Work that are not yet occupied or used by Owner shall remain covered by the builder's risk insurance.
  8. allow for the waiver of the insurer's subrogation rights, as set forth below.
  9. provide primary coverage for all losses and damages caused by the perils or causes of loss covered.
  10. not include a co-insurance clause.
  11. include an exception for ensuing losses from physical damage or loss with respect to any defective workmanship, design, or materials exclusions.
  12. include performance/hot testing and start-up.
  13. be maintained in effect, subject to the provisions herein regarding Substantial Completion and partial occupancy or use of the Work by Owner, until the Work is complete.
- B. *Notice of Cancellation or Change:* All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this Paragraph 6.05 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 10 days prior written notice has been given to the purchasing policyholder. Within three days of receipt of any such written notice, the purchasing policyholder shall provide a copy of the notice to each other insured.
- C. *Deductibles:* The purchaser of any required builder's risk or property insurance shall pay for costs not covered because of the application of a policy deductible.
- D. *Partial Occupancy or Use by Owner:* If Owner will occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 15.04, then Owner (directly, if it is the purchaser of the builder's risk policy, or through Contractor) will



provide notice of such occupancy or use to the builder's risk insurer. The builder's risk insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy; rather, those portions of the Work that are occupied or used by Owner may come off the builder's risk policy, while those portions of the Work not yet occupied or used by Owner shall remain covered by the builder's risk insurance.

- E. *Additional Insurance*: If Contractor elects to obtain other special insurance to be included in or supplement the builder's risk or property insurance policies provided under this Paragraph 6.05, it may do so at Contractor's expense.
- F. *Insurance of Other Property*: If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, such as tools, construction equipment, or other personal property owned by Contractor, a Subcontractor, or an employee of Contractor or a Subcontractor, then the entity or individual owning such property item will be responsible for deciding whether to insure it, and if so in what amount.

#### 6.06 *Waiver of Rights*

- A. All policies purchased in accordance with Paragraph 6.05, expressly including the builder's risk policy, shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any insureds thereunder, or against Engineer or its consultants, or their officers, directors, members, partners, employees, agents, consultants, or subcontractors. Owner and Contractor waive all rights against each other and the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Engineer, its consultants, all Subcontractors, all individuals or entities identified in the Supplementary Conditions as insureds, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner or Contractor as trustee or fiduciary, or otherwise payable under any policy so issued.
- B. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, for:
  - 1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other perils whether or not insured by Owner; and
  - 2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial occupancy or use pursuant to Paragraph 15.04, after Substantial Completion pursuant to Paragraph 15.03, or after final payment pursuant to Paragraph 15.06.
- C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 6.06.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of

recovery against Contractor, Subcontractors, or Engineer, or the officers, directors, members, partners, employees, agents, consultants, or subcontractors of each and any of them.

- D. Contractor shall be responsible for assuring that the agreement under which a Subcontractor performs a portion of the Work contains provisions whereby the Subcontractor waives all rights against Owner, Contractor, all individuals or entities identified in the Supplementary Conditions as insureds, the Engineer and its consultants, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by builder's risk insurance and any other property insurance applicable to the Work.

#### 6.07 *Receipt and Application of Property Insurance Proceeds*

- A. Any insured loss under the builder's risk and other policies of insurance required by Paragraph 6.05 will be adjusted and settled with the named insured that purchased the policy. Such named insured shall act as fiduciary for the other insureds, and give notice to such other insureds that adjustment and settlement of a claim is in progress. Any other insured may state its position regarding a claim for insured loss in writing within 15 days after notice of such claim.
- B. Proceeds for such insured losses may be made payable by the insurer either jointly to multiple insureds, or to the named insured that purchased the policy in its own right and as fiduciary for other insureds, subject to the requirements of any applicable mortgage clause. A named insured receiving insurance proceeds under the builder's risk and other policies of insurance required by Paragraph 6.05 shall distribute such proceeds in accordance with such agreement as the parties in interest may reach, or as otherwise required under the dispute resolution provisions of this Contract or applicable Laws and Regulations.
- C. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the money so received applied on account thereof, and the Work and the cost thereof covered by Change Order, if needed.

### **ARTICLE 7 – CONTRACTOR'S RESPONSIBILITIES**

#### 7.01 *Supervision and Superintendence*

- A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction.
- B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

#### 7.02 *Labor; Working Hours*

- A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.



- B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours, Monday through Friday. Contractor will not perform Work on a Saturday, Sunday, or any legal holiday. Contractor may perform Work outside regular working hours or on Saturdays, Sundays, or legal holidays only with Owner's written consent, which will not be unreasonably withheld.

#### 7.03 *Services, Materials, and Equipment*

- A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start up, and completion of the Work, whether or not such items are specifically called for in the Contract Documents.
- B. All materials and equipment incorporated into the Work shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.
- C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

#### 7.04 *"Or Equals"*

- A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the Contract Price has been based upon Contractor furnishing such item as specified. The specification or description of such an item is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or equal" item is permitted, Contractor may request that Engineer authorize the use of other items of material or equipment, or items from other proposed suppliers under the circumstances described below.
  - 1. If Engineer in its sole discretion determines that an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, Engineer shall deem it an "or equal" item. For the purposes of this paragraph, a proposed item of material or equipment will be considered functionally equal to an item so named if:
    - a. in the exercise of reasonable judgment Engineer determines that:
      - 1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;
      - 2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;

- 3) it has a proven record of performance and availability of responsive service; and
- 4) it is not objectionable to Owner.
- b. Contractor certifies that, if approved and incorporated into the Work:
  - 1) there will be no increase in cost to the Owner or increase in Contract Times; and
  - 2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.
- B. *Contractor's Expense*: Contractor shall provide all data in support of any proposed "or equal" item at Contractor's expense.
- C. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each "or-equal" request. Engineer may require Contractor to furnish additional data about the proposed "or-equal" item. Engineer will be the sole judge of acceptability. No "or-equal" item will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an "or-equal", which will be evidenced by an approved Shop Drawing or other written communication. Engineer will advise Contractor in writing of any negative determination.
- D. *Effect of Engineer's Determination*: Neither approval nor denial of an "or-equal" request shall result in any change in Contract Price. The Engineer's denial of an "or-equal" request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents.
- E. *Treatment as a Substitution Request*: If Engineer determines that an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item, Contractor may request that Engineer consider the proposed item as a substitute pursuant to Paragraph 7.05.

#### 7.05 Substitutes

- A. Unless the specification or description of an item of material or equipment required to be furnished under the Contract Documents contains or is followed by words reading that no substitution is permitted, Contractor may request that Engineer authorize the use of other items of material or equipment under the circumstances described below. To the extent possible such requests shall be made before commencement of related construction at the Site.
  - 1. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is functionally equivalent to that named and an acceptable substitute therefor. Engineer will not accept requests for review of proposed substitute items of material or equipment from anyone other than Contractor.
  - 2. The requirements for review by Engineer will be as set forth in Paragraph 7.05.B, as supplemented by the Specifications, and as Engineer may decide is appropriate under the circumstances.
  - 3. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:

- a. shall certify that the proposed substitute item will:
    - 1) perform adequately the functions and achieve the results called for by the general design,
    - 2) be similar in substance to that specified, and
    - 3) be suited to the same use as that specified.
  - b. will state:
    - 1) the extent, if any, to which the use of the proposed substitute item will necessitate a change in Contract Times,
    - 2) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item, and
    - 3) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty.
  - c. will identify:
    - 1) all variations of the proposed substitute item from that specified, and
    - 2) available engineering, sales, maintenance, repair, and replacement services.
  - d. shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including but not limited to changes in Contract Price, shared savings, costs of redesign, and claims of other contractors affected by any resulting change.
- B. *Engineer's Evaluation and Determination:* Engineer will be allowed a reasonable time to evaluate each substitute request, and to obtain comments and direction from Owner. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No substitute will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an acceptable substitute. Engineer's determination will be evidenced by a Field Order or a proposed Change Order accounting for the substitution itself and all related impacts, including changes in Contract Price or Contract Times. Engineer will advise Contractor in writing of any negative determination.
- C. *Special Guarantee:* Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.
- D. *Reimbursement of Engineer's Cost:* Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.
- E. *Contractor's Expense:* Contractor shall provide all data in support of any proposed substitute at Contractor's expense.

- F. *Effect of Engineer's Determination:* If Engineer approves the substitution request, Contractor shall execute the proposed Change Order and proceed with the substitution. The Engineer's denial of a substitution request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.05.D, by timely submittal of a Change Proposal.

7.06 *Concerning Subcontractors, Suppliers, and Others*

- A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner.
- B. Contractor shall retain specific Subcontractors, Suppliers, or other individuals or entities for the performance of designated parts of the Work if required by the Contract to do so.
- C. Subsequent to the submittal of Contractor's Bid or final negotiation of the terms of the Contract, Owner may not require Contractor to retain any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against which Contractor has reasonable objection.
- D. Prior to entry into any binding subcontract or purchase order, Contractor shall submit to Owner the identity of the proposed Subcontractor or Supplier (unless Owner has already deemed such proposed Subcontractor or Supplier acceptable, during the bidding process or otherwise). Such proposed Subcontractor or Supplier shall be deemed acceptable to Owner unless Owner raises a substantive, reasonable objection within five days.
- E. Owner may require the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work. Owner also may require Contractor to retain specific replacements; provided, however, that Owner may not require a replacement to which Contractor has a reasonable objection. If Contractor has submitted the identity of certain Subcontractors, Suppliers, or other individuals or entities for acceptance by Owner, and Owner has accepted it (either in writing or by failing to make written objection thereto), then Owner may subsequently revoke the acceptance of any such Subcontractor, Supplier, or other individual or entity so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity.
- F. If Owner requires the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, or both, with respect to the replacement; and Contractor shall initiate a Change Proposal for such adjustment within 30 days of Owner's requirement of replacement.
- G. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of the right of Owner to the completion of the Work in accordance with the Contract Documents.
- H. On a monthly basis Contractor shall submit to Engineer a complete list of all Subcontractors and Suppliers having a direct contract with Contractor, and of all other Subcontractors and Suppliers known to Contractor at the time of submittal.
- I. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions.

- J. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors, Suppliers, and all other individuals or entities performing or furnishing any of the Work.
- K. Contractor shall restrict all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed herein.
- L. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.
- M. All Work performed for Contractor by a Subcontractor or Supplier shall be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer.
- N. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor on account of Work performed for Contractor by the particular Subcontractor or Supplier.
- O. Nothing in the Contract Documents:
  - 1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier, or other individual or entity; nor
  - 2. shall create any obligation on the part of Owner or Engineer to pay or to see to the payment of any money due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

#### 7.07 *Patent Fees and Royalties*

- A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents.
- B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.

- C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

#### 7.08 *Permits*

- A. Unless otherwise provided in the Contract Documents, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of the submission of Contractor's Bid (or when Contractor became bound under a negotiated contract). Owner shall pay all charges of utility owners for connections for providing permanent service to the Work

#### 7.09 *Taxes*

- A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

#### 7.10 *Laws and Regulations*

- A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.
- B. If Contractor performs any Work or takes any other action knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all resulting costs and losses, and shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work or other action. It shall not be Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.
- C. Owner or Contractor may give notice to the other party of any changes after the submission of Contractor's Bid (or after the date when Contractor became bound under a negotiated contract) in Laws or Regulations having an effect on the cost or time of performance of the Work, including but not limited to changes in Laws or Regulations having an effect on procuring permits and on sales, use, value-added, consumption, and other similar taxes. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times resulting from such changes, then within 30 days of such notice Contractor may submit a Change Proposal, or Owner may initiate a Claim.



### 7.11 *Record Documents*

- A. Contractor shall maintain in a safe place at the Site one printed record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, written interpretations and clarifications, and approved Shop Drawings. Contractor shall keep such record documents in good order and annotate them to show changes made during construction. These record documents, together with all approved Samples, will be available to Engineer for reference. Upon completion of the Work, Contractor shall deliver these record documents to Engineer.

### 7.12 *Safety and Protection*

- A. Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury, or loss to:
  - 1. all persons on the Site or who may be affected by the Work;
  - 2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
  - 3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, other work in progress, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.
- B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify Owner; the owners of adjacent property, Underground Facilities, and other utilities; and other contractors and utility owners performing work at or adjacent to the Site, when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property or work in progress.
- C. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. The Supplementary Conditions identify any Owner's safety programs that are applicable to the Work.
- D. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.
- E. All damage, injury, or loss to any property referred to in Paragraph 7.12.A.2 or 7.12.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor at its expense (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of

Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).

- F. Contractor's duties and responsibilities for safety and protection shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 15.06.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).
- G. Contractor's duties and responsibilities for safety and protection shall resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from the Contract Documents.

#### 7.13 *Safety Representative*

- A. Contractor shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

#### 7.14 *Hazard Communication Programs*

- A. Contractor shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.

#### 7.15 *Emergencies*

- A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent threatened damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby or are required as a result thereof. If Engineer determines that a change in the Contract Documents is required because of the action taken by Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

#### 7.16 *Shop Drawings, Samples, and Other Submittals*

- A. *Shop Drawing and Sample Submittal Requirements:*
  - 1. Before submitting a Shop Drawing or Sample, Contractor shall have:
    - a. reviewed and coordinated the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
    - b. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;
    - c. determined and verified the suitability of all materials and equipment offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
    - d. determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.



2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review of that submittal, and that Contractor approves the submittal.
  3. With each submittal, Contractor shall give Engineer specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be set forth in a written communication separate from the Shop Drawings or Sample submittal; and, in addition, in the case of Shop Drawings by a specific notation made on each Shop Drawing submitted to Engineer for review and approval of each such variation.
- B. *Submittal Procedures for Shop Drawings and Samples:* Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals. Each submittal will be identified as Engineer may require.
1. *Shop Drawings:*
    - a. Contractor shall submit the number of copies required in the Specifications.
    - b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide and to enable Engineer to review the information for the limited purposes required by Paragraph 7.16.D.
  2. *Samples:*
    - a. Contractor shall submit the number of Samples required in the Specifications.
    - b. Contractor shall clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 7.16.D.
  3. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.
- C. *Other Submittals:* Contractor shall submit other submittals to Engineer in accordance with the accepted Schedule of Submittals, and pursuant to the applicable terms of the Specifications.
- D. *Engineer's Review:*
1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.
  2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction or to safety precautions or programs incident thereto.

3. Engineer's review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.
4. Engineer's review and approval of a Shop Drawing or Sample shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 7.16.A.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer will document any such approved variation from the requirements of the Contract Documents in a Field Order.
5. Engineer's review and approval of a Shop Drawing or Sample shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 7.16.A and B.
6. Engineer's review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Contract Documents, shall not, under any circumstances, change the Contract Times or Contract Price, unless such changes are included in a Change Order.
7. Neither Engineer's receipt, review, acceptance or approval of a Shop Drawing, Sample, or other submittal shall result in such item becoming a Contract Document.
8. Contractor shall perform the Work in compliance with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 7.16.D.4.

E. *Resubmittal Procedures:*

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous submittals.
2. Contractor shall furnish required submittals with sufficient information and accuracy to obtain required approval of an item with no more than three submittals. Engineer will record Engineer's time for reviewing a fourth or subsequent submittal of a Shop Drawings, sample, or other item requiring approval, and Contractor shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges.
3. If Contractor requests a change of a previously approved submittal item, Contractor shall be responsible for Engineer's charges to Owner for its review time, and Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.

7.17 *Contractor's General Warranty and Guarantee*

- A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on Contractor's warranty and guarantee.

- B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:
  - 1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
  - 2. normal wear and tear under normal usage.
- C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:
  - 1. observations by Engineer;
  - 2. recommendation by Engineer or payment by Owner of any progress or final payment;
  - 3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;
  - 4. use or occupancy of the Work or any part thereof by Owner;
  - 5. any review and approval of a Shop Drawing or Sample submittal;
  - 6. the issuance of a notice of acceptability by Engineer;
  - 7. any inspection, test, or approval by others; or
  - 8. any correction of defective Work by Owner.
- D. If the Contract requires the Contractor to accept the assignment of a contract entered into by Owner, then the specific warranties, guarantees, and correction obligations contained in the assigned contract shall govern with respect to Contractor's performance obligations to Owner for the Work described in the assigned contract.

#### 7.18 *Indemnification*

- A. To the fullest extent permitted by Laws and Regulations, and in addition to any other obligations of Contractor under the Contract or otherwise, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable.
- B. In any and all claims against Owner or Engineer or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 7.18.A shall not be limited in any way by any

limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

- C. The indemnification obligations of Contractor under Paragraph 7.18.A shall not extend to the liability of Engineer and Engineer's officers, directors, members, partners, employees, agents, consultants and subcontractors arising out of:
  - 1. the preparation or approval of, or the failure to prepare or approve maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or
  - 2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

#### 7.19 *Delegation of Professional Design Services*

- A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable Laws and Regulations.
- B. If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.
- C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.
- D. Pursuant to this paragraph, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 7.16.D.1.
- E. Contractor shall not be responsible for the adequacy of the performance or design criteria specified by Owner or Engineer.

### **ARTICLE 8 – OTHER WORK AT THE SITE**

#### 8.01 *Other Work*

- A. In addition to and apart from the Work under the Contract Documents, the Owner may perform other work at or adjacent to the Site. Such other work may be performed by Owner's employees, or through contracts between the Owner and third parties. Owner

may also arrange to have third-party utility owners perform work on their utilities and facilities at or adjacent to the Site.

- B. If Owner performs other work at or adjacent to the Site with Owner's employees, or through contracts for such other work, then Owner shall give Contractor written notice thereof prior to starting any such other work. If Owner has advance information regarding the start of any utility work at or adjacent to the Site, Owner shall provide such information to Contractor.
- C. Contractor shall afford each other contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected.
- D. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 8, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

#### 8.02 *Coordination*

- A. If Owner intends to contract with others for the performance of other work at or adjacent to the Site, to perform other work at or adjacent to the Site with Owner's employees, or to arrange to have utility owners perform work at or adjacent to the Site, the following will be set forth in the Supplementary Conditions or provided to Contractor prior to the start of any such other work:
  - 1. the identity of the individual or entity that will have authority and responsibility for coordination of the activities among the various contractors;
  - 2. an itemization of the specific matters to be covered by such authority and responsibility; and
  - 3. the extent of such authority and responsibilities.
- B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

#### 8.03 *Legal Relationships*

- A. If, in the course of performing other work at or adjacent to the Site for Owner, the Owner's employees, any other contractor working for Owner, or any utility owner for whom the Owner is responsible causes damage to the Work or to the property of Contractor or its Subcontractors, or delays, disrupts, interferes with, or increases the scope or cost of the performance of the Work, through actions or inaction, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor

must submit any Change Proposal seeking an equitable adjustment in the Contract Price or the Contract Times under this paragraph within 30 days of the damaging, delaying, disrupting, or interfering event. The entitlement to, and extent of, any such equitable adjustment shall take into account information (if any) regarding such other work that was provided to Contractor in the Contract Documents prior to the submittal of the Bid or the final negotiation of the terms of the Contract. When applicable, any such equitable adjustment in Contract Price shall be conditioned on Contractor assigning to Owner all Contractor's rights against such other contractor or utility owner with respect to the damage, delay, disruption, or interference that is the subject of the adjustment. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.

- B. Contractor shall take reasonable and customary measures to avoid damaging, delaying, disrupting, or interfering with the work of Owner, any other contractor, or any utility owner performing other work at or adjacent to the Site. If Contractor fails to take such measures and as a result damages, delays, disrupts, or interferes with the work of any such other contractor or utility owner, then Owner may impose a set-off against payments due to Contractor, and assign to such other contractor or utility owner the Owner's contractual rights against Contractor with respect to the breach of the obligations set forth in this paragraph.
- C. When Owner is performing other work at or adjacent to the Site with Owner's employees, Contractor shall be liable to Owner for damage to such other work, and for the reasonable direct delay, disruption, and interference costs incurred by Owner as a result of Contractor's failure to take reasonable and customary measures with respect to Owner's other work. In response to such damage, delay, disruption, or interference, Owner may impose a set-off against payments due to Contractor.
- D. If Contractor damages, delays, disrupts, or interferes with the work of any other contractor, or any utility owner performing other work at or adjacent to the Site, through Contractor's failure to take reasonable and customary measures to avoid such impacts, or if any claim arising out of Contractor's actions, inactions, or negligence in performance of the Work at or adjacent to the Site is made by any such other contractor or utility owner against Contractor, Owner, or Engineer, then Contractor shall (1) promptly attempt to settle the claim as to all parties through negotiations with such other contractor or utility owner, or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law, and (2) indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claims, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such damage, delay, disruption, or interference.

## ARTICLE 9 – OWNER'S RESPONSIBILITIES

### 9.01 *Communications to Contractor*

- A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.



9.02 *Replacement of Engineer*

- A. Owner may at its discretion appoint an engineer to replace Engineer, provided Contractor makes no reasonable objection to the replacement engineer. The replacement engineer's status under the Contract Documents shall be that of the former Engineer.

9.03 *Furnish Data*

- A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

9.04 *Pay When Due*

- A. Owner shall make payments to Contractor when they are due as provided in the Agreement.

9.05 *Lands and Easements; Reports, Tests, and Drawings*

- A. Owner's duties with respect to providing lands and easements are set forth in Paragraph 5.01.
- B. Owner's duties with respect to providing engineering surveys to establish reference points are set forth in Paragraph 4.03.
- C. Article 5 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of conditions at the Site, and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

9.06 *Insurance*

- A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 6.

9.07 *Change Orders*

- A. Owner's responsibilities with respect to Change Orders are set forth in Article 11.

9.08 *Inspections, Tests, and Approvals*

- A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 14.02.B.

9.09 *Limitations on Owner's Responsibilities*

- A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

9.10 *Undisclosed Hazardous Environmental Condition*

- A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 5.06.

9.11 *Evidence of Financial Arrangements*

- A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents (including obligations under proposed changes in the Work).

### 9.12 *Safety Programs*

- A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed.
- B. Owner shall furnish copies of any applicable Owner safety programs to Contractor.

## **ARTICLE 10 – ENGINEER'S STATUS DURING CONSTRUCTION**

### 10.01 *Owner's Representative*

- A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract.

### 10.02 *Visits to Site*

- A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.
- B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 10.08. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

### 10.03 *Project Representative*

- A. If Owner and Engineer have agreed that Engineer will furnish a Resident Project Representative to represent Engineer at the Site and assist Engineer in observing the progress and quality of the Work, then the authority and responsibilities of any such Resident Project Representative will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in Paragraph 10.08. If Owner designates another representative or agent to represent Owner at the Site who is not Engineer's consultant, agent, or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions.

### 10.04 *Rejecting Defective Work*

- A. Engineer has the authority to reject Work in accordance with Article 14.



10.05 *Shop Drawings, Change Orders and Payments*

- A. Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, are set forth in Paragraph 7.16.
- B. Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, are set forth in Paragraph 7.19.
- C. Engineer's authority as to Change Orders is set forth in Article 11.
- D. Engineer's authority as to Applications for Payment is set forth in Article 15.

10.06 *Determinations for Unit Price Work*

- A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor as set forth in Paragraph 13.03.

10.07 *Decisions on Requirements of Contract Documents and Acceptability of Work*

- A. Engineer will render decisions regarding the requirements of the Contract Documents, and judge the acceptability of the Work, pursuant to the specific procedures set forth herein for initial interpretations, Change Proposals, and acceptance of the Work. In rendering such decisions and judgments, Engineer will not show partiality to Owner or Contractor, and will not be liable to Owner, Contractor, or others in connection with any proceedings, interpretations, decisions, or judgments conducted or rendered in good faith.

10.08 *Limitations on Engineer's Authority and Responsibilities*

- A. Neither Engineer's authority or responsibility under this Article 10 or under any other provision of the Contract, nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer, shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.
- B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.
- C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.
- D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 15.06.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals, that the results certified indicate compliance with the Contract Documents.
- E. The limitations upon authority and responsibility set forth in this Paragraph 10.08 shall also apply to the Resident Project Representative, if any.

#### 10.09 *Compliance with Safety Program*

- A. While at the Site, Engineer's employees and representatives will comply with the specific applicable requirements of Owner's and Contractor's safety programs (if any) of which Engineer has been informed.

### **ARTICLE 11 – AMENDING THE CONTRACT DOCUMENTS; CHANGES IN THE WORK**

#### 11.01 *Amending and Supplementing Contract Documents*

- A. The Contract Documents may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.
  - 1. *Change Orders:*
    - a. If an amendment or supplement to the Contract Documents includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order. A Change Order also may be used to establish amendments and supplements of the Contract Documents that do not affect the Contract Price or Contract Times.
    - b. Owner and Contractor may amend those terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, without the recommendation of the Engineer. Such an amendment shall be set forth in a Change Order.
  - 2. *Work Change Directives:* A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the modification ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order, following negotiations by the parties as to the Work Change Directive's effect, if any, on the Contract Price and Contract Times; or, if negotiations are unsuccessful, by a determination under the terms of the Contract Documents governing adjustments, expressly including Paragraph 11.04 regarding change of Contract Price. Contractor must submit any Change Proposal seeking an adjustment of the Contract Price or the Contract Times, or both, no later than 30 days after the completion of the Work set out in the Work Change Directive. Owner must submit any Claim seeking an adjustment of the Contract Price or the Contract Times, or both, no later than 60 days after issuance of the Work Change Directive.
  - 3. *Field Orders:* Engineer may authorize minor changes in the Work if the changes do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Such changes will be accomplished by a Field Order and will be binding on Owner and also on Contractor, which shall perform the Work involved promptly. If Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, then before proceeding with the Work at issue, Contractor shall submit a Change Proposal as provided herein.

#### 11.02 *Owner-Authorized Changes in the Work*

- A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work. Such changes shall be supported by Engineer's recommendation, to the extent the change

involves the design (as set forth in the Drawings, Specifications, or otherwise), or other engineering or technical matters. Such changes may be accomplished by a Change Order, if Owner and Contractor have agreed as to the effect, if any, of the changes on Contract Times or Contract Price; or by a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved; or, in the case of a deletion in the Work, promptly cease construction activities with respect to such deleted Work. Added or revised Work shall be performed under the applicable conditions of the Contract Documents. Nothing in this paragraph shall obligate Contractor to undertake work that Contractor reasonably concludes cannot be performed in a manner consistent with Contractor's safety obligations under the Contract Documents or Laws and Regulations.

#### 11.03 *Unauthorized Changes in the Work*

- A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents, as amended, modified, or supplemented, except in the case of an emergency as provided in Paragraph 7.15 or in the case of uncovering Work as provided in Paragraph 14.05.

#### 11.04 *Change of Contract Price*

- A. The Contract Price may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Price shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment of Contract Price shall comply with the provisions of Article 12.
- B. An adjustment in the Contract Price will be determined as follows:
  - 1. where the Work involved is covered by unit prices contained in the Contract Documents, then by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 13.03); or
  - 2. where the Work involved is not covered by unit prices contained in the Contract Documents, then by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.04.C.2); or
  - 3. where the Work involved is not covered by unit prices contained in the Contract Documents and the parties do not reach mutual agreement to a lump sum, then on the basis of the Cost of the Work (determined as provided in Paragraph 13.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 11.04.C).
- C. *Contractor's Fee:* When applicable, the Contractor's fee for overhead and profit shall be determined as follows:
  - 1. a mutually acceptable fixed fee; or
  - 2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
    - a. for costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2, the Contractor's fee shall be 15 percent;
    - b. for costs incurred under Paragraph 13.01.B.3, the Contractor's fee shall be five percent;
    - c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 11.04.C.2.a and

11.04.C.2.b is that the Contractor's fee shall be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.A.1 and 13.01.A.2 by the Subcontractor that actually performs the Work, at whatever tier, and (2) with respect to Contractor itself and to any Subcontractors of a tier higher than that of the Subcontractor that actually performs the Work, a fee of five percent of the amount (fee plus underlying costs incurred) attributable to the next lower tier Subcontractor; provided, however, that for any such subcontracted work the maximum total fee to be paid by Owner shall be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the work;

- d. no fee shall be payable on the basis of costs itemized under Paragraphs 13.01.B.4, 13.01.B.5, and 13.01.C;
- e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and
- f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 11.04.C.2.a through 11.04.C.2.e, inclusive.

#### 11.05 *Change of Contract Times*

- A. The Contract Times may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Times shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment in the Contract Times shall comply with the provisions of Article 12.
- B. An adjustment of the Contract Times shall be subject to the limitations set forth in Paragraph 4.05, concerning delays in Contractor's progress.

#### 11.06 *Change Proposals*

- A. Contractor shall submit a Change Proposal to Engineer to request an adjustment in the Contract Times or Contract Price; appeal an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; contest a set-off against payment due; or seek other relief under the Contract. The Change Proposal shall specify any proposed change in Contract Times or Contract Price, or both, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents.
  - 1. *Procedures:* Contractor shall submit each Change Proposal to Engineer promptly (but in no event later than 30 days) after the start of the event giving rise thereto, or after such initial decision. The Contractor shall submit supporting data, including the proposed change in Contract Price or Contract Time (if any), to the Engineer and Owner within 15 days after the submittal of the Change Proposal. The supporting data shall be accompanied by a written statement that the supporting data are accurate and complete, and that any requested time or price adjustment is the entire adjustment to which Contractor believes it is entitled as a result of said event. Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal.
  - 2. *Engineer's Action:* Engineer will review each Change Proposal and, within 30 days after receipt of the Contractor's supporting data, either deny the Change Proposal in whole,

approve it in whole, or deny it in part and approve it in part. Such actions shall be in writing, with a copy provided to Owner and Contractor. If Engineer does not take action on the Change Proposal within 30 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of Engineer's inaction the Change Proposal is deemed denied, thereby commencing the time for appeal of the denial under Article 12.

3. *Binding Decision:* Engineer's decision will be final and binding upon Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under Article 12.
- B. *Resolution of Certain Change Proposals:* If the Change Proposal does not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters, then Engineer will notify the parties that the Engineer is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice shall be deemed a denial, and Contractor may choose to seek resolution under the terms of Article 12.

#### 11.07 *Execution of Change Orders*

- A. Owner and Contractor shall execute appropriate Change Orders covering:
  1. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive;
  2. changes in Contract Price resulting from an Owner set-off, unless Contractor has duly contested such set-off;
  3. changes in the Work which are: (a) ordered by Owner pursuant to Paragraph 11.02, (b) required because of Owner's acceptance of defective Work under Paragraph 14.04 or Owner's correction of defective Work under Paragraph 14.07, or (c) agreed to by the parties, subject to the need for Engineer's recommendation if the change in the Work involves the design (as set forth in the Drawings, Specifications, or otherwise), or other engineering or technical matters; and
  4. changes in the Contract Price or Contract Times, or other changes, which embody the substance of any final and binding results under Paragraph 11.06, or Article 12.
- B. If Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of this Paragraph 11.07, it shall be deemed to be of full force and effect, as if fully executed.

#### 11.08 *Notification to Surety*

- A. If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

## ARTICLE 12 – CLAIMS

### 12.01 *Claims*

- A. *Claims Process:* The following disputes between Owner and Contractor shall be submitted to the Claims process set forth in this Article:
  - 1. Appeals by Owner or Contractor of Engineer's decisions regarding Change Proposals;
  - 2. Owner demands for adjustments in the Contract Price or Contract Times, or other relief under the Contract Documents; and
  - 3. Disputes that Engineer has been unable to address because they do not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters.
- B. *Submittal of Claim:* The party submitting a Claim shall deliver it directly to the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto; in the case of appeals regarding Change Proposals within 30 days of the decision under appeal. The party submitting the Claim shall also furnish a copy to the Engineer, for its information only. The responsibility to substantiate a Claim shall rest with the party making the Claim. In the case of a Claim by Contractor seeking an increase in the Contract Times or Contract Price, or both, Contractor shall certify that the Claim is made in good faith, that the supporting data are accurate and complete, and that to the best of Contractor's knowledge and belief the amount of time or money requested accurately reflects the full amount to which Contractor is entitled.
- C. *Review and Resolution:* The party receiving a Claim shall review it thoroughly, giving full consideration to its merits. The two parties shall seek to resolve the Claim through the exchange of information and direct negotiations. The parties may extend the time for resolving the Claim by mutual agreement. All actions taken on a Claim shall be stated in writing and submitted to the other party, with a copy to Engineer.
- D. *Mediation:*
  - 1. At any time after initiation of a Claim, Owner and Contractor may mutually agree to mediation of the underlying dispute. The agreement to mediate shall stay the Claim submittal and response process.
  - 2. If Owner and Contractor agree to mediation, then after 60 days from such agreement, either Owner or Contractor may unilaterally terminate the mediation process, and the Claim submittal and decision process shall resume as of the date of the termination. If the mediation proceeds but is unsuccessful in resolving the dispute, the Claim submittal and decision process shall resume as of the date of the conclusion of the mediation, as determined by the mediator.
  - 3. Owner and Contractor shall each pay one-half of the mediator's fees and costs.
- E. *Partial Approval:* If the party receiving a Claim approves the Claim in part and denies it in part, such action shall be final and binding unless within 30 days of such action the other party invokes the procedure set forth in Article 17 for final resolution of disputes.
- F. *Denial of Claim:* If efforts to resolve a Claim are not successful, the party receiving the Claim may deny it by giving written notice of denial to the other party. If the receiving party does not take action on the Claim within 90 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of the inaction,



the Claim is deemed denied, thereby commencing the time for appeal of the denial. A denial of the Claim shall be final and binding unless within 30 days of the denial the other party invokes the procedure set forth in Article 17 for the final resolution of disputes.

- G. *Final and Binding Results:* If the parties reach a mutual agreement regarding a Claim, whether through approval of the Claim, direct negotiations, mediation, or otherwise; or if a Claim is approved in part and denied in part, or denied in full, and such actions become final and binding; then the results of the agreement or action on the Claim shall be incorporated in a Change Order to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

## ARTICLE 13 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

### 13.01 *Cost of the Work*

- A. *Purposes for Determination of Cost of the Work:* The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this Paragraph 13.01 are used for two distinct purposes:
1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or
  2. To determine the value of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price. When the value of any such adjustment is determined on the basis of Cost of the Work, Contractor is entitled only to those additional or incremental costs required because of the change in the Work or because of the event giving rise to the adjustment.
- B. *Costs Included:* Except as otherwise may be agreed to in writing by Owner, costs included in the Cost of the Work shall be in amounts no higher than those prevailing in the locality of the Project, shall not include any of the costs itemized in Paragraph 13.01.C, and shall include only the following items:
1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, and vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.
  2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates, and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.

3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 13.01.
4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.
5. Supplemental costs including the following:
  - a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
  - b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.
  - c. Rentals of all construction equipment and machinery, and the parts thereof, whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.
  - d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.
  - e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.
  - f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 6.05), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.
  - g. The cost of utilities, fuel, and sanitary facilities at the Site.
  - h. Minor expenses such as communication service at the Site, express and courier services, and similar petty cash items in connection with the Work.



- i. The costs of premiums for all bonds and insurance that Contractor is required by the Contract Documents to purchase and maintain.

C. *Costs Excluded:* The term Cost of the Work shall not include any of the following items:

1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 13.01.B.1 or specifically covered by Paragraph 13.01.B.4. The payroll costs and other compensation excluded here are to be considered administrative costs covered by the Contractor's fee.
2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.
3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.
5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 13.01.B.

D. *Contractor's Fee:* When the Work as a whole is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 11.04.C.

E. *Documentation:* Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 13, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

### 13.02 Allowances

A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.

B. *Cash Allowances:* Contractor agrees that:

1. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and
2. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.

- C. *Contingency Allowance*: Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.
- D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

### 13.03 *Unit Price Work*

- A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.
- B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Payments to Contractor for Unit Price Work will be based on actual quantities.
- C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.
- D. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, subject to the provisions of the following paragraph.
- E. Within 30 days of Engineer's written decision under the preceding paragraph, Contractor may submit a Change Proposal, or Owner may file a Claim, seeking an adjustment in the Contract Price if:
  1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement;
  2. there is no corresponding adjustment with respect to any other item of Work; and
  3. Contractor believes that it is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price, and the parties are unable to agree as to the amount of any such increase or decrease.

## **ARTICLE 14 – TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK**

### 14.01 *Access to Work*

- A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and authorities having jurisdiction will have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply therewith as applicable.

#### 14.02 Tests, Inspections, and Approvals

- A. Contractor shall give Engineer timely notice of readiness of the Work (or specific parts thereof) for all required inspections and tests, and shall cooperate with inspection and testing personnel to facilitate required inspections and tests.
- B. Owner shall retain and pay for the services of an independent inspector, testing laboratory, or other qualified individual or entity to perform all inspections and tests expressly required by the Contract Documents to be furnished and paid for by Owner, except that costs incurred in connection with tests or inspections of covered Work shall be governed by the provisions of Paragraph 14.05.
- C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.
- D. Contractor shall be responsible for arranging, obtaining, and paying for all inspections and tests required:
  - 1. by the Contract Documents, unless the Contract Documents expressly allocate responsibility for a specific inspection or test to Owner;
  - 2. to attain Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work;
  - 3. by manufacturers of equipment furnished under the Contract Documents;
  - 4. for testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work; and
  - 5. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.

Such inspections and tests shall be performed by independent inspectors, testing laboratories, or other qualified individuals or entities acceptable to Owner and Engineer.

- E. If the Contract Documents require the Work (or part thereof) to be approved by Owner, Engineer, or another designated individual or entity, then Contractor shall assume full responsibility for arranging and obtaining such approvals.
- F. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation. Such uncovering shall be at Contractor's expense unless Contractor had given Engineer timely notice of Contractor's intention to cover the same and Engineer had not acted with reasonable promptness in response to such notice.

#### 14.03 Defective Work

- A. *Contractor's Obligation:* It is Contractor's obligation to assure that the Work is not defective.
- B. *Engineer's Authority:* Engineer has the authority to determine whether Work is defective, and to reject defective Work.

- C. *Notice of Defects*: Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor.
- D. *Correction, or Removal and Replacement*: Promptly after receipt of written notice of defective Work, Contractor shall correct all such defective Work, whether or not fabricated, installed, or completed, or, if Engineer has rejected the defective Work, remove it from the Project and replace it with Work that is not defective.
- E. *Preservation of Warranties*: When correcting defective Work, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.
- F. *Costs and Damages*: In addition to its correction, removal, and replacement obligations with respect to defective Work, Contractor shall pay all claims, costs, losses, and damages arising out of or relating to defective Work, including but not limited to the cost of the inspection, testing, correction, removal, replacement, or reconstruction of such defective Work, fines levied against Owner by governmental authorities because the Work is defective, and the costs of repair or replacement of work of others resulting from defective Work. Prior to final payment, if Owner and Contractor are unable to agree as to the measure of such claims, costs, losses, and damages resulting from defective Work, then Owner may impose a reasonable set-off against payments due under Article 15.

#### 14.04 *Acceptance of Defective Work*

- A. If, instead of requiring correction or removal and replacement of defective Work, Owner prefers to accept it, Owner may do so (subject, if such acceptance occurs prior to final payment, to Engineer's confirmation that such acceptance is in general accord with the design intent and applicable engineering principles, and will not endanger public safety). Contractor shall pay all claims, costs, losses, and damages attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness), and for the diminished value of the Work to the extent not otherwise paid by Contractor. If any such acceptance occurs prior to final payment, the necessary revisions in the Contract Documents with respect to the Work shall be incorporated in a Change Order. If the parties are unable to agree as to the decrease in the Contract Price, reflecting the diminished value of Work so accepted, then Owner may impose a reasonable set-off against payments due under Article 15. If the acceptance of defective Work occurs after final payment, Contractor shall pay an appropriate amount to Owner.

#### 14.05 *Uncovering Work*

- A. Engineer has the authority to require additional inspection or testing of the Work, whether or not the Work is fabricated, installed, or completed.
- B. If any Work is covered contrary to the written request of Engineer, then Contractor shall, if requested by Engineer, uncover such Work for Engineer's observation, and then replace the covering, all at Contractor's expense.
- C. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, then Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, and provide all necessary labor, material, and equipment.

1. If it is found that the uncovered Work is defective, Contractor shall be responsible for all claims, costs, losses, and damages arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and pending Contractor's full discharge of this responsibility the Owner shall be entitled to impose a reasonable set-off against payments due under Article 15.
2. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, then Contractor may submit a Change Proposal within 30 days of the determination that the Work is not defective.

#### 14.06 *Owner May Stop the Work*

- A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, then Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work shall not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

#### 14.07 *Owner May Correct Defective Work*

- A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace rejected Work as required by Engineer, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, then Owner may, after seven days written notice to Contractor, correct or remedy any such deficiency.
- B. In exercising the rights and remedies under this Paragraph 14.07, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this paragraph.
- C. All claims, costs, losses, and damages incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 14.07 will be charged against Contractor as set-offs against payments due under Article 15. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.
- D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 14.07.

**ARTICLE 15 – PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD****15.01 Progress Payments**

- A. *Basis for Progress Payments:* The Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed during the pay period, as determined under the provisions of Paragraph 13.03. Progress payments for cost-based Work will be based on Cost of the Work completed by Contractor during the pay period.
- B. *Applications for Payments:*
1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens, and evidence that the materials and equipment are covered by appropriate property insurance, a warehouse bond, or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.
  2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.
  3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.
- C. *Review of Applications:*
1. Engineer will, within 10 days after receipt of each Application for Payment, including each resubmittal, either indicate in writing a recommendation of payment and present the Application to Owner, or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.
  2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:
    - a. the Work has progressed to the point indicated;
    - b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for



Unit Price Work under Paragraph 13.03, and any other qualifications stated in the recommendation); and

- c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.
3. By recommending any such payment Engineer will not thereby be deemed to have represented that:
  - a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract; or
  - b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.
4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
  - a. to supervise, direct, or control the Work, or
  - b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or
  - c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or
  - d. to make any examination to ascertain how or for what purposes Contractor has used the money paid on account of the Contract Price, or
  - e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.
5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 15.01.C.2.
6. Engineer will recommend reductions in payment (set-offs) necessary in Engineer's opinion to protect Owner from loss because:
  - a. the Work is defective, requiring correction or replacement;
  - b. the Contract Price has been reduced by Change Orders;
  - c. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
  - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible; or
  - e. Engineer has actual knowledge of the occurrence of any of the events that would constitute a default by Contractor and therefore justify termination for cause under the Contract Documents.

D. *Payment Becomes Due:*

1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended (subject to any Owner set-offs) will become due, and when due will be paid by Owner to Contractor.

E. *Reductions in Payment by Owner:*

1. In addition to any reductions in payment (set-offs) recommended by Engineer, Owner is entitled to impose a set-off against payment based on any of the following:
  - a. claims have been made against Owner on account of Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages on account of Contractor's conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;
  - b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;
  - c. Contractor has failed to provide and maintain required bonds or insurance;
  - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;
  - e. Owner has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;
  - f. the Work is defective, requiring correction or replacement;
  - g. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
  - h. the Contract Price has been reduced by Change Orders;
  - i. an event that would constitute a default by Contractor and therefore justify a termination for cause has occurred;
  - j. liquidated damages have accrued as a result of Contractor's failure to achieve Milestones, Substantial Completion, or final completion of the Work;
  - k. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;
  - l. there are other items entitling Owner to a set off against the amount recommended.
2. If Owner imposes any set-off against payment, whether based on its own knowledge or on the written recommendations of Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and the specific amount of the reduction, and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, if Contractor remedies the reasons for such action. The reduction



imposed shall be binding on Contractor unless it duly submits a Change Proposal contesting the reduction.

3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 15.01.C.1 and subject to interest as provided in the Agreement.

#### 15.02 *Contractor's Warranty of Title*

- A. Contractor warrants and guarantees that title to all Work, materials, and equipment furnished under the Contract will pass to Owner free and clear of (1) all Liens and other title defects, and (2) all patent, licensing, copyright, or royalty obligations, no later than seven days after the time of payment by Owner.

#### 15.03 *Substantial Completion*

- A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before final payment.
- B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.
- C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a preliminary certificate of Substantial Completion which shall fix the date of Substantial Completion. Engineer shall attach to the certificate a punch list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the preliminary certificate during which to make written objection to Engineer as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the preliminary certificate to Owner, notify Contractor in writing that the Work is not substantially complete, stating the reasons therefor. If Owner does not object to the provisions of the certificate, or if despite consideration of Owner's objections Engineer concludes that the Work is substantially complete, then Engineer will, within said 14 days, execute and deliver to Owner and Contractor a final certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as Engineer believes justified after consideration of any objections from Owner.
- D. At the time of receipt of the preliminary certificate of Substantial Completion, Owner and Contractor will confer regarding Owner's use or occupancy of the Work following Substantial Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Owner and Contractor agree otherwise in writing, Owner shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.
- E. After Substantial Completion the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor

may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.

- F. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the punch list.

#### 15.04 *Partial Use or Occupancy*

- A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:
  1. At any time Owner may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 15.03.A through E for that part of the Work.
  2. At any time Contractor may notify Owner and Engineer in writing that Contractor considers any such part of the Work substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.
  3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 15.03 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.
  4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 6.05 regarding builder's risk or other property insurance.

#### 15.05 *Final Inspection*

- A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work, or agreed portion thereof, is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

#### 15.06 *Final Payment*

- A. *Application for Payment:*
  1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of

inspection, annotated record documents (as provided in Paragraph 7.11), and other documents, Contractor may make application for final payment.

2. The final Application for Payment shall be accompanied (except as previously delivered) by:
  - a. all documentation called for in the Contract Documents;
  - b. consent of the surety, if any, to final payment;
  - c. satisfactory evidence that all title issues have been resolved such that title to all Work, materials, and equipment has passed to Owner free and clear of any Liens or other title defects, or will so pass upon final payment.
  - d. a list of all disputes that Contractor believes are unsettled; and
  - e. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of the Work, and of Liens filed in connection with the Work.
3. In lieu of the releases or waivers of Liens specified in Paragraph 15.06.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (a) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (b) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien, or Owner at its option may issue joint checks payable to Contractor and specified Subcontractors and Suppliers.

**B. *Engineer's Review of Application and Acceptance:***

1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the Application for Payment to Owner for payment. Such recommendation shall account for any set-offs against payment that are necessary in Engineer's opinion to protect Owner from loss for the reasons stated above with respect to progress payments. At the same time Engineer will also give written notice to Owner and Contractor that the Work is acceptable, subject to the provisions of Paragraph 15.07. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

**C. *Completion of Work:*** The Work is complete (subject to surviving obligations) when it is ready for final payment as established by the Engineer's written recommendation of final payment.

**D. *Payment Becomes Due:*** Thirty days after the presentation to Owner of the final Application for Payment and accompanying documentation, the amount recommended by Engineer

(less any further sum Owner is entitled to set off against Engineer's recommendation, including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions above with respect to progress payments) will become due and shall be paid by Owner to Contractor.

#### 15.07 *Waiver of Claims*

- A. The making of final payment will not constitute a waiver by Owner of claims or rights against Contractor. Owner expressly reserves claims and rights arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 15.05, from Contractor's failure to comply with the Contract Documents or the terms of any special guarantees specified therein, from outstanding Claims by Owner, or from Contractor's continuing obligations under the Contract Documents.
- B. The acceptance of final payment by Contractor will constitute a waiver by Contractor of all claims and rights against Owner other than those pending matters that have been duly submitted or appealed under the provisions of Article 17.

#### 15.08 *Correction Period*

- A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents, or by any specific provision of the Contract Documents), any Work is found to be defective, or if the repair of any damages to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas used by Contractor as permitted by Laws and Regulations, is found to be defective, then Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:
  - 1. correct the defective repairs to the Site or such other adjacent areas;
  - 2. correct such defective Work;
  - 3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and
  - 4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others, or to other land or areas resulting therefrom.
- B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others).
- C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.
- D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph, the correction period hereunder with

respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

- E. Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph shall not be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

## ARTICLE 16 – SUSPENSION OF WORK AND TERMINATION

### 16.01 *Owner May Suspend Work*

- A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by written notice to Contractor and Engineer. Such notice will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be entitled to an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension. Any Change Proposal seeking such adjustments shall be submitted no later than 30 days after the date fixed for resumption of Work.

### 16.02 *Owner May Terminate for Cause*

- A. The occurrence of any one or more of the following events will constitute a default by Contractor and justify termination for cause:
  1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule);
  2. Failure of Contractor to perform or otherwise to comply with a material term of the Contract Documents;
  3. Contractor's disregard of Laws or Regulations of any public body having jurisdiction; or
  4. Contractor's repeated disregard of the authority of Owner or Engineer.
- B. If one or more of the events identified in Paragraph 16.02.A occurs, then after giving Contractor (and any surety) ten days written notice that Owner is considering a declaration that Contractor is in default and termination of the contract, Owner may proceed to:
  1. declare Contractor to be in default, and give Contractor (and any surety) notice that the Contract is terminated; and
  2. enforce the rights available to Owner under any applicable performance bond.
- C. Subject to the terms and operation of any applicable performance bond, if Owner has terminated the Contract for cause, Owner may exclude Contractor from the Site, take possession of the Work, incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and complete the Work as Owner may deem expedient.
- D. Owner may not proceed with termination of the Contract under Paragraph 16.02.B if Contractor within seven days of receipt of notice of intent to terminate begins to correct its failure to perform and proceeds diligently to cure such failure.
- E. If Owner proceeds as provided in Paragraph 16.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds the cost to complete the Work, including all related claims, costs,

losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals) sustained by Owner, such excess will be paid to Contractor. If the cost to complete the Work including such related claims, costs, losses, and damages exceeds such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this paragraph, Owner shall not be required to obtain the lowest price for the Work performed.

- F. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue, or any rights or remedies of Owner against Contractor or any surety under any payment bond or performance bond. Any retention or payment of money due Contractor by Owner will not release Contractor from liability.
- G. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 6.01.A, the provisions of that bond shall govern over any inconsistent provisions of Paragraphs 16.02.B and 16.02.D.

#### 16.03 *Owner May Terminate For Convenience*

- A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):
  - 1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;
  - 2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses; and
  - 3. other reasonable expenses directly attributable to termination, including costs incurred to prepare a termination for convenience cost proposal.
- B. Contractor shall not be paid on account of loss of anticipated overhead, profits, or revenue, or other economic loss arising out of or resulting from such termination.

#### 16.04 *Contractor May Stop Work or Terminate*

- A. If, through no act or fault of Contractor, (1) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (2) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (3) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the contract and recover from Owner payment on the same terms as provided in Paragraph 16.03.
- B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Engineer, stop the



Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this paragraph are not intended to preclude Contractor from submitting a Change Proposal for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this paragraph.

## **ARTICLE 17 – FINAL RESOLUTION OF DISPUTES**

### **17.01 *Methods and Procedures***

- A. *Disputes Subject to Final Resolution:* The following disputed matters are subject to final resolution under the provisions of this Article:
  - 1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full; and
  - 2. Disputes between Owner and Contractor concerning the Work or obligations under the Contract Documents, and arising after final payment has been made.
- B. *Final Resolution of Disputes:* For any dispute subject to resolution under this Article, Owner or Contractor may:
  - 1. elect in writing to invoke the dispute resolution process provided for in the Supplementary Conditions; or
  - 2. agree with the other party to submit the dispute to another dispute resolution process; or
  - 3. if no dispute resolution process is provided for in the Supplementary Conditions or mutually agreed to, give written notice to the other party of the intent to submit the dispute to a court of competent jurisdiction.

## **ARTICLE 18 – MISCELLANEOUS**

### **18.01 *Giving Notice***

- A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:
  - 1. delivered in person, by a commercial courier service or otherwise, to the individual or to a member of the firm or to an officer of the corporation for which it is intended; or
  - 2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the sender of the notice.

### **18.02 *Computation of Times***

- A. When any period of time is referred to in the Contract by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

### **18.03 *Cumulative Remedies***

- A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of

them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract. The provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

18.04 *Limitation of Damages*

- A. With respect to any and all Change Proposals, Claims, disputes subject to final resolution, and other matters at issue, neither Owner nor Engineer, nor any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, shall be liable to Contractor for any claims, costs, losses, or damages sustained by Contractor on or in connection with any other project or anticipated project.

18.05 *No Waiver*

- A. A party's non-enforcement of any provision shall not constitute a waiver of that provision, nor shall it affect the enforceability of that provision or of the remainder of this Contract.

18.06 *Survival of Obligations*

- A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract, as well as all continuing obligations indicated in the Contract, will survive final payment, completion, and acceptance of the Work or termination or completion of the Contract or termination of the services of Contractor.

18.07 *Controlling Law*

- A. This Contract is to be governed by the law of the state in which the Project is located.

18.08 *Headings*

- A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.





**RD SUPPLEMENTARY GENERAL CONDITIONS TO EJCDC  
GENERAL CONDITIONS**

## **RD SUPPLEMENTAL GENERAL CONDITIONS TO EJCDC GENERAL CONDITIONS**

These Supplementary General Conditions amend or supplement the Standard General Conditions of the Construction Contract, EJCDC® C-700 (2013 Edition). All provisions that are not so amended or supplemented remain in full force and effect.

These revisions to the General Conditions are requirements of the funding agency, USDA Rural Development Utilities Service, and are applied in conjunction with the GRW Supplemental General Conditions.

The terms used in these Supplementary General Conditions have the meanings stated in the General Conditions. Additional terms used in these Supplementary General Conditions have the meanings stated below, which are applicable to both the singular and plural thereof.

The address system used in these Supplementary General Conditions is the same as the address system used in the General Conditions, with the prefix "SGC" added thereto.

### **SGC-1.01.A.8.**

**Add the following language to the end of Paragraph 1.01.A.8:**

The Change Order form to be used on this Project is EJCDC No. C-941. Agency approval is required before Change Orders are effective.

### **SGC-1.01.**

**Add the following language at the end of the last sentence of Paragraph 1.01.A.48:**

A Work Change Directive cannot change Contract Price or Contract Times without a subsequent Change Order.

### **SGC-1.01.**

**Add the following new Paragraph after Paragraph 1.01.A.48:**

49. *Abnormal Weather Conditions* – Conditions of extreme or unusual weather for a given region, elevation, or season as determined by Engineer. Extreme or unusual weather that is typical for a given region, elevation, or season should not be considered Abnormal Weather Conditions.

### **SGC-1.01**

**Add the following new Paragraph after Paragraph 1.01.A.49:**

50. *Agency* - The Project is financed in whole or in part by USDA Rural Utilities Service pursuant to the Consolidated Farm and Rural Development Act (7 USC Section 1921 et seq.). The Rural Utilities Service programs are administered through the USDA Rural Development offices; therefore, the Agency

for these documents is USDA Rural Development.

#### **SGC-2.02**

**Delete Paragraph 2.02.A in its entirety and insert the following new paragraph in its place:**

- A. Owner shall furnish to Contractor five copies of conformed Contract Documents incorporating and integrating all Addenda and any amendments negotiated prior to the Effective Date of the Contract (including one fully executed counterpart of the Agreement), and one copy in electronic portable document format (PDF). Additional printed copies of the conformed Contract Documents will be furnished upon request at the cost of reproduction.

#### **SGC-4.01**

**Delete the following sentence from Paragraph 4.01A:**

In no event will the Contract Times commence to run later than the ninetieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Agreement, whichever date is earlier.

#### **SGC-4.05**

**Replace the phrase “abnormal weather conditions” from Paragraph 4.05.C.2 and replace with “Abnormal Weather Conditions”**

#### **SGC-5.03**

**Add the following new paragraph after Paragraph 5.03B:**

If any geotechnical exploration for the project was performed and reported, said report will be included as an Appendix. The geotechnical report shall be used as a reference and all recommendations included therein shall be followed in full.

#### **SGC-5.06**

**Add the following new paragraph immediately after Paragraph 5.06.A.2:**

- 3. If any Hazardous Conditions were reported, said report will be included as an Appendix.

#### **SGC-6.03**

**Add the following paragraphs after Paragraph 6.03.J:**

- K. The insurance required by this Paragraph shall include specific coverage and be written for not less than the limits of liability and coverages tabulated in the prototype Certificate of Insurance included as Section 00 62 16, or as required by law, whichever is greater.

#### **SGC-7.04**

**Amend the third sentence of Paragraph 7.04.A by deleting the following words:**

Unless the specification or description contains or is followed by words reading that no like, equivalent or "or-equal" item is permitted

**SGC-7.04**

**Amend the last sentence of Paragraph 7.04.A.1.a.3 by striking out "and", and adding a period at the end of said paragraph.**

**SGC-7.04**

**Delete Paragraph 7.04.A.1.a.4 in its entirety and insert the following in its place:**

(Deleted)

**SGC-7.06**

**Amend Paragraph 7.06.A by adding the following text to the end of the Paragraph:**

The contractor shall not award work valued at more than fifty percent of the Contract Price to Subcontractor(s), without prior written approval of the Owner.

**SGC-7.06**

**Delete Paragraph 7.06.B in its entirety and insert the following in its place.**

(Deleted)

**SGC-7.06**

**Amend the second sentence of Paragraph 7.06.E by striking out "Owner may also require Contractor to retain specific replacements; provided, however, that".**

**SGC-10.03.A.**

The Duties, Responsibilities, and Limitations of Authority of the Resident Project Representative will be as stated in the document attached to these Supplementary General Conditions.

**SGC-11.07**

**Add the following new paragraph immediately after Paragraph 11.07B:**

11.07.C All Contract Change Orders must be concurred in by Agency before they are effective.

**SGC-13.02**

**Delete Paragraph 13.02.C in its entirety and insert the following in its place:**

(Deleted)

**SGC-15.01**

**Amend the second sentence of Paragraph 15.01B.1 by striking out the following text: “a bill of sale, invoice or other”.**

**SGC-15.01**

**Add the following new paragraph after Paragraph 15.01.B.3:**

4. The Application for Payment form to be used on this Project is EJCDC No. C-620. The Agency must approve all Applications for Payment before payment is made.

**SGC-15.01**

**Add the following language at the end of Paragraph 15.01.B.3:**

No payments will be made that would deplete the retainage, place in escrow any funds that are required for retainage, or invest the retainage for the benefit of the Contractor.

**SGC-15.01**

**Delete Paragraph 15.01.D.1 in its entirety and insert the following in its place:**

The Application for Payment with Engineer’s recommendations will be presented to the Owner and Agency for consideration. If both Owner and Agency find the Application for Payment acceptable, the recommended amount less any reduction under the provisions of Paragraph 15.01.E will become due twenty (20) days after the Application for Payment is presented to the Owner, and the Owner will make payment to the Contractor.

**SGC-15.02**

Amend Paragraph 15.02.A by striking out the following text: “no later than seven days after the time of payment by Owner” and inserting “no later than the time of payment by the Owner.”:

**SGC-18.11**

**Add the following new paragraph after Paragraph 18.10:**

18.11 *Tribal Sovereignty.*

- A. No provision of this Agreement will be construed by any of the signatories as abridging or debilitating any sovereign powers of the named Tribe; affecting the trust-beneficiary relationship between the Secretary of the Interior, Tribe and Indian landowner(s); or interfering with the government-to government relationship between the United States and the Tribe.

**SGC-19 Add a new Article 19, "Federal Requirements," after Article 18.****SGC-19.01****Add the following language at the beginning of Article 18 with the title "Agency Not a Party."**

- A. This Contract is expected to be funded in part with funds provided by Agency. Neither Agency, nor any of its departments, entities, or employees is a party to this Contract.

**SGC-19.02****Add the following language after Article 19.01.A with the title "Contract Approval."**

- A. Owner and Contractor will furnish Owner's attorney such evidence as required so that Owner's attorney can complete and execute the following "Certificate of Owner's Attorney" (Exhibit GC-A) before Owner submits the executed Contract Documents to Agency for approval.
- B. Concurrence by Agency in the award of the Contract is required before the Contract is effective.

**SC 19.03****Add the following language after Article 19.02.B with the title "Conflict of Interest."**

- A. Contractor may not knowingly contract with a supplier or manufacturer if the individual or entity who prepared the plans and specifications has a corporate or financial affiliation with the supplier or manufacturer. Owner's officers, employees, or agents shall not engage in the award or administration of this Contract if a conflict of interest, real or apparent, would be involved. Such a conflict would arise when: (i) the employee, officer or agent; (ii) any member of their immediate family; (iii) their partner or (iv) an organization that employs, or is about to employ, any of the above, has a financial interest in Contractor. Owner's officers, employees, or agents shall neither solicit nor accept gratuities, favors or anything of monetary value from Contractor or subcontractors.

**SC-19.04****Add the following language after Article 19.03.A with the title "Gratuities."**

- A. If Owner finds after a notice and hearing that Contractor, or any of Contractor's agents or representatives, offered or gave gratuities (in the form of entertainment, gifts, or otherwise) to any official, employee, or agent of Owner or Agency in an attempt to secure this Contract or favorable treatment in awarding, amending, or making any determinations related to the performance of this Contract, Owner may, by written notice to Contractor, terminate this Contract. Owner may also pursue other rights and remedies that the law or this Contract provides. However, the existence of the facts on which Owner bases such findings shall be an issue and may be reviewed in proceedings under the dispute resolution provisions of this Contract.
- B. In the event this Contract is terminated as provided in paragraph 19.04.A, Owner may pursue the same remedies against Contractor as it could pursue in the event of a breach of this Contract by Contractor. As a penalty, in addition to any other damages to which it

may be entitled by law, Owner may pursue exemplary damages in an amount (as determined by Owner) which shall not be less than three nor more than ten times the costs Contractor incurs in providing any such gratuities to any such officer or employee.

#### **SC-19.05**

**Add the following language after Article 19.04.B with the title “Audit and Access to Records.”**

- A. Owner, Agency, the Comptroller General of the United States, or any of their duly authorized representatives, shall have access to any books, documents, papers, and records of the Engineer which are pertinent to the Agreement, for the purpose of making audits, examinations, excerpts, and transcriptions. Engineer shall maintain all required records for three years after final payment is made and all other pending matters are closed.

#### **SC-19.06**

**Add the following language after Article 18.05.A with the title “Small, Minority and Women’s Businesses.”**

- A. If Contractor intends to let any subcontracts for a portion of the work, Contractor shall take affirmative steps to assure that small, minority and women’s businesses are used when possible as sources of supplies, equipment, construction, and services. Affirmative steps shall consist of: (1) including qualified small, minority and women’s businesses on solicitation lists; (2) assuring that small, minority and women’s businesses are solicited whenever they are potential sources; (3) dividing total requirements when economically feasible, into small tasks or quantities to permit maximum participation of small, minority, and women’s businesses; (4) establishing delivery schedules, where the requirements of the work permit, which will encourage participation by small, minority and women’s businesses; (5) using the services and assistance of the Small Business Administration and the Minority Business Development Agency of the U.S. Department of Commerce; (6) requiring each party to a subcontract to take the affirmative steps of this section; and (7) Contractor is encouraged to procure goods and services from labor surplus area firms.

**SGC-19.07 Add the following after Article 19.06.A with the title “Anti-Kickback.”**

- A. Contractor shall comply with the Copeland Anti-Kickback Act (18 USC 874 and 40 USC 276c) as supplemented by Department of Labor regulations (29 CFR Part 3, “Contractors and Subcontractors on Public Buildings or Public Works Financed in Whole or in Part by Loans or Grants of the United States”). The Act provides that Contractor or subcontractor shall be prohibited from inducing, by any means, any person employed in the construction, completion, or repair of public facilities, to give up any part of the compensation to which they are otherwise entitled. Owner shall report all suspected or reported violations to Agency.

#### **SGC-19.08**

**Add the following after Article 19.07.A with the title “Clean Air and Pollution Control Acts.”**

- A. If this Contract exceeds \$100,000, Compliance with all applicable standards, orders, or requirements issued under section 306 of the Clean Air Act (42 U.S.C. 1857(h) and 42 USC 7401et. seq.), section 508 of the Clean Water Act (33 U.S.C. 1368) and Federal Water Pollution Control Act (33 USC 1251 et seq.), Executive Order 11738, and



Environmental Protection Agency regulations (40 CFR part 15) is required. Contractor will report violations to the Agency and the Regional Office of the EPA.

#### **SGC-19.09**

**Add the following after Article 19.08 with the title “State Energy Policy.”**

- A. Contractor shall comply with the Energy Policy and Conservation Act (P.L. 94-163). Mandatory standards and policies relating to energy efficiency, contained in any applicable State Energy Conservation Plan, shall be utilized.

**SGC-19.10 Add the following after Article 19.09 with the title “Equal Opportunity Requirements.”**

- A. If this Contract exceeds \$10,000, Contractor shall comply with Executive Order 11246, “Equal Employment Opportunity,” as amended by Executive Order 11375, “Amending Executive Order 11246 Relating to Equal Employment Opportunity,” and as supplemented by regulations at 41 CFR part 60, “Office of Federal Contract Compliance Programs, Equal Employment Opportunity, Department of Labor.”
- B. Contractor’s compliance with Executive Order 11246 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative active obligations required by the Standard Federal Equal Employment Opportunity Construction Contract Specifications, as set forth in 41 CFR Part 60-4 and its efforts to meet the goals established for the geographical area where the Contract is to be performed. The hours of minority and female employment and training must be substantially uniform throughout the length of the Contract, and in each trade, and Contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting Contractor’s goals shall be a violation of the Contract, the Executive Order, and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.
- C. Contractor shall provide written notification to the Director of the Office of Federal Contract Compliance Programs within 10 working days of award of any construction subcontract in excess of \$10,000 at any tier for construction work under the Contract resulting from this solicitation. The notification shall list the name, address, and telephone number of the subcontractor; employer identification number; estimated dollar amount of subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the Contract is to be performed.

#### **SGC-19.11**

**Add the following after Article 19.10.C:**

**19.11 *Restrictions on Lobbying.***

- A. Contractor and each subcontractor shall comply with Restrictions on Lobbying (Public Law 101-121, Section 319) as supplemented by applicable Agency regulations. This Law applies to the recipients of contracts and subcontracts that exceed \$100,000 at any tier under a Federal loan that exceeds \$150,000 or a Federal grant that exceeds \$100,000. If applicable, Contractor must complete a certification form on lobbying activities related to a specific Federal loan or grant that is a funding source for this Contract. Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of

any agency, a member of Congress, or an employee of a member of Congress in connection with obtaining any Federal contract, grant, or any other award covered by 31 USC 1352. Each tier shall disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Certifications and disclosures are forwarded from tier to tier up to the Owner. Necessary certification and disclosure forms shall be provided by Owner.

## **SGC-19.12**

### **Add the following after Article 19.11.A :**

#### **19.12 *Environmental Requirements.***

When constructing a project involving trenching and/or other related earth excavations, Contractor shall comply with the following environmental constraints:

- A. Wetlands – When disposing of excess, spoil, or other construction materials on public or private property, Contractor shall not fill in or otherwise convert wetlands.
- B. Floodplains – When disposing of excess, spoil, or other construction materials on public or private property, Contractor shall not fill in or otherwise convert 100 year floodplain areas delineated on the latest Federal Emergency Management Agency Floodplain Maps, or other appropriate maps, i.e., alluvial soils on NRCS Soil Survey Maps.
- C. Historic Preservation – Any excavation by Contractor that uncovers an historical or archaeological artifact shall be immediately reported to Owner and a representative of Agency. Construction shall be temporarily halted pending the notification process and further directions issued by Agency after consultation with the State Historic Preservation Officer (SHPO).
- D. Endangered Species – Contractor shall comply with the Endangered Species Act, which provides for the protection of endangered and/or threatened species and critical habitat. Should any evidence of the presence of endangered and/or threatened species or their critical habitat be brought to the attention of Contractor, Contractor will immediately report this evidence to Owner and a representative of Agency. Construction shall be temporarily halted pending the notification process and further directions issued by Agency after consultation with the U.S. Fish and Wildlife Service.
- E. Mitigation Measures – If the project had an Environmental Report, Environmental Assessment, or Environmental Impact Statement to meet the requirements of the National Environmental Policy Act, compliance with the mitigation measures, if any, in that document are hereby included as a condition of this contract.



## SECTION 01010

### SUMMARY

#### PART 1 - GENERAL

##### 1.01 SUMMARY

- A. This Section includes the following:
1. Work covered by the Contract Documents.
  2. Sequence of Operations.
  3. Utility Shutdowns
  4. Tie-ins and Disconnections
  5. Temporary Systems
  6. Use of premises.
  7. Specification formats and conventions.

##### 1.02 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Contractor shall provide all material, services, labor, tools and equipment, necessary to construct this project. The following is a brief description of the major work items included in the contract:
- Diamond Ridge Booster Station: Installation of new suction and discharge piping and appurtenances, new pumps, controls, SCADA RTU, new electrical, VFD controls and yard piping as shown on the Drawings and described in the Specifications.
  - Big Run Booster Station: Construction of one (1) above ground booster pump station including path studies, electrical work, telemetry, testing, start up and all other related appurtenances as shown on the Drawings and described in the Specifications.
  - KY 504 West Booster Station: Installation of new suction piping and discharge piping and appurtenances, VFD Controls and electrical as shown on Drawings and described in the Specifications.
  - Rattlesnake Ridge Booster Station: Installation of new pumps and motors, and all other related appurtenances as shown on the Drawings and described in the Specifications.
  - Mayhew Flats Tank, US 60 Pump Station, RT. 986 Pump Station, Smokey Valley Pump Station, RT. 486 Pump Station, and Isonville Tank: New radio's for the RTU's at these various sites.
  - **PLEASE NOTE THAT DIAMOND RIDGE PUMP STATION MUST BE THE FIRST WORK COMPLETED IN CONTRACT.**

##### 1.03 SEQUENCE OF OPERATIONS

- A. Contractor to provide, in writing, a sequence of work to the Owner and Engineer for approval prior to any improvement work being conducted on any booster station. For each booster station, a preferred sequence of work is provided on the drawings. This is not to be the only manner in which work can be completed but is in the opinion of the Owner and Engineer the most appropriate sequence.
- B. Contractor understands that service must be maintained during all improvements at each booster station. If a temporary shutdown of the booster station is required,

Contractor must notify the Owner and Engineer, in writing, a week ahead of time, so that operations can be adjusted as needed.

- C. Before work can begin at any station all necessary equipment, materials, tools and manpower shall be on-site.

#### **1.04 UTILITY SHUTDOWNS**

- A. One-week advance notice to the Owner is required prior to performing any utility shutdown unless of an emergency in nature.
- B. Contractor shall know where all existing valves are located at or near each booster station to shut down expeditiously in case of line breaks.
- C. The existing water line is shown as an approximate location on the plans. The contractor shall use extreme caution while laying line not to break existing line and interrupt service to the existing customers of Rattlesnake Ridge Water District. The contractor is responsible for any repairs to the existing line that are caused by their work. The contractor shall locate the existing line ahead of the installation of the new line to insure the installation is within the existing easement.

#### **1.05 TIE-INS AND DISCONNECTIONS**

- A. Contractor shall furnish all materials and shall provide excavation, de-watering, scaffolding and support operations to support tie-ins.

#### **1.06 TEMPORARY SYSTEM (S)**

- A. All temporary water lines, pumps and hoses shall be depressurized and all temporary electrical lines and equipment de-energized when not in use and at the end of each workday.

#### **1.07 SPECIFICATION FORMATS AND CONVENTIONS**

- A. Specification Format: The Specifications are organized into Division and Sections using the 17-division format.

### **PART 2 - PRODUCTS**

Not used

### **PART 3 - EXECUTION**

Not used

END OF SECTION

**SECTION 01015****WORK SEQUENCE****PART 1 - GENERAL****1.01 WORK INCLUDED**

The Contractor shall submit to the Engineer for review and acceptance a complete schedule of his proposed sequence of construction operations prior to commencement of work. However, the Engineer shall not accept a construction schedule that fails to utilize the entire time allocated for the construction of the water system extension. This schedule requirement in no way prevents the Contractor from completing the project in a shorter time frame than scheduled. The construction schedule shall be submitted and approved by the Owner prior to the submittal of the first partial payment request. A revised construction schedule shall be submitted with every subsequent partial payment request. This revised schedule must be approved by the Owner prior to payment. The contractor shall use the following sequence of construction while working on the new water mains for the **RATTLESNAKE RIDGE WATER DISTRICT, CONTRACT 4 – BOOSTER STATION IMPROVEMENTS**.

1. Locate all water mains and existing valves and make sure they are workable
2. Notify the RATTLESNAKE RIDGE WATER DISTRICT a minimum of 48 hours prior to connecting into any existing line.
3. Contractor shall not begin work at any booster station without all materials necessary to complete the described or implied work as shown on DRAWINGS or SPECIFICATIONS.
4. Contractor shall coordinate work with other contracts as necessary. Diamond Ridge Booster Station shall be completed prior to any rehabilitation work on Diamond Ridge Water Storage Tanks. The Diamond Ridge Pump Station shall be the first work completed in this project.
5. **Contractor is responsible for any repairs to the existing utilities and/or property during construction.**

**1.02 RELATED WORK**

- A. Section 01010 - Summary of Work.

**1.03 ADDITIONAL INFORMATION**

Any delays caused by the Contractor shall be at his expense and at no cost to the Owner or Engineer.

- END OF SECTION -



**SECTION 01016****OCCUPANCY****PART 1 - GENERAL****1.01 WORK INCLUDED**

- A. The Contractor shall be aware that after each major portion of the project is completed, the Contractor shall notify the Engineer that those specific operations are complete and prior to replacing that portion of the work into service shall request an interim inspection of the work to be returned to or placed into service.
- B. The interim inspection requested by the Contractor shall not preclude or supersede the final inspection of the project or reduce the Contractor's responsibility for the completed portion prior to final acceptance of the work by the Owner.
- C. The Contractor shall provide all necessary temporary controls and other items required for operation of all work placed into service prior to final acceptance as required. At such time as new controls, etc. are complete and functioning, the Contractor shall remove all temporary installed items.

- END OF SECTION -





**SECTION 01025****MEASUREMENT AND PAYMENT****PART 1 - GENERAL****1.01 WORK INCLUDED**

The Contractor shall furnish all necessary labor, machinery, tools, apparatus, equipment, materials, equipment, service, other necessary supplies and perform all work, including all excavation and backfilling (without additional compensation, except where specifically set out in these specifications) at the unit or lump sum prices for the following items.

**1.02 PROGRESS AND PAYMENTS SCHEDULES**

- A. Within ten (10) days after the date of formal execution of the AGREEMENT, the Contractor shall prepare and submit to the Engineer, for approval, a construction schedule which depicts the Contractor's plan for completing the contract requirements and show work placement in dollars versus contract time. The Contractor's construction schedule must be approved by the Engineer before any payments will be made on this contract.
- B. Within ten (10) days after the date of formal execution of the CONTRACT AGREEMENT, the Contractor shall prepare and submit to the Engineer, for approval, a periodic estimate which depicts the Contractor's cost for completing the contract requirements and show by major unit of the project work, the Contractor's dollar value for the material and the labor (two separate amounts) to be used as a basis for the periodic payments. The Contractor's periodic estimate must be approved by the Engineer before any payments will be made on this contract.
- C. The Engineer's decision as to sufficiency and completeness of the Contractor's construction schedule and periodic estimate will be final.
- D. The Contractor must make current, to the satisfaction of the Engineer, the construction schedule and periodic estimate each time he requests a payment on this contract.
- E. The Contractor's construction schedule and periodic estimate must be maintained at the construction site available for inspection and shall be revised to incorporate approved change orders as they occur.
- F. When the Contractor requests a payment on this contract, it must be on the approved periodic estimate and be current. Further, the current periodic estimate and construction schedule (both updated and revised) shall be submitted for review and approval by the Engineer before monthly payments will be made by the Owner. The Contractor shall submit six (6) current copies of each (periodic estimate and construction schedule) when requesting payment.

**1.03 CONDITIONS FOR PAYMENT**

- A. The Owner will make payments for acceptable work in place and materials properly stored on-site. The value of payment shall be as established on the approved construction schedule and periodic estimate, EXCEPT the Owner will retain ten percent (10%) of the work in place and a percentage as hereinafter listed for items properly stored or untested.
- B. No payment will be made for stored materials unless a proper invoice from the supplier is attached to the pay request. Further, no item whose value is less than \$1,000 will be considered as stored materials for pay purposes.

- C. Payment for pipeline items shall be limited to eighty percent (80%) of the bid price until the pipeline items have been tested and clean up has been completed and accepted by the Engineer.
- D. Payment for equipment items shall be limited to eighty-five percent (85%) of their scheduled value (materials portion only) until they are set in place. Eighty-five percent (85%) for stored materials and equipment shall be contingent on proper on-site storage as recommended by the manufacturer or required by the Engineer.
- E. Payment for equipment items set in place shall be limited to ninety percent (90%) of their scheduled value until they are ready for operation and have been certified by the manufacturer. Ninety percent (90%) payment for installed equipment shall be contingent on proper routine maintenance of the equipment in accordance with the manufacturer's recommendations.
- F. Payment for equipment items set in place and ready for operation shall be limited to ninety-five percent (95%) of their scheduled value until all acceptance tests have been completed and the required manufacturer's pre-startup operator's training has been completed.
- G. Payment for the labor portion of equipment items will be subject only to the degree of completeness and the appropriate retainage.
- H. The retainage shall be an amount equal to 10% of said estimate. The retainage on the equipment items shall be 10% as defined hereinbefore.
- I. If at any time thereafter when the progress of the WORK is not satisfactory or determine that the Contractor is not making satisfactory progress, additional amounts may be retained.
- J. **All steel and iron on this project shall be American made.**

#### **1.04 CLAIMS FOR EXTRA WORK**

- A. If the Contractor claims that any instructions by Drawings or otherwise involve extra cost, he shall give the Engineer written notice of said claim within ten (10) days after the receipt of such instructions and, in any event before proceeding to execute the work, stating clearly and in detail the basis of his claim or claims. No such claim shall be valid unless so made.
- B. Claims for additional compensation for extra work, due to alleged errors in spot elevations, contour lines or bench marks, will not be recognized unless accompanied by certified survey data, made prior to the time the original ground was disturbed, clearly showing that errors exist which resulted, or would result, in handling more material or performing more work than would reasonably be estimated from the Drawings and topographical maps issued.
- C. Any discrepancies which may be discovered between actual conditions and those represented by the topographical maps and Drawings shall at once be reported to the Engineer, and work shall not proceed, except at the Contractor's risk, until written instructions have been received by him from the Engineer.
- D. If, on the basis of the available evidence, the Engineer determines that an adjustment of the Contract Price or time is justifiable, the procedure shall then be as provided herein for "Changes in the Work".
- E. By execution of this Contract, the Contractor warrants that he has visited the site of the proposed work and fully acquainted himself with the conditions there existing relating to construction and labor, and that he fully understands the facilities, difficulties and restrictions attending the execution of the work under this Contract. The Contractor further warrants that he has

thoroughly examined and is familiar with the Drawings, Specifications and all other documents comprising the Contract. The Contractor further warrants that by execution of this Contract his failure when he was bidding on this Contract to receive or examine any form, instrument or document, or to visit the site and acquaint himself with conditions there existing, in no way relieves him from any obligation under the Contract, and the Contractor agrees that the Owner shall be justified in rejecting any claim based on facts regarding which he should have been on notice as a result thereof.

## **1.05 DETERMINATION OF THE VALUE OF EXTRA (ADDITIONAL) OR OMITTED WORK**

- A. The value of extra (additional) or omitted work shall be determined in one or more of the following ways:
  - 1. On the basis of the actual cost of all the items of labor (including on-the-job supervision), materials and use of equipment, plus a maximum 20% for added work or a minimum 20% for deleted work which shall cover the Contractor's general supervision, overhead and profit. In case of subcontracts, the sum of total overhead amounts of the subcontractors and Contractor, plus total profit amounts for the subcontracts and Contractor shall not exceed 25% of the cost. Subcontractors shall be limited to 15% and Contractors shall be limited to 10% for combined overhead and profit. The cost of labor shall include required insurance, taxes and fringe benefits. Contractor to provide detailed breakdown of all cost as justification of change in work. Equipment costs shall be based on current rental rates in the areas where the work is being performed, but in no case shall such costs be greater than the current rates published by the Associated Equipment Distributors, Chicago, Illinois.
  - 2. By estimate and acceptance in a lump sum.
  - 3. By unit prices named in the Contract or subsequently agreed upon.
- B. Provided, however, that the cost or estimated cost of all extra (additional) work shall be determined in advance of authorization by the Engineer and approved by the Owner.
- C. All extra (additional) work shall be executed under the conditions of the original Contract. Any claim for extension of time shall be adjusted according to the proportionate increase or decrease in the final total cost of the work unless negotiated on another basis.
- D. Except for over-runs in contract unit price items, no extra (additional) work shall be done except upon a written change Order from the Engineer, and no claim on the part of the Contractor for pay for extra (additional) work shall be recognized unless so ordered in writing by the Engineer.

## **PART 2 - PRODUCTS**

### **2.01 RENOVATION OF DIAMOND RIDGE PUMP STATION**

The pump station work will be paid as a lump sum and shall include the following: materials, labor, taxes, bonds, and insurance. The work shall be completed in place as shown on the construction drawings and shall adhere to the contents of these specifications. The renovation price will also include but is not limited to the following: Exterior piping and connections, meter, pumps, motors, control panel, RTU, antenna, heater, valves, painting, site piping, water main, grip rings, fittings, seeding, clean-up, permits, site work, gravel, electric, insulation, dog house structure and all other items necessary for a complete installation as shown in the plans and specifications.

## **2.02 RENOVATION OF RATTLESNAKE RIDGE PUMP STATION**

The pump station work will be paid as a lump sum and shall include the following: materials, labor, taxes, bonds, and insurance. The work shall be completed in place as shown on the construction drawings and shall adhere to the contents of these specifications. The renovation price will also include new pumps and motors, and all other items necessary for a complete installation as shown in the plans and specifications.

## **2.03 RENOVATION OF KY 504 PUMP STATION**

The pump station work will be paid as a lump sum and shall include the following: materials, labor, taxes, bonds, and insurance. The work shall be completed in place as shown on the construction drawings and shall adhere to the contents of these specifications. The renovation price will also include new VFD controls, piping, fittings, valves, painting and all other items necessary for a complete installation as shown in the plans and specifications. Work shall also include removal of the single phase service and installation of and adequately sized transformer to run single phase components from the three phase service.

## **2.04 BIG RUN PREFABRICATED PUMP STATION**

The pump station work will be paid as a lump sum and shall include the following: materials, labor, taxes, bonds, and insurance. The work shall be completed in place as shown on the construction drawings and shall adhere to the contents of these specifications. The payment for a new prefabricated self enclosed dual pump station unit shall also include pipe connections to existing water main, cut/cap existing water main, electric, new RTU and antenna, removal of existing pump station and delivery to owner, and all other items necessary for a complete installation as shown in the plans and specifications.

## **2.05 NEW REMOTE TERMINAL UNIT AT KY 7 TANK AND GREGORYVILLE TANK**

The RTU work will include any materials and labor, equipment to provide a new unit to replace existing units at both locations. This shall include any path studies, licensing, or start-up. The existing antennas shall be replaced with new antennas. All units must be compatible with the MTU and of the same manufacturer.

## **2.06 NEW RADIO'S FOR RTU AT VARIOUS TANK AND PUMP STATION LOCATIONS**

The replacement of the existing RTU radio's as directed in locations as described in other parts of the specifications, and shall include all materials and labor to make a complete transition of new radio's from the existing radio's.

## **2.07 NEW REMOTE TERMINAL UNIT AND TANK LEVEL TRANSMITTER AT KY 504 WEST TANK, KY 504 EAST TANKS, AND DIAMOND RIDGE TANK**

The RTU and tank level transmitter work will include any materials and labor, equipment to provide new units to replace existing units at all three locations. This shall include any path studies, licensing, or start-up. The existing antennas shall be replaced with new antennas. All units must be compatible with the MTU and of the same manufacturer.

# **PART 3 - EXECUTION**

## **3.01 PAY ITEMS**

- A. The pay items listed herein before refer to the items listed in the Bid Schedule and cover all of the pay items under the base bid for this contract.
- B. Any and all other items of work listed in the specifications or shown on the Contract Drawings for this contract shall be considered incidental to and included in those pay items.

**3.02 QUANTITIES OF ESTIMATE**

- A. Wherever the estimated quantities of work to be done and materials to be furnished under this Contract are shown in any of the documents, including the Bid Proposal, they are given for use in comparing bids and the right is especially reserved except as herein otherwise specifically limited, to increase or diminish them as may be deemed reasonably necessary or desirable by the Owner to complete the work contemplated by this Contract, and such increase or diminution shall not give cause for claims or liability for damages. The Engineer will not be financially responsible for any omissions from the Contract Documents and therefore not included by the Contractor in his proposal.
- B. Aerial photographs utilized for plan sheets in the Contract Documents are indicated at an approximate scale and shall not be scaled for quantity take-offs. The pipeline quantities listed in the Bid Schedule are given for use in comparing bids and may not be the actual quantities to be installed. It is the Contractor's responsibility to field verify the length and quantities of pipeline to be installed prior to the ordering of materials. Payment on unit price contracts are based on actual quantities installed. The Owner or Engineer will not be financially responsible for any shortage of pipe or overrun of pipe ordered for the pipeline quantities.
- C. The actual quantities of all materials to be used for this project shall be field verified prior to the Contractor ordering the necessary materials. The quantity listed in the bid schedule is given for use in comparing bids and may increase or diminish as may be deemed necessary or as directed by the Owner. Any such increase or diminution shall not give cause for claims or liability for damages. The Engineer or Owner will not be financially responsible for any charges incurred for restocking of materials ordered.

- END OF SECTION -

**SECTION 01030****LABOR PROVISIONS****PART 1 - GENERAL****1.01 WORK INCLUDED**

- A. The Contractor shall conform to all provisions of the Kentucky Department of Labor, Wage Decisions (latest revisions), relative to minimum wages and hours as they may apply to the work to be accomplished under these specifications.
- B. In addition to the above, certain Federal laws and regulations shall govern the work and shall supplement or supplant the Kentucky Department of Labor Wage Decisions cited above, as the case may be.

**1.02 RELATED SECTIONS**

- A. Section 3 - Part 1 Hours and Wages

**1.03 WAGE RATES**

**Prevailing wage rates apply to this job.**

**1.04 LABOR PREFERENCE**

Where feasible, the Contractor will utilize local labor.

**1.05 HOURS OF WORK**

- A. Hours of work shall be as set out in Kentucky Department of Labor Wage Decisions (latest revisions); that is, not more than eight (8) hours in one calendar day, nor more than forty (40) hours in one week, except in case of emergency caused by fire, flood or damage to life and property.
- B. Any laborer, workman, mechanic, helper, assistant or apprentice working in excess of forty (40) hours per week, except in case of emergency, shall be paid not less than 1-1/2 times the wage rate. Whenever overtime work is scheduled, the Contractor shall give prior notice to the Owner.

- END OF SECTION -





**SECTION 01040****COORDINATION****PART 1 - GENERAL****1.01 COORDINATION OF THE WORK**

The Contractor shall coordinate the work of all the crafts, trades and subcontractors engaged on the Work, and he shall have final responsibility as regards the schedule, workmanship and completeness of each and all parts of the Work.

All crafts, trades and subcontractors shall be made to cooperate with each other and with others as they may be involved in the installation of work which adjoins, incorporates, precedes or follows the work of another. It shall be the Contractor's responsibility to point out areas of cooperation prior to the execution of subcontract agreements and the assignment of the parts of the Work. Each craft, trade and subcontractor shall be made responsible to the Owner, for furnishing embedded items, giving directions for doing all cutting and fitting, making all provisions for accommodating the Work, and for protecting, patching, repairing and cleaning as required to satisfactorily perform the Work.

The Contractor shall be responsible for all cutting, digging and other action of his subcontractors and workmen. Where such action impairs the safety or function of any structure or component of the Project, the Contractor shall make such repairs, alterations and additions as will, in the opinion of the Engineer, bring said structure or component back to its original design condition at no additional cost to the Owner.

Each subcontractor is expected to be familiar with the General Requirements and all sections of the Detailed Specifications for all other trades and to study all Drawings applicable to his work to the end that complete coordination between trades will be affected. Each Contractor shall consult with the Engineer if conflicts exist on the Drawings.

The Contractor shall conduct testing of water booster stations in a timely manner. Prior to any booster station is accepted it shall be tested, manufacturer's start-up, and site clean-up.

- END OF SECTION -



**SECTION 01200****SUBSTITUTIONS****PART 1 - GENERAL**

- A. If the CONTRACTOR wishes to furnish or use a substitute item of material or equipment or construction method he shall make written application to the Contracting Officer within thirty (30) days after execution of the Contract, certifying that the proposed substitute will perform adequately the functions called for by the general design, be similar and of equal substance to that specified and be suited to the same use and capable of performing the same functions as that specified. Requests for review of substitute items of material and equipment will not be accepted by the ENGINEER from anyone other than CONTRACTOR.
- B. In making request for substitution, CONTRACTOR represents:
  - 1. He has personally investigated proposed product or method, and determined that it is equal or superior in all respects to that specified.
  - 2. He will provide the same or better guarantee for substitution as for product or method specified.
  - 3. He will coordinate installation of accepted substitution into work, making such changes as required in all respects.
  - 4. He waives all claims for additional costs related to substitution that consequently become apparent.
  - 5. Cost data is complete and includes all related costs under this Contract.
  - 6. Contractor will pass through any cost savings from approval of a substitution.

**1.01 SUBMITTALS**

- A. The CONTRACTOR shall submit six (6) copies of requests for substitution. Include in request the following:
  - 1. Complete data substantiating compliance of proposed substitution with Contract Documents.
  - 2. Indication whether or not incorporation or use of the substitute in connection with the Work is subject to payment of any license fee or royalty.
  - 3. For Products:
    - a. Product identification, including manufacturer's name and address.
    - b. Manufacturer's literature with product description, performance and test data, and reference standards.
    - c. Samples.

- d. Name and address of similar projects on which product was used, data of installation, and product performance and maintenance records.
- 4. For Construction Methods:
  - a. Detailed description of proposed method.
  - b. Drawings illustrating methods.
- 5. Itemized comparison of proposed substitution with product or method specified.
- 6. Data relating to changes in construction schedule.
- 7. Relation to separate contracts, if any.
- 8. Accurate cost data on proposed substitution in comparison with product or method specified.
- D. Substitutions will not be accepted if:
  - 1. They are only shown or implied on Shop Drawings.
  - 2. Acceptance will require substantial revision of Contract Documents.
  - 3. Substitutions would change design concepts or Specifications.
  - 4. Substitutions would delay completion of the Work.
  - 5. Substitutions involve items for which a manufacturer was declared at time of bidding.
- E. The ENGINEER will determine whether substitute brands or products are equal to those specified in the Contract Documents. No substitute will be ordered or installed without the ENGINEER's prior written acceptance.
- F. The OWNER may require CONTRACTOR to furnish at CONTRACTOR'S expense a special performance guarantee or other surety with respect to any substitute.
- G. If the ENGINEER determines that a substitute is not equal to that named in the Specifications, the CONTRACTOR shall furnish one of the brands or products specified, at no additional cost to the OWNER.
- H. The time required by the ENGINEER to evaluate and either accept or reject proposed substitutes is included in the Contract Time and no extension of the Contract Time shall be allowed therefore.

## **1.02 ENGINEERING COSTS**

- A. The ENGINEER will record all time required in evaluating substitutions proposed by CONTRACTOR and in making any change in the Drawings or Specifications occasioned thereby. Whether or not the ENGINEER accepts a proposed substitute, the CONTRACTOR will reimburse the OWNER for the actual costs of the ENGINEER for evaluating any proposed substitute which either does not meet the requirements of the Drawings and Specifications, or the acceptance of which would require changes to other portions of the work.

- B. CONTRACTOR shall reimburse OWNER for all associated engineering costs, including redesign, additional shop drawing reviews, investigations, consultant fees and revision of the Contract Documents required because of the substitution.

- END OF SECTION -



## **SECTION 01300**

### **SUBMITTALS**

#### **PART 1 - GENERAL**

##### **1.01 WORK INCLUDED**

Shop drawings, descriptive literature, project data and samples (when samples are specifically requested) for all manufactured or fabricated items shall be submitted by the Contractor to the Engineer for examination and review in the form and in the manner required by the Engineer. All SUBMITTALS shall be furnished in at least six (6) copies and shall be checked, reviewed and signed by the Contractor before submission to the Engineer. The review of the Drawings by the Engineer shall not be construed as a complete check but only for conformance with the design concept of the Project and for compliance with information given in the Contract Documents. Review of such drawings will not relieve the Contractor of the responsibility for any errors that may exist, as the Contractor shall be responsible for the dimensions and design of adequate connections, details, and satisfactory construction of all work.

##### **1.02 RELATED REQUIREMENTS SPECIFIED ELSEWHERE**

- A. General Provision.
- B. Section 01720 - Project Record Documents (As-Built).

##### **1.03 DEFINITIONS**

The term "submittals" shall mean shop drawings, manufacturer's drawings, catalog sheets, brochures, descriptive literature, diagrams, schedules, calculations, material lists, performance charts, test reports, office and field samples, and items of similar nature which are normally submitted for the Engineer's review for conformance with the design concept and compliance with the Contract Documents.

##### **1.04 GENERAL CONDITIONS**

- A. Review by the Engineer of shop drawings or SUBMITTALS of material and equipment shall not relieve the Contractor from the responsibilities of furnishing same of proper dimension, size, quality, quantity, materials and all performance characteristics to efficiently perform the requirements and intent of the Contract Documents. Review shall not relieve the Contractor from responsibility for errors of any kind on the shop drawings. Review is intended only to assure conformance with the design concept of the Project and compliance with the information given in the Contract Documents.
- B. Review of shop drawings shall not be construed as releasing the Contractor from the responsibility of complying with the Specifications.

##### **1.05 GENERAL REQUIREMENTS FOR SUBMITTALS**

- A. Shop Drawings:
  - 1. Shop drawings shall be prepared by a qualified detailer. Details shall be identified by reference to sheet and detail numbers shown on Contract Drawings. Where applicable, show fabrication, layout, setting and erection details.
  - 2. Shop drawings are defined as original drawings prepared by the Contractor, subcontractors, suppliers, or distributors performing work under this Contract. Shop

drawings illustrate some portion of the work and show fabrication, layout, setting or erection details of equipment, materials and components. The Contractor shall, except as otherwise noted, have prepared the number of reviewed copies required for his distribution plus two (2) which will be retained by the Engineer. Shop drawings shall be folded to an approximate size of 8-1/2" x 11" and in such manner that the title block will be located in the lower righthand corner of the exposed surface.

- B. Project data shall include manufacturer's standard schematic drawings modified to delete information which is not applicable to the Project, and shall be supplemented to provide additional information applicable to the Project. Each copy of descriptive literature shall be clearly marked to identify pertinent information as it applies to the Project.
- C. Where samples are required, they shall be adequate to illustrate materials, equipment or workmanship, and to establish standards by which completed work is judged. Provide sufficient size and quantity to clearly illustrate functional characteristics of product and material, with integrally related parts and attachment devices, along with a full range of color samples.
- D. All submittals shall be referenced to the applicable item, section and division of the Specifications, and to the applicable Drawing(s) or Drawing schedule(s).
- E. The Contractor shall review and check SUBMITTALS, and shall indicate his review by initials and date.
- F. If the submittals deviate from the Contract Drawings and/or Specifications, the Contractor shall advise the Engineer, in letter of transmittal of the deviation and the reasons therefor. All changes shall be clearly marked on the submittal with a bold red mark. Any additional costs for modifications shall be borne by the Contractor.
- G. In the event the Engineer does not specifically reject the use of material or equipment at variance to that which is shown on the Drawings or specified, the Contractor shall, at no additional expense to the Owner, and using methods reviewed by the Engineer, make any changes to structures, piping, controls, electrical work, mechanical work, etc., that may be necessary to accommodate this equipment or material. Should equipment other than that on which design drawings are based be accepted by the Engineer, shop drawings shall be submitted detailing all modification work and equipment changes made necessary by the substituted item.
- H. Additional information on particular items, such as special drawings, schedules, calculations, performance curves, and material details, shall be provided when specifically requested in the technical Specifications.
- I. Submittals for all electrically operated items (including instrumentation and controls) shall include complete wiring diagrams showing leads, runs, number of wires, wire size, color coding, all terminations and connections, and coordination with related equipment.
- J. Equipment shop drawings shall indicate all factory or shop paint coatings applied by suppliers, manufacturers and fabricators; the Contractor shall be responsible for insuring the compatibility of such coatings with the field-applied paint products and systems.
- K. Fastener specifications of manufacturer shall be indicated on equipment shop drawings.
- L. Where manufacturers' brand names are given in the Specifications for building and construction materials and products, such as grout, bonding compounds, curing compounds, masonry cleaners, waterproofing solutions and similar products, the Contractor shall submit names and descriptive literature of such materials and products he proposes to use in this Contract.



- M. No material shall be fabricated or shipped unless the applicable drawings or submittals have been reviewed by the Engineer and returned to the Contractor.
- N. All bulletins, brochures, instructions, parts lists, and warranties packaged with and accompanying materials and products delivered to and installed in the Project shall be saved and transmitted to the Owner through the Engineer.

#### **1.06 CONTRACTOR RESPONSIBILITIES**

- A. Verify field measurements, field construction criteria, catalog numbers and similar data.
- B. Coordinate each submittal with requirements of Work and of Contract Documents.
- C. Notify Engineer, in writing at time of submission, of deviations in submittals from requirements of Contract Documents.
- D. Begin no work, and have no material or products fabricated or shipped which required submittals until return of submittals with Engineer's stamp and initials or signature indicating review.

- END OF SECTION -



**SECTION 01380****CONSTRUCTION PHOTOGRAPHY****PART 1 - GENERAL****1.01 WORK INCLUDED**

The Contractor shall be responsible for video taping the entire project site both prior to construction and immediately after completion and acceptance of all work. Video tapes shall be produced by a videographer acceptable to the Engineer and of a professional quality.

**1.02 VIDEO TAPE**

The video tape shall be of a high quality DVD format. DVD shall show the time, date, and project location on screen during playback.

**1.03 SUBMITTALS**

The Contractor shall provide two copies of the project video tape or DVD with jackets. Both the video tapes or DVD's and jackets shall be clearly labeled with project name start date and completion date as shown below.

Project Name and Contract No.

Owner Name

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

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

-END OF SECTION-



**SECTION 01450****QUALITY CONTROL****PART 1 - GENERAL****1.01 QUALITY CONTROL**

- A. Work of all crafts and trades shall be laid out to lines and elevations as established by the Contractor from the Drawings or from instructions by the Engineer.
- B. Unless otherwise shown, all work shall be plumb and level, in straight lines and true planes, parallel or square to the established lines and levels. The Work shall be accurately measured and fitted to tolerance as established by the best practices of the crafts and trades involved, and shall be as required to fit all parts of the Work carefully and neatly together.
- C. All equipment, materials and articles incorporated into the Work shall be new and of comparable quality as specified. All workmanship shall be first-class and shall be performed by mechanics skilled and regularly employed in their respective trades.

**1.02 TESTS, INSPECTIONS, AND CERTIFICATIONS OF MATERIALS**

- A. Tests, inspections and certifications of materials, equipment, subcontractors or completed work, as required by the various sections of the Specifications shall be obtained by the Contractor and all costs shall be included in the Contract Price.
- B. The Contractor shall submit to the Engineer the name of testing laboratory to be used.
- C. Contractor shall deliver written notice to the Engineer at least 24 hours in advance of any inspections or tests to be made at the Project site. All inspections, tests, samples for water quality or other procedures requiring the Engineer to attest to be conducted in the field shall be done in the presence of the Engineer or his representative.
- D. Certifications by independent testing laboratories may be by copy of the attestation(s) and shall give scientific procedures and results of tests. Certifications by persons having interest in the matter shall be by original attest properly sworn to and notarized.

- END OF SECTION -



**SECTION 01500****TEMPORARY FACILITIES AND CONTROLS****PART 1 - GENERAL****1.01 DESCRIPTION**

- A. The Contractor shall make his own provisions for temporary electricity and water and maintain strict supervision of use of temporary utility services as follows:
  - 1. Enforce compliance with applicable standards.
  - 2. Enforce safety practices
  - 3. Prevent abuse of services.
  - 4. Pay all utility charges required.

**1.02 REQUIREMENTS OF REGULATORY AGENCIES**

- A. The Contractor shall obtain and pay for all permits as required by governing authorities.
- B. Obtain and pay for temporary easements required across property other than that of Owner or that is shown on the Contract Drawings.
- C. The Contractor shall comply with applicable codes.

**1.03 REMOVAL**

- A. The Contractor shall completely remove temporary materials, equipment, and offices upon completion of construction.
- B. The Contractor shall repair damage caused by installation and restore to specified or original condition.

**1.04 TEMPORARY LIGHTING**

- A. The Contractor shall furnish and install temporary lighting required for:
  - 1. Construction needs.
  - 2. Safe and adequate working conditions.
  - 3. Public Safety.
  - 4. Security lighting.
  - 5. Temporary office and storage area lighting.
- B. Service periods for safety lighting shall be as follows:
  - 1. Within construction area: All times that authorized personnel are present.

- 2. Public areas: At all times.
- C. Costs of Installation and Preparation: Contractor shall pay all installation, maintenance and removal costs of temporary lighting.
- D. Maintenance of temporary lighting service (replacement of bulbs, etc.) shall be the sole responsibility of the General Contractor.

#### **1.05 TEMPORARY WATER**

The Contractor shall provide the water necessary for testing and disinfection. Water purchased from the owner for flushing and testing shall be paid for at the whole sale price by the contractor. The Contractor shall supply his own hoses, chlorine for disinfection, etc.

#### **1.06 SANITARY FACILITIES**

Contractor shall provide sanitary facilities as set forth in General Provisions (GP-2.04.Sanitary Regulations).

#### **1.07 FIELD OFFICE (Office Trailer not Required for this Contract)**

The Contractor shall make his own provisions for providing the electricity, telephone, gas, water, sewer, and other utilities to his office trailer that are required or as necessary for completion of the work.

The Contractor shall be responsible for all utility charges.

### **PART 2 - PRODUCTS**

Not used.

### **PART 3 – EXECUTION**

#### **3.01 IMPLEMENTATION**

- B. The Contractor shall provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to storm drains, adjacent areas and walkways prior to the start of any site work.
- C. Straw bale dikes, silt fencing and synthetic filter fabric shall be used as necessary to protect adjacent lands, surface waters, and vegetation to achieve environmental objectives.
- D. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- E. Soil deposited on pavement by construction and other contractor vehicles shall be removed and the pavement swept as required.
- F. Plan and execute construction by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
- G. Minimize amount of bare soil exposed at one time.
- H. Provide temporary measures such as berms, dikes, drains, hay bales, gabions, etc., as directed by the Engineer so as to minimize siltation due to runoff.



- I. Construct fill and waste areas by selective placement to avoid erosive exposed surface of silts or clays.
- J. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

### **3.02 OPERATION AND MAINTENANCE**

- A. The Contractor shall inspect, repair, and maintain erosion and sediment control measures until final stabilization has been established.

### **3.03 REMOVAL OF FACILITIES**

- A. The Contractor shall remove the temporary facilities after final stabilization has been established. Used devices (including old straw bales) shall be disposed of as Construction & Demolition debris.

### **3.04 DUST CONTROL**

- A. Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere.

- END OF SECTION -



**SECTION 01530**

**BARRIERS**

**PART 1 - GENERAL**

**1.01 WORK INCLUDED**

Temporary Railing: Temporary railing shall be provided around open pits and other locations where needed, to prevent accidents or injury to persons.

**1.02 COST**

The Contractor shall pay all costs for temporary railing.

- END OF SECTION -



**SECTION 01540****SECURITY****PART 1 - GENERAL****1.01 WORK INCLUDED**

- A. Provide barricades, lanterns and other such signs and signals as may be necessary to warn of the dangers in connection with open excavation and obstructions.
- B. Provide an adequate and approved system to secure the Project area at all times, especially during non-construction periods; the Contractor shall be solely responsible for taking proper security measures.

**1.02 COSTS**

Contractor shall pay all costs for protection and security systems.

- END OF SECTION -



**SECTION 01580****PROJECT IDENTIFICATION AND SIGNS****PART 1 - GENERAL****1.01 WORK INCLUDED**

- A. The Contractor shall provide all signs required by these specifications near the site of the work. The sign shall set forth the description of the work and the names of the Owner, Engineer and Contractor as shown on the Plans or in these Specifications.
- B. The Contractor shall furnish and install One (1) sign on the Project. One sign shall conform to the specifications and painted as shown on Figure I on the following page. The location of signs shall be determined by the Owner and/or Engineer at the pre-construction meeting.

**PART 2 - PRODUCT****2.01 SIGN**

The sign shall be constructed of 3/4" thick APA A-B Exterior grade or marine plywood. Posts shall be 4" x 4" of fencing type material. Prime all wood with white primer. Sign shall be as shown in Figure I and II.

**PART 3 - EXECUTION****3.01 MAINTENANCE**

The sign shall be maintained in good condition until completion of the Project.

**3.02 LOCATION**

The location of the project signs shall be determined at the pre-construction conference after the contract has been awarded.

-END OF SECTION-





## SECTION 01600

### MATERIAL AND EQUIPMENT

#### PART 1 - GENERAL

##### 1.01 COMPLIANCE WITH SAFETY REGULATIONS

The equipment items furnished shall comply with all governing Federal and State laws regarding safety, including all requirements of the Occupational Safety and Health Act of 1970 (OSHA).

#### PART 2 - PRODUCTS

##### 2.01 REFERENCES

- A. General Provisions: Section 10 Correction and Guarantee of Work, Section 13 Materials and Equipment.
- B. Section 02600 – Pipe, Fittings, and Installation
- C. Section 02640 - Valves.
- D. All material shall meet applicable American Water Works Association (AWWA), American Standard Testing Methods (ASTM), Underwriters Laboratories (UL), Factory Mutual (FM), National Sanitation Foundation (NSF) standards.

#### RATTLESNAKE RIDGE WATER DISTRICT.

The following is a list of manufacturers for the materials that may be provided on the project. All material shall meet applicable AWWA, ASTM, Underwriters Laboratories, and Factory Mutual standards. The Owner and Engineer shall approve actual materials during shop drawing review. **This project must comply with all American Iron and Steel Requirements.**

MATERIAL/ITEM	APPROVED MANUFACTURER
Air Release Valve (Water and Sewer)	Apco, ARI, Primer Corp or Approved Equal
All Brass Fittings (AWWA brass)	Ford
Aluminum Hatch	Bil-Co or Approved Equal
Blowoff Assembly (Underground)	Hydrants shall follow the details as displayed in the PLANS.
Bolted Cast Couplings	Dresser, Smith & Blair, Ford, Viking-Johnson, JCM, Powerseal or Approved Equal
Brass Nipples and Pipe	State Origin
Brass Service Saddles	Ford
Casing Spacers	State Origin
Check Valve	Valve shall be those manufactured by Mueller,

<b>MATERIAL/ITEM</b>	<b>APPROVED MANUFACTURER</b>
	Kennedy, American Flow Control, or Approved Equal.
Tracing Wire	APSS-1201-6-YP3 12 Gauge Copper Clad 0.030, Blue
Customer Meter	Badger (Orion) Radio Read M25LL
Customer Meter Box Cover	Precast Concrete w/ lid by Brooks Products
Customer Meter Setter	Ford (VBHH72-7W-41-33-NL
DI and Cast Iron Full Body Tapping Sleeves	Mueller, Clow, US Pipe, American Flow or Approved Equal or Approved Equal
DI Double Strap Service Saddles	Mueller, Ford, Smith & Blair, JCM or Approved Equal
DI Pipe Class 350	Griffin, Clow, US Pipe, American DI Pipe or Approved Equal
Dual Disc Check Valve	Valve shall be Series #8800 (class 125) as manufactured by Val-Matic® Valve & Mfg. Corporation, Elmhurst, IL. USA. or Approved Equal.
Flushing Hydrant Assembly	Mueller® – Super Centurion 250, Model No. A-423 or Approved Equal
Full Circle Repair Clamps (all stainless steel)	Mueller, Smith & Blair, Ford, Powerseal, Cascade or Approved Equal
Gate Valves	Mueller Resilient Seat or Approved Equal
Individual Pressure Reducing Valve	Watts Model No. N55BUM1 or Approved Equal
Mainline Pressure Reducing Valve	n/a
MJ Fittings Compact/Full Body MJ Packs	McWayne (Tyler/Union, Clow), Griffin, US Pipe, American DI Pipe or Approved Equal
PVC Pipe Class 200 or C900	Diamond, JM Manufacturing, Napco, Freedom, ETI, National, Pioneer or Approved Equal
Restraint Joint Collar Fittings	Mueller, McWayne, Ford, EBBA or Approved Equal
Service Tubing – Polyethylene Tubing (CTS Service Tubing)	Domestic
Stainless Steel Tapping Valves and Sleeves (Check Working Pressure)	Mueller, Kennedy, Ford or Approved Equal
Underground Tracer Wire Anchor System	Valve Box Protector Ring w/copper locator pin

-END OF SECTION-

**SECTION 01610****TRANSPORTATION AND HANDLING****PART 1 - GENERAL****1.01 WORK INCLUDED**

- A. Handling and Distribution:
  - 1. The Contractor shall handle, haul, and distribute all materials and all surplus materials on the different portions of the work, as necessary or required; shall provide suitable and adequate storage room for materials and equipment during the progress of the work, and be responsible for the protection, loss of, or damage to materials and equipment furnished by him, until the final completion and acceptance of the work.
  - 2. Storage and demurrage charges by transportation companies and vendors shall be borne by the Contractor.
- B. Storage of Materials and Equipment: All excavated materials and equipment to be incorporated in the work shall be placed so as not to injure any part of the work or the existing facilities and so that free access can be had at all times to all parts of the work and to all public utility installations in the vicinity of the work. Materials and equipment shall be kept neatly piled and compactly stored in such locations as will cause a minimum of inconvenience to public travel and adjoining owners, tenants and occupants.

- END OF SECTION -



**SECTION 01700**  
**PROJECT CLOSEOUT**

**PART 1 - GENERAL**

**1.01 RELATED REQUIREMENTS SPECIFIED ELSEWHERE**

- A. Liquidated Damages: General Provisions-11.20. CHARGES FOR DELAY CAUSED BY THE CONTRACTOR
- B. Cleaning: Section 01710.
- C. Project Record Documents: Section 01720.

**1.02 SUBSTANTIAL COMPLETION**

- A. Contractor:
  - 1. Submit written certification to Engineer that project is substantially complete.
  - 2. Submit list of major items to be completed or corrected.
- B. Engineer will make an inspection within seven days after receipt of certification, together with Owner's Representative.
- C. Should Engineer consider that work is substantially complete:
  - 1. Contractor shall prepare, and submit to Engineer, a list of items to be completed or corrected, as determined by the inspection.
  - 2. Engineer will prepare and issue a Certificate of Substantial Completion, containing:
    - a. Date of Substantial Completion.
    - b. Contractor's list of items to be completed or corrected, verified and amended by Engineer.
    - c. The time within which Contractor shall complete or correct work of listed items.
    - d. Time and date Owner will assume possession of work or designated portion thereof.
    - e. Responsibilities of Owner and Contractor for:
      - (1) Insurance
      - (2) Utilities
      - (3) Operation of mechanical, electrical and other systems.
      - (4) Maintenance and cleaning.
      - (5) Security

- f. Signatures of:
  - (1) Engineer.
  - (2) Contractor.
  - (3) Owner.
- 3. Owner occupancy of Project or Designated Portion of Project:
  - a. Contractor shall:
    - (1) Obtain certificate of occupancy.
    - (2) Perform final cleaning in accordance with Section 01710.
  - b. Owner will occupy Project, under provisions stated in Certificate of Substantial Completion.
- 4. Contractor shall complete work listed for completion or correction, within designated time.
- D. Should Engineer consider that work is not substantially complete.
  - 1. He shall immediately notify Contractor, in writing, stating reasons.
  - 2. Contractor shall complete work, and send second written notice to Engineer, certifying that Project, or designated portion of Project is substantially complete.
  - 3. Engineer will reinspect work.

### **1.03 FINAL INSPECTION**

- A. Contractor shall submit written certification that:
  - 1. Contract Documents have been reviewed.
  - 2. Project has been inspected for compliance with Contract Documents.
  - 3. Work has been completed in accordance with Contract Documents.
  - 4. Equipment and systems have been tested in presence of Owner's Representative and are operational.
  - 5. Project is completed and ready for final inspection.
- B. Engineer will make final inspection within seven (7) days after receipt of certification.
- C. Should Engineer consider that work is finally complete in accordance with requirements of Contract Documents, he shall request Contractor to make Project Closeout submittals.
- D. Should Engineer consider that work is not finally complete:
  - 1. He shall notify Contractor, in writing, stating reasons.
  - 2. Contractor shall take immediate steps to remedy the stated deficiencies, and send second written notice to Engineer certifying that work is complete.

3. Engineer will reinspect work.

**1.04 FINAL CLEAN UP**

The Work will not be considered as completed and final payment made until all final clean up has been done by the Contractor in a manner satisfactory to the Engineer. See Section 01710 for detailed requirements.

**1.05 CLOSEOUT SUBMITTALS**

Project Record Documents: To requirements of Section 01720.

**1.06 FINAL APPLICATION FOR PAYMENT**

Contractor shall submit final applications in accordance with requirements of GENERAL PROVISIONS.

**1.07 FINAL CERTIFICATE FOR PAYMENT**

- A. Engineer will issue final certificate in accordance with provisions of GENERAL PROVISIONS.
- B. Should final completion be materially delayed through no fault of Contractor, Engineer may issue a Semi-Final Certificate for Payment.

- END OF SECTION -





**SECTION 01710****CLEANING****PART 1 - GENERAL****1.01 WORK INCLUDED**

- A. During its progress the work and the adjacent areas affected thereby shall be kept cleaned up and all rubbish, surplus materials, and unneeded construction equipment shall be removed and all damage repaired so that the public and property owners will be inconvenienced as little as possible.
- B. Where material or debris has washed or flowed into or been placed in existing watercourses, ditches, gutters, drains, pipes, structures, by work done under this contract, or elsewhere during the course of the Contractor's operations, such material or debris shall be entirely removed and satisfactorily disposed of during the progress of the work, and the ditches, channels, drains, pipes, structures, and work, etc., shall, upon completion of the work, be left in a clean and neat condition.
- C. On or before the completion of the work, the Contractor shall, unless otherwise especially directed or permitted in writing, tear down and remove all temporary buildings and structures built by him; shall remove all temporary works, tools, and machinery or other construction equipment furnished by him; shall remove, acceptably disinfect, and cover all organic matter and material containing organics in, under, and around privies, houses, and other buildings used by him; shall remove all rubbish from any grounds which he has occupied; and shall leave the roads and all parts of the premises and adjacent property affected by his operations in a neat and satisfactory condition.
- D. The Contractor shall thoroughly clean all materials and equipment installed by him and his subcontractors, and on completion of the work shall deliver it undamaged and in fresh and new appearing condition.
- E. The Contractor shall restore or replace, when and as directed, any public or private property damaged by his work, equipment, or employees, to a condition equal or better than that existing immediately prior to the beginning of operations. To this end the Contractor shall do as required all necessary highway or driveway, walk, and landscaping work. Suitable materials, equipment, and methods shall be used for such restoration. The restoration of existing property or structures shall be done as promptly as practicable as work progresses and shall not be left until the end of the contract period.

**1.02 DESCRIPTION**

- A. Related Requirements Specified Elsewhere:
  - 1. Project Closeout: Section 01700.
  - 2. Cleaning for Specific Products or Work: Specification Section for that work.
- B. On a continuous basis, maintain premises free from accumulations of waste, debris, and rubbish, caused by operations.

- C. At completion of Work, remove waste materials, rubbish, tools, equipment, machinery and surplus materials, and clean all sight-exposed surfaces; leave Project clean and ready for occupancy.

### **1.03 SAFETY REQUIREMENTS**

- A. Hazards Control:
  - 1. Store volatile wastes in covered metal containers, and remove from premises daily.
  - 2. Prevent accumulation of wastes, which create hazardous conditions.
  - 3. Provide adequate ventilation during use of volatile or noxious substances.
- B. Conduct cleaning and disposal operations in compliance with local ordinances and anti-pollution laws.
  - 1. Do not burn or bury rubbish and waste materials on Project site without written permission from the Owner.
  - 2. Do not dispose of volatile wastes such as mineral spirits, oil, or fuel in open drainage ditches or storm or sanitary drains.
  - 3. Do not dispose of wastes into streams or waterways.

## **PART 2 - PRODUCTS**

### **2.01 MATERIALS**

- A. Use only cleaning materials recommended by manufacturer of surface to be cleaned.
- B. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

## **PART 3 - EXECUTION**

### **3.01 DURING CONSTRUCTION**

- A. Execute cleaning to ensure that grounds and public properties are maintained free from accumulations of waste materials and rubbish.
- B. Wet down dry materials and rubbish to minimize blowing dust.
- C. At reasonable intervals during progress of Work, clean site and public properties, and dispose of waste materials, debris and rubbish.
- D. Provide on-site containers for collection of waste materials, debris and rubbish.
- E. Remove waste materials, debris and rubbish from site and legally dispose of at public or private dumping areas off construction site.
- F. The Contractor shall thoroughly clean all materials and equipment installed.

**3.02 FINAL CLEANING**

- A. Employ experienced workmen, or professional cleaners, for final cleaning.
- B. In preparation for substantial completion, conduct final inspection of project area(s).
- C. Broom clean paved surfaces; rake clean other surfaces of grounds.
- D. Maintain cleaning until Project, or portion thereof, is accepted by Owner.

- END OF SECTION -



**SECTION 01720****PROJECT RECORD DOCUMENTS****PART 1 - GENERAL****1.01 WORK INCLUDED**

The Contractor shall obtain from the Engineer, one (1) set of prints of the Contract Drawings. These prints shall be kept and maintained in good condition at the project site and a qualified representative of the Contractor shall enter upon these prints, from day-to-day, the actual "as-built" record of the construction progress. Entries and notations shall be made in a neat and legible manner and these prints shall be delivered to the Engineer upon completion of the construction. APPROVAL FOR FINAL PAYMENT WILL BE CONTINGENT UPON COMPLIANCE WITH THIS PROVISION.

**1.02 RELATED REQUIREMENTS SPECIFIED ELSEWHERE:**

- A. Section 01300 - Submittals.
- B. General Provisions – Kentucky Engineering Group, PLLC

**1.03 MAINTENANCE OF DOCUMENTS**

- A. Maintain at job site, one copy of:
  - 1. Contract Drawings
  - 2. Specifications
  - 3. Addenda
  - 4. Reviewed Shop Drawings
  - 5. Change Orders
  - 6. Other Modifications to Contract
- B. Store documents in approved location, apart from documents used for construction.
- C. Provide files and racks for storage of documents.
- D. Maintain documents in clean, dry legible condition.
- E. Do not use record documents for construction purposes.
- F. Make documents available at all times for inspection by Engineer and Owner.

**1.04 MARKING DEVICES**

Provide colored pencil or felt-tip marking pen for all marking.

**1.05 RECORDING**

- A. Label each document "PROJECT RECORD" in 2-inch high printed letters.

- B. Keep record documents current.
- C. Do not permanently conceal any work until required information has been recorded.
- D. Contract Drawings: Legibly mark to record actual construction:
  - 1. Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvements.
  - 2. Location of internal utilities and appurtenances concealed in construction referenced to visible and accessible features of structure.
  - 3. Field changes of dimension and detail.
  - 4. Changes made by Change Order or Field Order.
  - 5. Details not on original Contract Drawings.
- E. Specifications and Addenda: Legibly mark up each Section to record:
  - 1. Manufacturer, trade name, catalog number, and supplier of each product and item of equipment actually installed.
  - 2. Changes made by Change Order or Field Order.
  - 3. Other matters not originally specified.
- F. Shop Drawings: Maintain as record documents; legibly annotate Shop Drawings to record changes made after review.

#### **1.06 SUBMITTAL**

- A. At completion of project, deliver record documents to Engineer.
- B. Accompany submittal with transmittal letter, in duplicate, containing:
  - 1. Date.
  - 2. Project Title and Number.
  - 3. Contractor's Name and Address.
  - 4. Title and Number of each Record Document.
  - 5. Certification that each Document as Submitted is Complete and Accurate.
  - 6. Signature of Contractor, or his authorized Representative.

- END OF SECTION -

**SECTION 01740**  
**WARRANTIES AND BONDS**

**PART 1 - GENERAL**

**1.01 WORK INCLUDED**

- A. Compile specified warranties and bonds.
- B. Compile specified service and maintenance contracts.
- C. Co-execute submittals when so specified.
- D. Review submittals to verify compliance with Contract Documents.
- E. Related requirements specified elsewhere:
  - 1. Bid Bond: Instructions to Bidders.
  - 2. Performance and Payment Bonds: General Provisions.
  - 3. Guaranty: General Provisions.
  - 4. General Warranty of Construction: General Provisions.
  - 5. Project Closeout: Section 01700.
  - 6. Warranties and Bonds required for specific products: As listed herein.
  - 7. Provisions of Warranties and Bonds, Duration: Respective specification sections for particular products.
  - 8. Operating and Maintenance Data: Section 01730.

**1.02 SUBMITTALS REQUIREMENTS**

- A. Assemble warranties, bonds and service and maintenance contracts, executed by each of the respective manufacturers, suppliers and subcontractors.
- B. Furnish two (2) original signed copies.
- C. Table of Contents: Neatly typed, in orderly sequence. Provide complete information for each item.
  - 1. Product, equipment or work item.
  - 2. Firm name, address and telephone number.
  - 3. Scope

4. Date of beginning of warranty, bond or service and maintenance contract.
5. Duration of warranty, bond or service and maintenance contract.
6. Provide information for Owner's personnel:
  - a. Proper procedure in case of failure.
  - b. Instances which might affect the validity of warranty or bond.
7. Contractor name, address and telephone number.

### **1.03 FORM OF SUBMITTALS**

- A. Prepare in duplicate packets.
- B. Format:
  1. Size 8-1/2 in. x 11 in., punch sheets for 3-ring binder: Fold larger sheets to fit into binders.
  2. Cover: Identify each packet with typed or printed title "WARRANTIES AND BONDS". List:
    - a. Title of Project.
    - b. Name of Contractor.
- C. Binders: Commercial quality, three-ring, with durable and cleanable plastic covers.

### **1.04 TIME OF SUBMITTALS**

- A. For equipment or component parts of equipment put into service during progress of construction: Submit documents within 10 days after inspection and acceptance.
- B. Otherwise, make submittals within 10 days after date of substantial completion, prior to final request for payment.
- C. For items of work, where acceptance is delayed materially beyond the Date of Substantial Completion, provide updated submittal within 10 days after acceptance, listing the date of acceptance as the start of the warranty period.

### **1.05 SUBMITTALS REQUIRED**

Submit warranties, bonds, service and maintenance contracts as specified in the respective sections of the Specifications.

- END OF SECTION -



**SECTION 02220****EARTHWORK****PART 1 GENERAL****1.01 SUMMARY**

- A. This Section includes excavation and backfilling including the loosening, removing, refilling, transporting, storage and disposal of all materials classified as "earth" necessary to be removed for the construction and completion of all work under the Contract, and as shown on the Contract Drawings, specified or directed.

**1.02 REFERENCES**

- A. Materials and installation shall be in accordance with the latest revisions of the following codes, standards, and specifications, except where more stringent requirements have been specified herein:
1. American Society for Testing and Materials (ASTM)
    - a. A328 Specification for Steel Sheet Piling
    - b. D698 Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup>) (600 kN-m/m<sup>3</sup>)
    - c. D1556 Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
    - d. D1760 Specification for Pressure Treatment of Timber Products
    - e. D2922 Test Methods for Density of Soil and Soil Aggregate in Place by Nuclear Methods (Shallow Depth)

**1.03 DEFINITIONS**

- A. Excavation (or Trenching)
1. Grubbing, stripping, removing, storing and rehandling of all materials of every name and nature necessary to be removed for all purposes incidental to the construction and completion of all the work under construction.
  2. All sheeting, sheetpiling, bracing and shoring, and the placing, driving, cutting off and removing of the same.
  3. All diking, ditching, fluming, cofferdamming, pumping, bailing, draining, well pointing, or otherwise disposing of water.
  4. The removing and disposing of all surplus materials from the excavations in the manner specified.
  5. The maintenance, accommodation and protection of travel and the temporary paving of highways, roads and driveways.

6. The supporting and protecting of all tracks, rails, buildings, curbs, sidewalks, pavements, overhead wires, poles, trees, vines, shrubbery, pipes, sewers, conduits or other structures or property in the vicinity of the work, whether over- or underground or which appear within or adjacent to the excavations, and the restoration of the same in case of settlement or other injury.
  7. All temporary bridging and fencing and the removing of same.
- B. Earth
1. All materials such as sand, gravel, clay, loam, ashes, cinders, pavements, muck, roots or pieces of timber, soft or disintegrated rock, not requiring blasting, barring, or wedging from their original beds, and specifically excluding all ledge or bedrock and individual boulders or masonry larger than one-half cubic yard in volume.
- C. Backfill
1. The refilling of excavation and trenches to the line of filling indicated on the Contract Drawings or as directed using materials suitable for refilling of excavations and trenches; and the compacting of all materials used in filling or refilling by rolling, ramming, watering, puddling, etc., as may be required.
- D. Spoil
1. Surplus excavated materials not required or not suitable for backfills or embankments.
- E. Embankments
1. Fills constructed above the original surface of the ground or such other elevation as specified or directed.
- F. Limiting Subgrade
1. The underside of the pipe barrel for pipelines
  2. The underside of footing lines for structures
- G. Excavation Below Subgrade
1. Excavation below the limiting subgrades of structures or pipelines.
  2. Where materials encountered at the limiting subgrades are not suitable for proper support of structures or pipelines, the Contractor shall excavate to such new lines and grades as required.

**PART 2 PRODUCTS****2.01 MATERIALS AND CONSTRUCTION****A. Wood Sheeting and Bracing**

1. Shall be sound and straight; free from cracks, shakes and large or loose knots; and shall have dressed edges where directed.
2. Shall conform to National Design Specifications for Stress Grade Lumber having a minimum fiber stress of 1200 pounds per square inch.
3. Sheeting and bracing to be left-in-place shall be pressure treated in accordance with ASTM D1760 for the type of lumber used and with a preservative approved by the Engineer.

**B. Steel Sheeting and Bracing**

1. Shall be sound
2. Shall conform to ASTM A328 with a minimum thickness of 3/8 inch.

**PART 3 EXECUTION****3.01 UNAUTHORIZED EXCAVATION**

- A. Whenever excavations are carried beyond or below the lines and grades shown on the Contract Drawings, or as given or directed by the Engineer, all such excavated space shall be refilled with special granular materials, concrete or other materials as the Engineer may direct. All refilling of unauthorized excavations shall be at the Contractor's expense.
- B. All material which slides, falls or caves into the established limits of excavations due to any cause whatsoever, shall be removed and disposed of at the Contractor's expense and no extra compensation will be paid the Contractor for any materials ordered for refilling the void areas left by the slide, fall or cave-in.

**3.02 REMOVAL OF WATER****A. General**

1. The Contractor shall at all times provide and maintain proper and satisfactory means and devices for the removal of all water entering the excavations, and shall remove all such water as fast as it may collect, in such manner as shall not interfere with the prosecution of the work or the proper placing of pipes, structures, or other work.
2. Unless otherwise specified, all excavations which extend down to or below the static groundwater elevations shall be dewatered by lowering and maintaining the groundwater beneath such excavations at all times when work thereon is in progress, during subgrade preparation and the placing of the structure or pipe thereon.

3. Water shall not be allowed to rise over or come in contact with any masonry, concrete or mortar, until at least 24 hours after placement, and no stream of water shall be allowed to flow over such work until such time as the Engineer may permit.
4. Where the presence of fine grained subsurface materials and a high groundwater table may cause the upward flow of water into the excavation with a resulting quick or unstable condition, the Contractor shall install and operate a well point system to prevent the upward flow of water during construction.
5. Water pumped or drained from excavations, or any sewers, drains or water courses encountered in the work, shall be disposed of in a suitable manner without injury to adjacent property, the work under construction, or to pavements, roads, drives, and water courses. No water shall be discharged to sanitary sewers. Sanitary sewage shall be pumped to sanitary sewers or shall be disposed of by an approved method.
6. Any damage caused by or resulting from dewatering operations shall be the sole responsibility of the Contractor.

B. Work Included

1. The construction and removal of cofferdams, sheeting and bracing, and the furnishing of materials and labor necessary therefor.
2. The excavation and maintenance of ditches and sluiceways.
3. The furnishing and operation of pumps, well points, and appliances needed to maintain thorough drainage of the work in a satisfactory manner.

C. Well Point Systems

1. Installation

- a. The well point system shall be designed and installed by or under the supervision of an organization whose principal business is well pointing and which has at least five consecutive years of similar experience and can furnish a representative list of satisfactory similar operations.
- b. Well point headers, points and other pertinent equipment shall not be placed within the limits of the excavation in such a manner or location as to interfere with the laying of pipe or trenching operations or with the excavation and construction of other structures.
- c. Detached observation wells of similar construction to the well points shall be installed at intervals of not less than 50 feet along the opposite side of the excavation from the header pipe and line of well points, to a depth of at least 5 feet below the proposed excavation. In addition, one well point in every 50 feet shall be fitted with a tee, plug and valve so that the well point can be converted for use as an observation well. Observation wells shall be not less than 1-½ inches in diameter.
- d. Standby gasoline or diesel powered equipment shall be provided so that in the event of failure of the operating equipment, the standby equipment can be readily connected to the system. The standby equipment shall be maintained in good order and actuated regularly not less than twice a week.

## 2. Operation

- a. Where well points are used, the groundwater shall be lowered and maintained continuously (day and night) at a level not less than 2 feet below the bottom of the excavation. Excavation will not be permitted at a level lower than 2 feet above the water level as indicated by the observation wells.
- b. The effluent pumped from the well points shall be examined periodically by qualified personnel to determine if the system is operating satisfactorily without the removal of fines.
- c. The water level shall not be permitted to rise until construction in the immediate area is completed and the excavation backfilled.

### 3.03 STORAGE OF MATERIALS

#### A. Sod

1. Any sod cut during excavation shall be removed and stored during construction so as to preserve the grass growth. Sod damaged while in storage shall be replaced in like kind at the sole expense of the Contractor.

#### B. Topsoil

1. Topsoil suitable for final grading shall be removed and stored separately from other excavated material.

#### C. Excavated Materials

1. All excavated materials shall be stored in locations so as not to endanger the work, and so that easy access may be had at all times to all parts of the excavation. Stored materials shall be kept neatly piled and trimmed, so as to cause as little inconvenience as possible to public travel or to adjoining property holders.
2. Special precautions must be taken to permit access at all times to fire hydrants, fire alarm boxes, police and fire department driveways, and other points where access may involve the safety and welfare of the general public.
- 3.

### 3.04 DISPOSAL OF MATERIALS

#### A. Spoil Material

1. All spoil materials shall be disposed of as required by the local, state or federal regulations pertaining to the area or as described in the Special Provisions or on the Contract Drawings.
2. The surface of all spoil areas shall be graded and dressed and no unsightly mounds or heaps shall be left on completion of the work.

### 3.05 SHEETING AND BRACING

#### A. Installation

1. The Contractor shall furnish, place and maintain such sheeting, bracing and shoring as may be required to support the sides and ends of excavations in such manner as to prevent any movement which could, in any way, injure the pipe, structures, or other work; diminish the width necessary for construction; otherwise damage or delay the work of the Contract; endanger existing structures, pipes or pavements; or cause the excavation limits to exceed the right-of-way limits.
2. In no case will bracing be permitted against pipes or structures in trenches or other excavations.
3. Sheeting shall be driven as the excavation progresses, and in such manner as to maintain pressure against the original ground at all times. The sheeting shall be driven vertically with the edges tight together, and all bracing shall be of such design and strength as to maintain the sheeting in its proper position. Seepage which carries fines through the sheeting shall be plugged to retain the fines.
4. Where breast boards are used between soldier pile, the boards shall be back packed with soil to maintain support.
5. The Contractor shall be solely responsible for the adequacy of all sheeting and bracing.

#### B. Removal

1. In general, all sheeting and bracing, whether of steel, wood or other material, used to support the sides of trenches or other open excavations, shall be withdrawn as the trenches or other open excavations are being refilled. That portion of the sheeting extending below the top of a pipe or structural foundation shall not be withdrawn, unless otherwise directed, before more than 6 inches of earth is placed above the top of the pipe or structural foundation and before any bracing is removed. The voids left by the sheeting shall be carefully refilled with selected material and rammed tight with tools especially adapted for the purpose or otherwise as may be approved.
2. The Contractor shall not remove sheeting and bracing until the work has attained the necessary strength to permit placing of backfill.

#### C. Left in Place

1. If, to serve any purpose of his own, the Contractor files a written request for permission to leave sheeting or bracing in the trench or excavation, the Engineer may grant such permission, in writing, on condition that the cost of such sheeting and bracing be assumed and paid by the Contractor.
2. The Contractor shall leave in place all sheeting, shoring and bracing which are shown on the Contract Drawings or specified to be left in place or which the Engineer may order, in writing, to be left in place. All shoring, sheeting and bracing shown or ordered to be left in place will be paid for under the appropriate item of the Contract. No payment allowance will be made for wasted ends or for portions above the proposed cutoff level which are driven down instead of cut-off.

3. In case sheeting is left in place, it shall be cut off or driven down as directed so that no portion of the same shall remain within 12 inches of the street subgrade or finished ground surface.

### **3.06 BACKFILLING**

#### **A. General**

1. All excavations shall be backfilled to the original surface of the ground or to such other grades as may be shown, specified or directed.
2. Backfilling shall be done with suitable excavated materials which can be satisfactorily compacted during refilling of the excavation. In the event the excavated materials are not suitable, Special Backfill as specified or ordered by the Engineer shall be used for backfilling.
4. Any settlement occurring in the backfilled excavations shall be refilled and compacted.

#### **B. Unsuitable Materials**

1. Stones, pieces of rock or pieces of pavement greater than 1 cubic foot in volume or greater than 1.5 feet in any single dimension shall not be used in any portion of the backfill.
2. All stones, pieces of rock or pavement shall be distributed through the backfill and alternated with earth backfill in such a manner that all interstices between them shall be filled with earth.
3. Frozen earth shall not be used for backfilling.

#### **C. Compaction and Density Control**

1. The compaction shall be as specified for the type of earthwork, i.e., structural, trenching or embankment.
  - a. The compaction specified shall be the percent of maximum dry density.
  - b. The compaction equipment shall be suitable for the material encountered.
2. Where required, to assure adequate compaction, in-place density test shall at the expense of the Contractor be made by an approved testing laboratory.
  - a. The moisture-density relationship of the backfill material shall be determined by ASTM D698, Method D.
    - 1) Compaction curves for the full range of materials used shall be developed.
  - b. In-place density shall be determined by the methods of ASTM D1556 or ASTM D2922 and shall be expressed as a percentage of maximum dry density.
3. Where required, to obtain the optimum moisture content, the Contractor shall add, at his expense, sufficient water during compaction to assure the specified maximum

density of the backfill. If, due to rain or other causes, the material exceeds the optimum moisture content, it shall be allowed to dry, assisted if necessary, before resuming compaction or filling efforts.

4. The Contractor shall be responsible for all damage or injury done to pipes, structures, property or persons due to improper placing or compacting of backfill.

### **3.07 OTHER REQUIREMENTS**

#### **A. Drainage**

1. All material deposited in roadway ditches or other water courses shall be removed immediately after backfilling is completed and the section, grades and contours of such ditches or water courses restored to their original condition, in order that surface drainage will be obstructed no longer than necessary.

#### **B. Unfinished Work**

1. When, for any reason, the work is to be left unfinished, all trenches and excavations shall be filled and all roadways, sidewalks and watercourses left unobstructed with their surfaces in a safe and satisfactory condition. The surface of all roadways and sidewalks shall have a temporary pavement.

#### **C. Hauling Material on Streets**

1. When it is necessary to haul material over the streets or pavements, the Contractor shall provide suitable tight vehicles so as to prevent deposits on the streets or pavements. In all cases where any materials are dropped from the vehicles, the Contractor shall clean up the same as often as required to keep the crosswalks, streets and pavements clean and free from dirt, mud, stone and other hauled material.

#### **D. Dust Control**

1. It shall be the sole responsibility of the Contractor to control the dust created by any and all of his operations to such a degree that it will not endanger the safety and welfare of the general public.
2. Calcium chloride and petroleum products shall not to be used for dust control.

#### **E. Test Pits**

1. For the purpose of obtaining detail locations of underground obstructions, the Contractor shall make excavations in advance of the work. Payment for the excavations ordered by the Engineer will be made under an appropriate item of the Contract and shall include sheeting, bracing, pumping, excavation and backfilling.

- END OF SECTION -



**SECTION 02222****EXCAVATION****PART 1 - GENERAL****1.01 WORK INCLUDED**

- A. Structure excavation.
- B. Shoring excavations.

**1.02 RELATED WORK**

- A. Section 01450 - Quality Control.
- B. Section 02228 - Rock Removal.
- C. Section 02211 - Rough Grading.
- D. Section 02220 - Backfilling and Embankments.
- E. Section 02226 - Trenching.

**1.03 REGULATORY REQUIREMENTS**

- A. Protect excavations by shoring, bracing, sheet piling, underpinning, or other methods required to prevent cave-in or loose soil from falling into excavation.
- B. Underpin adjacent structures which may be damaged by excavation work, including service utilities and pipe chases.
- C. Notify Engineer of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.
- D. Protect bottom of excavations and soil adjacent to and beneath foundations from frost.
- E. Grade excavation top perimeter to prevent surface water run-off into excavation.

**PART 2 - PRODUCTS****2.01 MATERIALS**

- A. Subsoil: Excavated material, graded free of lumps larger than 12 inches, rocks larger than 12 inches, and debris.
- B. # 57's or # 9's: Mineral aggregate graded 1/4 inch to 5/8 inch, free of soil, subsoil, clay, shale, or foreign matter.

**PART 3 - EXECUTION****3.01 PREPARATION**

Identify required liens, levels, contours, and datum.

**3.02 EXCAVATION**

- A. Excavate subsoil required for structure foundations, construction operations, and other work. All excavation shall be unclassified excavation.
- B. Contractor is responsible to adequately brace open cuts and protect workmen and equipment from cave-in.
- C. Remove lumped subsoil, boulders, and rock up to 1/3 cu. yd., measured by volume. Remove larger material under Section 02228.
- D. Correct unauthorized excavation at no cost to Owner.
- E. Fill over-excavated areas under structure bearing surfaces in accordance with direction by Engineer.
- F. Stockpile excavated material in area designated on site.

**3.03 FIELD QUALITY CONTROL**

Provide for visual inspection of rock surfaces under provisions of Section 01450.

- END OF SECTION -

**SECTION 02226****TRENCHING, BACKFILLING AND COMPACTING****PART 1 GENERAL****1.01 SUMMARY**

- A. This Section includes excavation and backfill as required for pipe installation or other construction in the trench, and removal and disposal of water, in accordance with the applicable provisions of the Section entitled "Earthwork" unless modified herein.

**PART 2 PRODUCTS**

NOT USED

**PART 3 EXECUTION****3.01 EXCAVATION**

- A. The trench excavation shall be located as shown on the Contract Drawings or as specified. Under ordinary conditions, excavation shall be by open cut from the ground surface. Where the depth of trench and soil conditions permit, tunneling may be required beneath cross walks, curbs, gutters, pavements, trees, driveways, railroad tracks and other surface structures. No additional compensation will be allowed for such tunneling over the price bid for open cut excavation of equivalent depths below the ground surface unless such tunnel excavation is specifically provided for in the Contract Documents.
- B. Trenches shall be excavated to maintain the depths as shown on the Contract Drawings or as specified for the type of pipe to be installed.
- C. The alignment and depth shall be determined and maintained by the use of a string line installed on batter boards above the trench, a double string line installed along side of the trench or a laser beam system.
- D. The minimum width of trench excavation shall be 6-inches on each side of the pipe hub for 21-inch diameter pipe and smaller and 12-inches on each side of the pipe hub for 24-inch diameter pipe and larger.
- E. Trenches shall not be opened for more than 300 feet in advance of pipe installation nor left unfilled for more than 100 feet in the rear of the installed pipe when work is in progress without the consent of the Engineer. Open trenches shall be protected and barricaded as required.
- F. Bridging across open trenches shall be constructed and maintained where required.

**3.02 SUBGRADE PREPARATION FOR PIPE**

- A. Where pipe is to be laid on undisturbed bottom of excavated trench, mechanical excavation shall not extend lower than the finished subgrade elevation at any point.

- B. Where pipe is to be laid on special granular material the excavation below subgrade shall be to the depth specified or directed. The excavation below subgrade shall be refilled with special granular material as specified or directed, shall be deposited in layers not to exceed 6 inches and shall be thoroughly compacted prior to the preparation of pipe subgrade.
- C. The subgrade shall be prepared by shaping with hand tools to the contour of the pipe barrel to allow for uniform and continuous bearing and support on solid undisturbed ground or embedment for the entire length of the pipe.
- D. Pipe subgrade preparation shall be performed immediately prior to installing the pipe in the trench. Where bell holes are required they shall be made after the subgrade preparation is complete and shall be only of sufficient length to prevent any part of the bell from becoming in contact with the trench bottom and allowing space for joint assembly.

### **3.03 STORAGE OF MATERIALS**

- A. Traffic shall be maintained at all times in accordance with the applicable Highway Permits. Where no Highway Permit is required at least one-half of the street must be kept open for traffic.
- B. Where conditions do not permit storage of materials adjacent to the trench, the material excavated from a length as may be required, shall be removed by the Contractor, at his cost and expense, as soon as excavated. The material subsequently excavated shall be used to refill the trench where the pipe had been built, provided it be of suitable character. The excess material shall be removed to locations selected and obtained by the Contractor.
  - 1. The Contractor shall, at his cost and expense, bring back adequate amounts of satisfactory excavated materials as may be required to properly refill the trenches.
- C. If directed by the Engineer, the Contractor shall refill trenches with select fill or other suitable materials and excess excavated materials shall be disposed of as spoil.

### **3.04 REMOVAL OF WATER AND DRAINAGE**

- A. The Contractor shall at all times provide and maintain proper and satisfactory means and devices for the removal of all water entering the trench, and shall remove all such water as fast as it may collect, in such manner as shall not interfere with the prosecution of the work.
- B. The removal of water shall be in accordance with the Section entitled "Earthwork".

### **3.05 PIPE EMBEDMENT**

- A. All pipe shall be protected from lateral displacement and possible damage resulting from superimposed backfill loads, impact or unbalanced loading during backfilling operations by being adequately embedded in suitable pipe embedment material. To ensure adequate lateral and vertical stability of the installed pipe during pipe jointing and embedment operations, a sufficient amount of the pipe embedment material to hold the pipe in rigid alignment shall be uniformly deposited and thoroughly compacted on each side, and back of the bell, of each pipe as laid.
- B. Concrete cradle and encasement of the class specified shall be installed where and as shown on the Contract Drawings or ordered by the Engineer. Before any concrete is placed, the pipe shall be securely blocked and braced to prevent movement or flotation. The concrete cradle or encasement shall extend the full width of the trench as excavated unless otherwise authorized by the Engineer. Where concrete is to be placed in a sheeted trench it shall be

poured directly against sheeting to be left in place or against a bond-breaker if the sheeting is to be removed.

- C. Embedment materials placed above the centerline of the pipe or above the concrete cradle to a depth of 12 inches above the top of the pipe barrel shall be deposited in such manner as to not damage the pipe. Compaction shall be as required for the type of embedment being installed.

### **3.06 BACKFILL ABOVE EMBEDMENT**

- A. The remaining portion of the pipe trench above the embedment shall be refilled with suitable materials compacted as specified.
  - 1. Where trenches are within the ditch-to-ditch limits of any street or road or within a driveway or sidewalk, or shall be under a structure, the trench shall be refilled in horizontal layers not more than 8 inches in thickness, and compacted to obtain 95% maximum density, and determined as set forth in the Section entitled "Earthwork".
  - 2. Where trenches are in open fields or unimproved areas outside of the ditch limits of roads, the backfilling may be by placing the material in the trench and mounding the surface.
  - 3. Hand tamping shall be required around buried utility lines or other subsurface features that could be damaged by mechanical compaction equipment.
- B. Backfilling of trenches beneath, across or adjacent to drainage ditches and water courses shall be done in such a manner that water will not accumulate in unfilled or partially filled trenches and the backfill shall be protected from surface erosion by adequate means.
  - 1. Where trenches cross waterways, the backfill surface exposed on the bottom and slopes thereof shall be protected by means of stone or concrete rip-rap or pavement.
- C. All settlement of the backfill shall be refilled and compacted as it occurs.
- D. Temporary pavement shall be placed as specified in the Section entitled "Restoration of Surfaces".

-END OF SECTION-



**SECTION 02228****ROCK REMOVAL****PART 1 GENERAL****1.01 SUMMARY**

- A. This Section includes removal to the widths and depths shown on the Contract Drawings or as directed by the Engineer, including the loosening, removing, transporting, storing and disposal of all materials requiring blasting, barring, or wedging for removal from their original beds, and backfill of rock excavations with acceptable materials
- B. Use of explosives for rock removal shall be used only with prior permission from both the Engineer and Owner. **Blasting will NOT be permitted in this project.**
- C. Rock removal is part of and incidental to unclassified excavation. No separate payment shall be made for rock removal.

**1.02 SUBMITTALS**

- A. In addition to those submittals identified in the General Provisions, the following items shall be submitted:
  - 1. Before any blasting operations begin the Contractor shall obtain all permits and licenses required.

**1.03 DEFINITIONS**

- A. Rock
  - 1. All pieces of ledge or bedrock, boulders or masonry larger than one-half cubic yard in volume.
  - 2. Any material requiring blasting, barring, or wedging for removal from its original bed.

**PART 2 PRODUCTS**

NOT USED

**PART 3 EXECUTION****3.01 BLASTING (Use of explosives for rock removal shall be used only with prior permission from both the Engineer and Owner.)**

- A. General
  - 1. Handling of explosives and blasting shall be done only by experienced persons.

2. Handling and blasting shall be in accordance with all Federal, State and local laws, rules and regulations relating to the possession, handling, storage and transportation and use of explosives.
3. All blasts in open cut shall be properly covered and protected with approved blasting mats.
4. Charges shall be of such size that the excavation will not be unduly large and shall be so arranged and timed that adjacent rock, upon or against which pipelines or structures are to be built, will not be shattered.
5. Blasting will not be permitted within 25 feet of pipelines or structures.
6. All existing pipes or structures exposed during excavation shall be adequately protected from damage before proceeding with the blasting.
7. NFPA 495 - Code for Manufacture, Transportation, Storage and Use of Explosive Materials.
8. Commonwealth of Kentucky Department of Mines and Minerals, Laws and Regulations Governing Explosives and Blasting.

B. Repair of Damages Due to Blasting

1. Any injury or damage to the work or to existing pipes or structures shall be repaired or rebuilt by the Contractor at his expense.
2. Whenever blasting may damage adjacent rock, pipes or structures, blasting shall be discontinued and the rock removed by drilling, barring, wedging or other methods.

C. Explosives

1. At no time shall an excessive amount of explosives be kept at the site of the work. Such explosives shall be stored, handled and used in conformity with all applicable laws and regulations.
2. Accurate daily records shall be kept showing the amounts of explosives on hand, both at the site and at any storage magazine, the quantities received and issued, and the purpose for which issued.
3. The Contractor shall be responsible for any damage or injury to any persons, property or structures as a result of his handling, storage or use of explosives.

D. Rock Clearance in Trenches

1. Ledge rock, boulders and large stones shall be removed from the sides and bottom of the trench to provide clearance for the specified embedment of each pipe section, joint or appurtenance; but in no instance shall the clearance be less than 6 inches. Additional clearance at the pipe bell or joint shall be provided to allow for the proper make-up of the joint.
2. At the transition from an earth bottom to a rock bottom the minimum bottom clearance shall be 12 inches for a distance of not less than 5 feet.



E. Rock Clearance at Structures

1. Concrete for structures shall be placed directly on the rock and the excavation shall be only to the elevations and grades shown on the Contract Drawings.

**3.02 EXCAVATION AND BACKFILL**

- A. Rock removal and backfilling shall be performed in accordance with the applicable provisions of the Section entitled "Earthwork".
- B. The rock excavated which cannot be incorporated into the backfill material, as specified, shall be disposed of as spoil and shall be replaced with the quantity of acceptable material required for backfilling.

-END OF SECTION-



**SECTION 02270****SLOPE PROTECTION AND EROSION CONTROL****PART 1 - GENERAL****1.01 WORK INCLUDED**

- A. The Contractor shall do all work and take all measures necessary to control soil erosion resulting from construction operations, shall prevent the flow of sediment from the construction site, and shall contain construction materials (including excavation and backfill) within his protected working area so as to prevent damage to adjacent property.
- B. The Contractor shall not employ any construction method that violates a rule, regulation, guideline or procedure established by Federal, State or local agencies having jurisdiction over the environmental effects of construction. The Contractor shall be responsible for obtaining all associated permits.
- C. Pollutants such as chemicals, fuels, lubricants, bitumen, raw sewage and other harmful waste shall not be discharged into or alongside of any body of water or into natural or man-made channels leading thereto.

**PART 2 - PRODUCTS****2.01 MATERIALS**

- A. Temporary Slope Protection and Erosion Control:  
  
Bales may be hay or straw, and shall be reasonably clean and free of noxious weeds and deleterious materials. Filter fabric for sediment traps shall be of suitable materials acceptable to the Engineer.
- B. Permanent Slope Protection and Erosion Control:  
  
On slopes 2H:1V and steeper, and where shown on the drawings place Type A Dumped Rock Fill with a 24-inch minimum thickness over non-woven geotextile filter fabric.

**PART 3 - EXECUTION****3.01 METHODS OF CONSTRUCTION**

- A. The Contractor shall use any of the acceptable methods necessary to control soil erosion and prevent the flow of sediment to the maximum extent possible. These methods shall include, but not be limited to, the use of water diversion structures, diversion ditches and settling basins.
- B. Construction operations shall be restricted to the areas of work indicated on the Drawings and to the area which must be entered for the construction of temporary or permanent facilities. The Engineer has the authority to limit the surface area of erodible earth material exposed by clearing and grubbing, excavation, borrow and fill operations and to direct the Contractor to provide immediate permanent or temporary pollution control measures to prevent contamination of the wetlands and adjacent watercourses. Such work may involve the construction of temporary berms, dikes, dams, sediment basins, slope drains, and use of temporary mulches, mats, or other control devices or methods as necessary to control erosion.

- C. Excavated soil material shall not be placed adjacent to the wetlands or watercourses in a manner that will cause it to be washed away by high water or runoff. Earth berms or diversions shall be constructed to intercept and divert runoff water away from critical areas. Diversion outlets shall be stable or shall be stabilized by means acceptable to the Engineer. If for any reason construction materials are washed away during the course of construction, the Contractor shall remove those materials from the fouled areas as directed by the Engineer.
- D. For work within easements, all materials used in construction such as excavation, backfill, roadway, and pipe bedding and equipment shall be kept within the limits of the easements.
- E. The Contractor shall not pump silt-laden water from trenches or other excavations into the wetlands, or adjacent watercourses. Instead, silt-laden water from his excavations shall be discharged within areas surrounded by baled hay or into sediment traps to ensure that only sediment-free water is returned to the watercourses. Damage to vegetation by excessive watering or silt accumulation in the discharge area shall be avoided.
- F. Prohibited construction procedures include, but are not limited to, the following:
  - 1. Dumping of spoil material into any streams, wetlands, surface waters, or unspecified locations.
  - 2. Indiscriminate, arbitrary, or capricious operation of equipment in wetlands or surface waters.
  - 3. Pumping of silt-laden water from trenches or excavations into surface waters, or wetlands.
  - 4. Damaging vegetation adjacent to or outside of the construction area limits.
  - 5. Disposal of trees, brush, debris, paints, chemicals, asphalt products, concrete curing compounds, fuels, lubricants, insecticides, washwater from concrete trucks or hydroseeders, or any other pollutant in wetlands, surface waters, or unspecified locations.
  - 6. Permanent or unauthorized alteration of the flow line of any stream.
  - 7. Open burning of debris from the construction work.
- G. Any temporary working roadways required shall be clean fill approved by the Engineer. In the event fill is used, the Contractor shall take every precaution to prevent the fill from mixing with native materials of the site. All such foreign fill materials shall be removed from the site following construction.

### **3.02 EROSION CHECKS**

The Contractor shall furnish and install baled hay or straw erosion checks in all locations indicated on the Drawings, surrounding the base of all deposits of stored excavated material outside of the disturbed area, and where indicated by the Engineer. Checks, where indicated on the Drawings, shall be installed immediately after the site is cleared and before trench excavation is begun at the location indicated. Checks located surrounding stored material shall be located approximately 6 ft. from that material. Bales shall be held in place with two 2 in. by 2 in. by 3 ft. wooden stakes. Each bale shall be butted tightly against the adjoining bale to preclude short circuiting of the erosion check.

- END OF SECTION -

**SECTION 02502**  
**RESTORATION OF SURFACES**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. This Section includes restoration and maintenance of all types of surfaces, sidewalks, curbs, gutters, culverts and other features disturbed, damaged or destroyed during the performance of the work under or as a result of the operations of the Contract.
- B. The quality of materials and the performance of work used in the restoration shall produce a surface or feature equal to the condition of each before the work began.

**1.02 REFERENCES**

- A. Materials and installation shall be in accordance with the latest revisions of the following codes, standards and specifications, except where more stringent requirements have been specified herein:
  - 1. American Society for Testing and Materials (ASTM)
    - a. D698 - Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup>) (600 kN-m/m<sup>3</sup>)

**1.03 SUBMITTALS**

- A. In addition to those submittals identified in the General Provisions, the following items shall be submitted:
  - 1. A schedule of restoration operations. After an accepted schedule has been agreed upon it shall be adhered to unless otherwise revised with the approval of the Engineer.

**PART 2 PRODUCTS**

NOT USED

**PART 3 EXECUTION**

**3.01 GENERAL**

- A. In general, permanent restoration of paved surfaces will not be permitted until one months' time has elapsed after excavations have been completely backfilled as specified. A greater length of time, but not more than nine months may be allowed to elapse before permanent restoration of street surfaces is undertaken, if additional time is required for shrinkage and settlement of the backfill.
- B. The replacement of surfaces at any time, as scheduled or as directed, shall not relieve the Contractor of responsibility to repair damages by settlement or other failures.

**3.02 TEMPORARY PAVEMENT**

- A. Immediately upon completion of refilling of the trench or excavation, the Contractor shall place a temporary pavement over all disturbed areas of streets, driveways, sidewalks, and other traveled places where the original surface has been disturbed as a result of his operations.
- B. Unless otherwise specified or directed the temporary pavement shall consist of compacted run-of-crusher limestone to such a depth as required to withstand the traffic to which it will be subjected.
- C. Where concrete pavements are removed, the temporary pavement shall be surfaced with "cold patch". The surface of the temporary pavement shall conform to the slope and grade of the area being restored.
- D. For dust prevention, the Contractor shall treat all surfaces, not covered with cold patch, as frequently as may be required.
- E. The temporary pavement shall be maintained by the Contractor in a safe and satisfactory condition until such time as the permanent paving is completed. The Contractor shall immediately remove and restore all pavement as shall become unsatisfactory.

**3.03 PERMANENT PAVEMENT REPLACEMENT**

- A. The permanent and final repaving of all streets, driveways and similar surfaces where pavement has been removed, disturbed, settled or damaged by or as a result of performance of the Contract shall be repaired and replaced by the Contractor, by a new and similar pavement.
  - 1. The top surface shall conform with the grade of existing adjacent pavement and the entire replacement shall meet the current specifications of the local community for the particular types of pavement.
  - 2. Where the local community has no specification for the type of pavement, the work shall be done in conformity with the State Department of Transportation Standard which conforms the closest to the type of surfacing being replaced, as determined by the Engineer.

**3.04 PREPARATION FOR PERMANENT PAVEMENT**

- A. When scheduled and within the time specified, the temporary pavement shall be removed and a base prepared, at the depth required by the local community or Highway Permit, to receive the permanent pavement.
  - 1. The base shall be brought to the required grade and cross-section and thoroughly compacted before placing the permanent pavement.
  - 2. Any base material which has become unstable for any reason shall be removed and replaced with compacted base materials.
- B. Prior to placing the permanent pavement all service boxes, manhole frames and covers and similar structures within the area shall be adjusted to the established grade and cross-section.

- C. The edges of existing asphalt pavement shall be cut a minimum of 1 foot beyond the excavation or disturbed base whichever is greater.

- 1. All cuts shall be parallel or perpendicular to the centerline of the street.

### **3.05 ASPHALT PAVEMENT**

- A. The permanent asphalt pavement replacement for streets, driveways and parking area surfaces shall be replaced with bituminous materials of the same depth and kind as the existing unless otherwise specified.
- B. Prior to placing of any bituminous pavement a sealer shall be applied to the edges of the existing pavement and other features.
- C. The furnishing, handling and compaction of all bituminous materials shall be in accordance with the State Department of Transportation Standards.

### **3.06 CONCRETE PAVEMENT AND PAVEMENT BASE**

- A. Concrete pavements and concrete bases for asphalt, brick or other pavement surfaces shall be replaced with Class "B" Concrete, air-entrained.
- B. Paving slabs or concrete bases shall be constructed to extend 1 foot beyond each side of the trench and be supported on undisturbed soil. Where such extension of the pavement will leave less than 2 feet of original pavement slab or base, the repair of the pavement slab or base shall be extended to replace the slab to the original edge of the pavement or base unless otherwise indicated on the Contract Drawings.
- C. Where the edge of the pavement slab or concrete base slab falls within the excavation, the excavation shall be backfilled with Special Backfill compacted to 95% maximum dry density as determined by ASTM D 698 up to the base of the concrete.
- D. The new concrete shall be of the same thickness as the slab being replaced and shall contain reinforcement equal to the old pavement.
  - 1. New concrete shall be placed and cured in accordance with the applicable provisions of the State Department of Transportation Standards.

### **3.07 STONE OR GRAVEL PAVEMENT**

- A. All pavement and other areas surfaced with stone or gravel shall be replaced with material to match the existing surface unless otherwise specified.
  - 1. The depth of the stone or gravel shall be at least equal to the existing.
  - 2. After compaction the surface shall conform to the slope and grade of the area being replaced.

### **3.08 CONCRETE WALKS, CURBS AND GUTTER REPLACEMENT**

- A. Concrete walks, curbs and gutters removed or damaged in connection with or as a result of the construction operations shall be replaced with new construction.
  - 1. The minimum replacement will be a flag or block of sidewalk and 5 feet of curb or gutter.

- B. Walks shall be constructed of Class "B" concrete, air-entrained with KY-DOT #2 stone aggregate on a 4-inch base of compacted gravel or stone.
  - 1. The walk shall be not less than 4 inches in thickness or the thickness of the replaced walk where greater than 4 inches, shall have construction joints spaced not more than 25 feet apart, shall have expansion joints spaced not more than 50 feet apart and shall be sloped at right angles to the longitudinal centerline approximately inch per foot of width.
- C. 1/2-inch expansion joint material shall be placed around all objects within the sidewalk area as well as objects to which the new concrete will abut, such as valve boxes, manhole frames, curbs, buildings and others.
- D. Walks shall be hand-floated and broom-finished, edged and grooved at construction joints and at intermediate intervals matching those intervals of the walk being replaced.
  - 1. The intermediate grooves shall be scored a minimum of 1/4 of the depth of the walk.
  - 2. The lengths of blocks formed by the grooving tool, and distances between construction and expansion joints shall be uniform throughout the length of the walk in any one location.
- E. The minimum length of curb or gutter to be left in place or replaced shall be 5 feet. Where a full section is not being replaced, the existing curb or gutter shall be saw cut to provide a true edge.
  - 1. The restored curb or gutter shall be the same shape, thickness and finish as being replaced and shall be built of the same concrete and have construction and expansion joints as stated above for sidewalks.
- F. All concrete shall be placed and cured as specified in the Section for concrete.

### **3.09 LAWNS AND IMPROVED AREAS**

- A. The area to receive topsoil shall be graded to a depth of not less than 4 inches or as specified, below the proposed finished surface.
  - 1. If the depth of existing topsoil prior to construction was greater than 4 inches, topsoil shall be replaced to that depth.
- B. The furnishing and placing of topsoil, seed and mulch shall be in accordance with the Section entitled "Topsoil and Seeding".
- C. When required to obtain germination, the seeded areas shall be watered in such a manner as to prevent washing out of the seed.
- D. Any washout or damage which occurs shall be regraded and reseeded until a good sod is established.
- E. The Contractor shall maintain the newly seeded areas, including regrading, reseeding, watering and mowing, in good condition.



### **3.10 CULTIVATED AREA REPLACEMENT**

- A. Areas of cultivated lands shall be graded to a depth to receive topsoil of not less than the depth of the topsoil before being disturbed. All debris and inorganic material shall be removed prior to the placing of the topsoil.
- B. The furnishing and placing of topsoil shall be in accordance with the Section entitled "Topsoil and Seeding".
- C. After the topsoil has been placed and graded, the entire area disturbed during construction shall be cultivated to a minimum depth of 12-inches with normal farm equipment.
  - 1. Any debris or inorganic materials appearing shall be removed.
  - 2. The removal of stones shall be governed by the adjacent undisturbed cultivated area.
- D. Grass areas shall be reseeded using a mixture equal to that of the area before being disturbed, unless otherwise specified.

### **3.11 OTHER TYPES OF RESTORATION**

- A. Trees, shrubs and landscape items damaged or destroyed as a result of the construction operations shall be replaced in like species and size.
  - 1. All planting and care thereof shall meet the standards of the American Association of Nurserymen.
- B. Water courses shall be reshaped to the original grade and cross-section and all debris removed. Where required to prevent erosion, the bottom and sides of the water course shall be protected.
- C. Culverts destroyed or removed as a result of the construction operations shall be replaced in like size and material and shall be replaced at the original location and grade. When there is minor damage to a culvert and with the consent of the Engineer, a repair may be undertaken, if satisfactory results can be obtained.
- D. Should brick pavements be encountered in the work, the restoration shall be as set forth in the Special Provisions or as directed.

### **3.12 MAINTENANCE**

- A. The finished products of restoration shall be maintained in an acceptable condition for and during a period of one year following the date of Substantial Completion or other such date as set forth elsewhere in the Contract Documents.

-END OF SECTION-



**SECTION 02600****PIPE, FITTINGS AND INSTALLATION****PART 1 - GENERAL****1.01 SCOPE**

- A. Furnish all labor, materials, equipment and incidentals necessary to install and test pipe and fittings as shown on the Drawings and required by the Specifications.
- B. Piping shall be located substantially as shown. The Engineer reserves the right to make such modifications in locations as may be found desirable to avoid interference between pipes or for other reasons.
- C. Wherever the word pipe or piping is used it shall mean pipe and fittings unless otherwise noted. All ductile iron pipe (D.I.P.), fittings, glands and accessories shall be of the same manufacturer unless approved otherwise.

**PART 2 - PRODUCTS****2.01 DUCTILE IRON PIPE (D.I.P.) AND FITTINGS**

- A. Ductile iron pipe (D.I.P.) shall conform to ANSI/AWWA C150/A21.50, ANSI/AWWA C151/A21.51 Standard. The pipe shall conform to thickness class 350 unless noted otherwise. All pipe, fittings and joints should be capable of accommodating pressure up to 350 psi. Joint restraints required. SEE SECTION 01600 MATERIAL AND EQUIPMENT for APPROVED MANUFACTURE.
- B. Ductile iron mechanical joint fittings shall have a body thickness and radii of curvature conforming to ANSI A21.10 and have joints in accordance with ANSI/AWWA C111.A21.11. Fittings and joints shall be supplied with all accessories.
- C. All pipe and fittings shall be tar coated outside and shall receive a standard cement lining with bituminous seal coat on the inside in accordance with ASA Specification A21.40 (AWWA-C104).
- D. Cement mortar lining and seal coating for pipe and fittings, where applicable, shall be in accordance with ANSI/AWWA C104/A21.4. Bituminous outside coating shall be in accordance with ANSI/AWWA C151/A21.51 for pipe and ANSI/AWWA C110/A21.10 for fittings.
- E. All ductile fittings shall be rated at 350 psi water working pressure plus water hammer. Ductile iron fittings shall be ductile cast-iron grade 80-60-03 per ASTM Specification A339-55.
- F. No separate pay item has been established for fittings and no determination of the number of fittings required on the job has been made. The Contractor, during the bidding phase, shall determine the number of fittings required on the job and include the cost of the fittings and installation in the unit price for pipe.
- G. Push-on type joints shall be single rubber gasket, with cast gasket socket and recessed bell with a tapered annular opening and flared socket and shall conform to ANSI/AWWA C111/A21.11. Plain spigot ends shall be suitably beveled to permit easy entry into the bell, centering and compressing the gasket.

- H. Ductile iron flanged joint pipe shall conform to ANSI/AWWA C115/A 21.15 Standard and have a Class of 350. The pipe shall have a rated working pressure of 350 psi with Class 125 flanges. Gaskets shall be ring gaskets with a thickness of 1/8-inch. Flange bolts shall conform to ANSI B16.1.
- I. Flanged fittings shall meet all requirements of ANSI/AWWA C110/A21.10 and have Class 125 flanges. Fittings shall accommodate a working pressure up to 350 psi and be supplied with all accessories.
- J. Ball and Socket type joint. The joint shall be boltless with restraint provided by a bayonet-type locking of the retainer over the bell. All pipe components shall be rugged, high strength ductile iron. The barrel is cast of 60-42-10 ductile iron in accordance with American National Standard A21.51. The bell, ball, and retainer are cast of 70-50-05 ductile iron in accordance with the applicable requirements of American National Standard A21.10. The gasket will be of high quality rubber and symmetrical in shape. The first and last section of river crossing pipe shall be furnished with mechanical joint ends suitable for connection to the remaining system piping.
- K. No separate pay item has been established for fittings and no determination of the number of fittings required on the job has been made. The Contractor, during the bidding phase, shall determine the number of fittings required on the job and include the cost of the fittings and installation in the unit price for pipe.
- L. Restraint glands or fittings shall be either "Meg-a-Lug" or "Series 100" or "Series 1200" as manufactured by EBBA Iron Sales, Inc., Eastland, Texas.
- M. Restrained Joint Pipe:
  - 1. Restrained joints for 4" through 16" push-on joint pipe installation is required and indicated in the project plans or specifications, restrained push-on joint pipe and fittings utilizing ductile iron components shall be provided.
  - 2. Restrained joint pipe shall be ductile iron manufactured in accordance with the requirements of ANSI/AWWA C151/A21.51. Push-on joints for such pipe shall be in accordance with ANSI/AWWA C111/A21.11. Pipe thickness shall be designed in accordance with ANSI/AWWA C150/A21.50, and shall be based on laying conditions and internal pressures as stated in the project plans and specifications. Pipe shall be U.S. Pipe TR FLEX pipe or equal.
  - 3. Restrained joint fittings shall be ductile iron in accordance with applicable requirements of ANSI/AWWA C110/A21.10 with the exception of the manufacturer's proprietary design dimensions. Push-on joints for such fittings shall be in accordance with ANSI/AWWA C111/A21.11. Fittings shall be U.S. Pipe TR FLEX fittings or equal.
  - 4. Cement mortar lining and seal coating for pipe and fittings, where applicable, shall be in accordance with ANSI/AWWA C104/A21.4. Bituminous outside coating shall be in accordance with ANSI/AWWA C151/A21.51 for pipe and ANSI/AWWA C110/A21.10 for fittings.
  - 5. Restrained push-on joints for pipe and fittings shall be designed for a water working pressure of 350 psi in sizes 4" through 24" and 250 psi for sizes 30" through 54".
  - 6. Restrained push-on joint pipe and fittings shall be capable of being deflected after assembly.

## **2.02 POLYVINYL CHLORIDE (PVC) PIPE (SDR 21 AND SDR 17)**

- A. Polyvinyl chloride (PVC) pipe for water mains shall be Class 200 (SDR 21) or Class 250 (SDR 17) PVC pressure rated pipe as shown on the Drawings or indicated in the proposal form with either twin gasket joints or integral bell joints with rubber O-ring seals.
- B. All PVC pipe shall conform to the latest revisions of ASTM D-1784 (PVC Compounds), ASTM D-2241 (PVC Plastic Pipe, SDR) and ASTM D-2672 (Bell-End PVC Pipe). Rubber gasketed joints shall conform to ASTM D-3139. The gaskets for the PVC pipe joint shall conform to ASTM F-477 and D-1869.
- C. Couplings shall be furnished by the pipe manufacturer and shall accommodate the pipe for which they are used. Rubber gasket joints shall provide adequate expansion to allow for a 50 degree change in temperature on one length of pipe. Lubrication for rubber connected couplings shall be water soluble, non-toxic, be non-objectionable in taste and odor and have no deteriorating affect on the PVC or rubber gaskets and shall be as supplied by the pipe manufacturer. Couplings shall conform to ASTM D-3139; SDR-21, 200 psi.
- D. All pipe and couplings shall bear identification markings that will remain legible during normal handling, storage and installation, which have been applied in a manner that will not reduce the strength of the pipe or coupling or otherwise damage them. Pipe and coupling markings shall include the normal size and OD base, material code designation, dimension ratio number, ASTM Pressure Class, ASTM designation number for this standard, manufacturer's name or trademark, seal (mark) of the testing agency that verified the suitability of the pipe material for potable-water service. Each marking shall be applied at intervals of not more than 5 feet for the pipe and shall be marked on each coupling.

## **2.03 POLYVINYL CHLORINE (PVC) PIPE - C.I. PIPE SIZE DR14 AND DR 18**

- A. Pipe shall meet the requirements of AWWA C-900 Polyvinyl Chlorine (PVC) Pressure Pipe. All Class 200 pipe shall meet the requirements of DR 14 and all Class 150 pipe shall meet the requirements of DR 18. Joints shall be integral bell or twin gasket joints with rubber O-ring seals.
- B. All pipe shall be suitable for use as a pressure conduit. Provisions must be made for expansion and contractions at each joint with an elastomeric ring. The bell shall consist of an integral wall section with a solid cross-section elastomeric ring which meets the requirements of ASTM D-1869 and F-477. The bell section shall be designed to be at least as strong as the pipe wall. Sizes and dimensions shall be as shown in this specification.
- C. Gaskets and lubricants intended for use with PVC pipe and couplings shall be made from materials that are compatible with the plastic material and with each other when used together, will not support the growth of bacteria, and will not adversely affect the potable qualities of the water that is to be transported. Gaskets and lubricants shall be supplied by the pipe manufacturer.
- D. Physical Requirements:
  - 1. Standard Laying Lengths - Standard laying lengths shall be 20 ft. (plus or minus 1") for all sizes. The total footage of pipe of any class and size shall be furnished in standard lengths. Each length of pipe shall be tested to four times the class pressure of the pipe for minimum of 5 second. The integral bell shall be tested with the pipe.

2. Pipe Stiffness - The pipe stiffness using F/y for PVC class water pipe shall be as follows:

<u>Class</u>	<u>DR</u>	<u>F/y</u>
200	14	815
150	18	364

3. Quick Burst Test - Randomly selected tested in accordance with ASTM D-1599 shall withstand without failure pressures listed below when applied in 60 - 70 seconds. Class 150 shall have a minimum burst pressure of 755 psi and Class 200 shall have a minimum burst pressure of 986 psi at 73 degrees F. for all sizes.
4. Drop Impact Test - Pipe shall withstand without failure at 73 degrees F. an impact of 120 ft/lbs created by a falling 12 lb missile with a 2" radius nose without visible evidence of shattering or splitting.
- E. All pipe and couplings shall bear identification markings that will remain legible during normal handling, storage and installation, which have been applied in a manner that will not reduce the strength of the pipe or coupling or otherwise damage them. Pipe and coupling markings shall include the nominal size and OD base, material code designation, dimension ratio number, AWWA Pressure Class, AWWA designation number for this standard, manufacturer's name or trademark, seal (mark) of the testing agency that verified the suitability of the pipe material for potable-water service. Each marking shall be applied at intervals of not more than 5 feet for the pipe and shall be marked on each coupling.

#### **2.04 DUCTILE IRON MECHANICAL JOINT FITTINGS FOR PVC PIPE**

- A. General: Cast-iron mechanical joints shall conform to the latest revision of ANSI A21.11 for centrifugally cast-iron water pipe.
1. 3" to 12". All Working Pressures: Fittings shall conform to ASA Specification A21.10 for 250 psi water working pressure plus water hammer.
  2. Fittings 12" and Over, for 150 psi and Less WWP: Fittings for use on 150 psi WWP pipe shall be AWWA Class D Pattern.
  3. Fittings 12" and Larger, for 200 psi and Above WWP: Fittings shall be ductile iron or gray iron rated at 250 psi water working pressure plus water hammer. Ductile iron fittings only will be used with ductile iron pipe.
- B. All ductile iron fittings shall be rated at 250 psi water working pressure plus water hammer. Ductile iron fittings shall be ductile cast-iron grad 80-60-03 per ASTM Specification A33955. All fittings for connection to PVC pipe-all classes, shall be ductile iron.
- C. No separate pay item has been established for fittings and no determination of the number of fittings required on the job has been made. The Contractor, during the bidding phase, shall determine the number of fittings required on the job and include the cost of the fittings and installation in the unit price for pipe.
- D. Lining and Coating: All mechanical joint fittings shall be cement lined and bituminous seal coated per Federal Specification WW-P-421b and ASA Specification A421.40 (AWWA C104). Bituminous outside coating shall be in accordance with ANSI/AWWA C110/A21.10.

## 2.05 HIGH-DENSITY POLYETHYLENE - AWWA APPROVED POTABLE WATER PIPE

- A. General: This section is for High-density Polyethylene AWWA C906 and NSF 14 Approved Pipe for Potable Water Service in Sizes 4" to 24" DIPS (Ductile Iron Pipe Size) and defines the characteristics and properties of high-density polyethylene pipe. This specification governs the material, pipe, fittings, butt fusion, and general construction practice for HDPE piping systems.

Pipe shall have a hydrostatic design stress rating of 800 psi based on a material with a 1,600 psi at 23° hydrostatic design basis as determined in accordance with ASTM D-2837.

Fittings shall be molded or fabricated from material meeting the same standards as the pipe.

Joints shall be made by the thermal butt fusion system. All joints shall be completely watertight, airtight and as strong as or stronger than the pipe wall, in strict accordance with the manufacturer's recommendations.

Sections of polyethylene pipe shall be joined into continuous lengths on the job site above ground. The joining method shall be the heat fusion method and shall be performed in strict accordance with the pipe manufacturer's recommendations. The heat fusion equipment used in the joining procedures shall be capable of meeting all conditions recommended by the pipe manufacturer, including, but not limited to, temperature requirements of 400°F, alignment, and 150 psi interfacial fusion pressure.

Heat fusion joining shall be 100% efficient offering a joint weld strength equal to or greater than the tensile strength of the pipe. Socket fusion shall not be used.

- B. References: Where all or part of a Federal, ASTM, ANSI, AWWA, etc., standard specification is incorporated by reference in these Specifications, the reference standard shall be the latest edition and revision and considered a part of these specifications.
- C. Material: Materials used for the manufacture of polyethylene pipe and fittings shall be extra high molecular weight, high density PE 3408 polyethylene resin. The material shall be listed by PPI (Plastics Pipe Institute, a division of the Society of the Plastics Industry) in PPI TR-4 with a 73°F hydrostatic design basis of 1,600 psi and a 140°F hydrostatic design basis of 800 psi. The PPI listing shall be in the name of the pipe manufacturer and shall be based on ASTM D 2837 testing.
- D. Pipe and Fittings: Qualification of Manufacturers. The Manufacturer shall have manufacturing and quality assurance facilities capable of producing and assuring the quality of the pipe and fittings required by these Specifications. The Manufacturer's production facilities shall be open for inspection by the Owner or his Authorized Representative.
1. Pipe: Pipe supplied under this specification shall have a nominal DIPS (Ductile Iron Pipe Size) OD unless otherwise specified. The DR (Dimension Ratio) and the pressure rating of the pipe supplied shall be as shown on the drawings. The pipe shall be produced from approved HDPE pipe grade resin with the nominal physical properties as specified in the appropriate ASTM specifications for the sizes indicated. Pipe having a diameter 3" and larger will be made to the dimensions and tolerances specified in ASTM F 714.

The pipe shall contain no recycled compound except that generated in the manufacturer's own plant. The pipe shall be homogeneous throughout and free of visible cracks, holes, voids, foreign inclusions, or other defects that may affect the wall

integrity.

2. Pipe Performance: The pipe will be extruded from resin meeting the specifications of ASTM D 3350 with a minimum cell classification of 345464C.
  3. Fittings: HDPE fittings shall be in accordance with ASTM D 3261 and shall be manufactured by injection molding, a combination of extrusion and machining, or fabrication from HDPE pipe conforming to this specification. The fittings shall be fully pressure rated and provide a working pressure equal to that of the pipe with an included 2:1 safety factor. The fittings shall be manufactured from the same base resin type and cell classification as the pipe itself. The fittings shall be homogeneous throughout and free from cracks, holes, foreign inclusions, voids, or other injurious defects.
  4. Molded Fittings. Molded fittings shall be manufactured and tested in accordance with ASTM D 3261 and shall be so marked. Molded fittings shall be tested in accordance with AWWA C906.
  5. X-Ray Inspection. The Manufacturer shall submit samples from each molded fittings production lot to x-ray inspection.
  6. Fabricated Fittings. Fabricated fittings shall be made by heat fusion joining specially machined shapes cut from pipe, polyethylene sheet stock or molded fittings. Fabricated fittings shall be rated for internal pressure service at least equal to the full service pressure rating of the mating pipe. Fabricated fittings shall be tested in accordance with AWWA C906.
  7. Polyethylene Flange Adapters. Flange adapters shall be made with sufficient throughbore length to be clamped in a butt fusion-joining machine without the use of a stub-end holder. The sealing surface of the flange adapter shall be machined with a series of small v-shaped grooves (serrations) to promote gasketless sealing, or restrain the gasket against blowout.
- E. Joining - Butt Fusion: Sections of polyethylene pipe shall be joined by the butt fusion process into continuous lengths at the job site. The joining method shall be the heat fusion method and shall be performed in strict accordance with the pipe manufacturer's recommendations. The heat fusion equipment used in the joining procedures should be capable of meeting all conditions recommended by the pipe manufacturer. Properly executed electrofusion fittings may be used. Extrusion welding or hot gas welding of HDPE shall not be used for pressure pipe applications or fabrications where shear or structural strength is important. Mechanical joint adapters, flanges, unions, grooved-couplers, transition fittings, and some mechanical couplings may be used to mechanically connect HDPE pipe. Refer to the manufacturer's recommendations.
- F. Joining - Other Means: Polyethylene pipe and fittings may be joined together or to other materials by means of (a) flanged connections (flange adapters and back-up rings), (b) mechanical couplings designed for joining polyethylene pipe or for joining polyethylene pipe to another material, (c) MJ Adapters or (d) electrofusion. When joining by other means, the installation instructions of the joining device manufacturer shall be observed.

ID Stiffener and Restraint. A stiffener shall be installed in the bore of the polyethylene pipe when an OD compression mechanical coupling is used and when connecting plain end PE pipe to a mechanical joint pipe, fitting or appurtenance. External clamp and tie rod restraint shall be installed where PE pipe is connected to the socket of a mechanical joint pipe, fitting or



appurtenance except where an MJ Adapter is used.

- G. **Quality and Workmanship:** The pipe and/or fitting manufacturer's production facilities shall be open for inspection by the owner or his designated agents with a reasonable advanced notice. During inspection, the manufacturer shall demonstrate that it has facilities capable of manufacturing and testing the pipe and/or fittings to standards required by this specification. Pipe which has been tested by the manufacturer and falls outside of the appropriate limits set forth in this specification will be cause for rejection.
- H. **QA Records:** QA/QC records shall be maintained intact for a minimum of one year from the date of production.
- I. **Pipe Marking:** During extrusion production, the HDPE pipe shall be continuously marked with durable printing including the following information:
  - Nominal Size
  - Dimension Ratio
  - Pressure Class, psi
  - Manufacturer's Name and Product Series
  - Cell Class
  - ASTM Basis
  - "NSF-PW"
  - Pipe Test Category
  - Plant Code & Extruder
  - Production Date
  - Operator Number (Shift Letter optional)
  - Resin Supplier Code
- J. **Pipe Packaging, Handling, & Storage:** The manufacturer shall package the pipe in a manner designed to deliver the pipe to the project neatly, intact, and without physical damage. The transportation carrier shall use appropriate methods and intermittent checks to insure the pipe is properly supported, stacked, and restrained during transport such that the pipe is not nicked, gouged, or physically damaged. Pipe shall be stored on clean, level ground to prevent undue scratching or gouging. If the pipe must be stacked for storage, such stacking shall be done in accordance with the pipe manufacturer's recommendations. The pipe shall be handled in such a manner that it is not pulled over sharp objects or cut by chokers or lifting equipment. Sections of pipe having been discovered with cuts or gouges in excess of 10% of the pipe wall thickness shall be cut out and removed. The undamaged portions of the pipe shall be rejoined using the heat fusion joining method. Fused segments of pipe shall be handled so as to avoid damage to the pipe. Chains or cable type chokers must be avoided when lifting fused sections of pipe. Nylon slings are preferred. Spreader bars are recommended when lifting long fused sections.
- K. **Testing:**
  - **Fusion Quality.** The Contractor shall ensure the field set-up and operation of the fusion equipment, and the fusion procedure used by the Contractor's fusion operator while on site. Upon request by the Owner, the Contractor shall verify field fusion quality by making and testing a trial fusion. The trial fusion shall be allowed to cool completely; then test straps shall be cut out and bent strap tested in accordance with ASTM D 2657. If the bent strap test of the trial fusion fails at the joint, the field fusions represented by the trial fusion shall be rejected. The Contractor at his expense shall make all necessary corrections to equipment, set-up, operation and fusion procedure, and shall re-make the rejected fusions.

- Hydro-Test: Pipelines shall be tested to the requirements and specifications of the engineer of record. HDPE pressure pipe shall be tested in accordance with the specifications and requirements of the engineer of record and/or with the manufacturer's recommendations. The pressure rating of the pipe is a function of temperature at the time of hydro-test. Refer to the manufacturer's temperature related pressure ratings. At a minimum and if not specified elsewhere, hydro-test the piping system at 1.5 times the pressure rating of the pipe for 2 to 3 hours per Driscopipe Technical Note #35. If a system component such as a fabricated or mechanical fitting has a pressure rating less than that of the pipe, the piping system should be pressure tested to manufacturer's guidelines on that component.

## PART 3 - EXECUTION

### 3.01 LAYING DEPTHS FOR WATER MAINS

In general, water mains shall be laid with a minimum cover of 36" above the top of the main, unless otherwise noted on the Drawings, i.e. for minimum separation between water main and other utilities, connections to existing mains, valve locations, or when required by Kentucky Department of Highways, i.e. ditch lines and borings shall be 42" minimum cover.

### 3.02 PIPE BEDDING

- A. The foundation for pipes laid in trenches shall be prepared so that the entire load of the backfill on top of the pipe will be carried uniformly on the barrel of the pipe. Pipe bells shall not carry any of the load of the backfill.
- B. The Contractor shall use the "Undercutting Method" of pipe bedding.
- C. When the "Undercutting Method" is used in rock bottom trenches, Class I granular bedding (No.9 crushed stone aggregate) or earth shall be of such depth that the bottom of the barrel of the pipe will be at least 6" above the bottom of the trench as excavated. Pipe bedding required in this paragraph is NOT considered a separate pay item.
- D. In wet, yielding and mucky locations where pipe is in danger of sinking below grade or floating out of line or grade, the pipe must be weighted or secured permanently in place by such means as will prove effective. In areas where a high water table exists, the Contractor is cautioned to exercise extreme care in the placement of the backfill material to prevent flotation of the pipe at any time.
- E. Where an unstable (i.e., water, mud, etc.) trench bottom is encountered, stabilization of the trench bottom is required. This is to be accomplished by undercutting the trench depth and replacing to grade with a foundation of crushed stone aggregate. The depth of the foundations dependent upon the severity of the trench bottom. The size of stone aggregate used in the foundation will be determined by the condition of the unstable material. Once the trench bottom has been stabilized, the required Class I bedding can be placed. The amount of crushed stone aggregate required to bring the top of the foundation to the trench bottom prior to the removal of the unstable material will be considered a separate pay item following negotiation between the Contractor and Owner and constitute a change order item. No compensation will be made if the instability of the trench bottom is caused by the Contractor's neglect.
- F. The Contractor shall use compacted earth material or Class I granular bedding (No.9 crushed stone aggregate) when the pipe is to be placed in the rock bottom trenches or in trenches with excavated rock present. This type of bedding material shall be placed 12" above and 6" below the pipe as shown on the Contract Drawings as "Class C Bedding Detail".

- G. It should be noted that no pipe shall be laid on solid or blasted rock. No rock shall be allowed to rest against the pipe once it is placed in the trench.
- H. Pipe bedding as required in Paragraphs C and D of this Article is NOT considered a separate pay item.

### 3.03 PIPE LAYING

- A. All pipe shall be laid with ends abutting and true to the lines and grades indicated on the Plans. Pipe shall be fitted and matched so that when laid in the work, it will provide a smooth and uniform invert. Supporting of pipe shall be as set out hereinbefore under "Pipe Bedding" and in no case shall the supporting of pipe on blocks be permitted.
- B. Fittings and specials for the water main shall be provided and laid as and where directed by the Engineer or as shown on the Plans.
- C. Before each piece of pipe is lowered into the trench, it shall be thoroughly swabbed out to insure its being clean. Any piece of pipe or fitting which is known to be defective shall not be laid or placed in the lines. If any defective pipe or fitting shall be discovered after the pipe is laid, it shall be removed and replaced with a satisfactory pipe or fitting without additional charge. In case a length of pipe is cut to fit in a line, it shall be so cut as to leave a smooth end at right angles to the longitudinal axis of the pipe.
- D. The interior of the pipe, as the work progresses, shall be cleaned of dirt, jointing materials, and superfluous materials of every description. When laying of pipe is topped for any reason, the exposed end of such pipe shall be closed with a plywood plug fitted into the pipe bell so as to exclude earth or other material and precautions shall be taken to prevent flotation of pipe by runoff into trench.
- E. No backfilling (except for securing pipe in place) over pipe will be allowed until the Engineer has had an opportunity to make an inspection of the joints, alignment and grade in the section laid, but such inspection shall not relieve the Contractor of further liability in case of defective joints, misalignment caused by backfilling and other such deficiencies that are noted later.
- F. Anchorage of Bends, Tees, Plugs and Valves:
  - 1. At all tees, plugs, caps and bends of 11-1/4 degrees and over, and at reducers or in fittings where changes in pipe diameter occur, movement shall be prevented by using suitable harness, thrust blocks or ballast. Valves shall be provided with similar protection. Thrust blocks and supports shall be as shown in the typical details, with sufficient volumes of concrete being provided; however, care shall be taken to leave weep holes unobstructed and allow for future tightening of all nearby joints. Unless otherwise directed by the Engineer, thrust blocks shall be placed so that the pipe and fitting joints will be accessible for repair. Thrust blocks shall bear on undisturbed earth or rock.
  - 2. Bridles, harness or pipe ballasting shall meet with the approval of the Engineer. Steel rods and clamps shall be galvanized.
  - 3. No extra pay shall be allowed for work on proper anchorage of pipe, fittings or other appurtenances; such items shall be included in the unit price bid for the supported item.

### 3.04 HORIZONTAL DIRECTIONAL DRILLING (HDPE PIPE)

Horizontal directional drilling technique shall be used for installing pipes and utility lines below ground using a surface-mounted drill rig that launches and places a drill string at a shallow angle to the surface and has tracking and steering capabilities. The drill shall be advanced underground, creating a borehole along its path. As the destination is reached, the drill string is angled upwards to penetrate the surface. After the borehole has been opened, a backreamer shall be attached to the head of the drill string and the HDPE pipe shall be attached to the backreamer. The drill string shall then be retracted. During retraction, the borehole will be expanded by the backreamer and the HDPE pipe drawn into the borehole. To protect HDPE pipe against excessive pulling load, a weak-link or breakaway device shall always be used at the head of the HDPE pipe. the allowable tensile load for setting weak-link devices shall be determined using ASTM F 1804 Standard Practice for Determining Allowable Tensile Load for Polyethylene (PE) Gas Pipe During Pull-In Installation. Horizontal Directional Drilling (HDD) applications shall be installed in accordance with ASTM F1962 Standard Guide for Use of Maxi-Horizontal Directional Drilling for Placement of Polyethylene Pipe or Conduit under Obstacle, Including river Crossings, Plastic Pipe Institute (PPI) Polyethylene Pipe for Horizontal Directional Drilling, and the Mini Horizontal Directional Drilling Manual published by the North American Society of Trenchless Technology (NASTT). Additional information is available in Plexco® Literature Trenchless Technology Bulletin No. 1 - Horizontal Directional Drilling Note.

### 3.05 WATER MAINS PUSHED UNDER DRIVEWAYS

The Contractor may be required to tunnel or bore under a bituminous or concrete surface driveway instead of open trenching as requested by the property owner. The opening under the driveway shall be of the smallest diameter possible to accommodate the water main to minimize settlement of the driveway. Should settlement occur, the Contractor shall repair the driveway at his own expense in a manner satisfactory to the Engineer and the property owner.

### 3.06 JOINTING

Jointing shall be accomplished in accordance with the manufacturer's recommendation.

### 3.07 TYPES OF CRUSHED STONE MATERIAL

Two classes of crushed stone material are mentioned in the Detailed Specifications. The Type of material used in each class is as follows:

Class I	No. 9 Aggregate
Class II	Dense Graded Aggregate

### 3.08 BACKFILLING

#### A. Initial Backfill:

1. This backfill is defined as that material which is placed over the water main from the spring line in an earth trench to a point 6" above the top of the pipe or from the trench bottom in a rock trench to a point 12" above the top of the pipe. The initial backfill for Case I situations shall be earth material free of rocks, acceptable to the Engineer or Class I material (No. 9 crushed stone aggregate). The initial backfill for Case II, Case III and Case IV situations shall be compacted earth material or be Class I material (No.9 crushed stone aggregate).

2. In areas where large quantities of rock are excavated, and the excavated earth is insufficient, then the Contractor must either haul in earth or order crushed stone aggregate for backfilling over the top of the pipe. Neither earth nor the crushed stone aggregate used to fulfill the backfill requirements is considered a pay item.
- B. Final Backfill: There are four cases where the method final backfilling varies. The various cases and their trench situations are as follows:
1. Case I: Areas not subject to vehicular traffic.
  2. Case II: Gravel areas subject to light vehicular traffic such as residential driveways; church and commercial parking lots and entrances; and farm drives.
  3. Case III: City and County gravel roads; gravel and bituminous road shoulders; all bituminous surface areas such as City and County streets, residential driveways, church and commercial parking lots, and entrances; City and County road shoulders.
  4. Case IV: State maintained streets and roads; road shoulders for State roads and streets.
- C. In all cases, walking or working on the completed pipelines, except as may be necessary in backfilling, will not be permitted until the trench has been backfilled to a point twelve (12) inches above the top of the pipe. The method of final backfilling for each of the above cases is as follows:
1. Case I - The trench shall be backfilled from a point 6" (12" for a rock trench) above the top of the pipe to a point 8" below the surface of the ground with earth material free from large rock (over one-half cubic foot in volume), acceptable to the Engineer. The remainder of the trench to existing grade shall be backfilled with earth material reasonably free of any rocks.  
  
Earth backfill used in this Case is not a separate pay item but will be paid under the pay item "Water Main".
  2. Case II - The trench shall be backfilled from a point 6" (12" for a rock trench) above the top of the pipe to a point 12" below the surface of the ground with Class I (No. 9 crushed stone aggregate) material. The trench shall be tamped to assure maximum possible compaction (approximately 80 to 85 percent of Standard Proctor density). Extreme care shall be exercised to prevent damage to the pipe during tamping operation. The remainder of the trench to existing grade shall be backfilled with Class II (dense graded aggregate) material with the material being mounded over the trench. The trench shall be tamped again to assure additional compaction. The trench may be left with a slight mound if permitted by the Engineer.  
  
Class I material used and method of backfilling used in this case is not a separate pay item and is considered incidental to the work and will be paid for under the item "Water Main".  
  
Class II material used in this method of backfill is not a separate pay item and will be included in the unit price per linear foot under the item "Water Main".  
  
Sufficient stockpiles of Class II material shall be placed throughout the project area to insure immediate replacement by the Contractor of any settled areas. No extra payment will be made for the filling of settled areas by the Contractor.

3. Case III - The trench shall be backfilled from a point 6" (12" for a rock trench) above the top of pipe to the height indicated in the "City and County Maintained Streets, Roads and Driveway Pavement Replacement" detail with Class I (No. 9 crushed stone aggregate) material. Said material shall be tamped as described for Case II. A 12-inch layer of Class II (dense graded aggregate) material shall be placed over the compacted backfill before bituminous or concrete surface is placed as shown in the previously mentioned details. The 12-inch layer of Class II material is NOT a separate pay item but such expense will be borne by the Contractor and is considered incidental to the bid items "Bituminous Surface Replacement" and "Concrete Surface Replacement". Also considered incidental is all temporary stone required for a temporary surface between backfilling and pavement replacement.

Sufficient stockpiles of Class II material shall be placed throughout the project area to insure immediate replacement by the Contractor of any settled areas. No extra payment will be made for the filling in of settled areas by the Contractor. Class II material used in this method of backfill is paid for as a support item under item "Bituminous Surface Replacement" or "Concrete Surface Replacement" as its unit price per linear foot.

Class I material used for backfilling is not a separate pay item and is considered incidental to the bid item "Water Main".

4. Case IV - The trench shall be backfilled from the spring line to a point one 12-inches above the top of the pipe with earth material free from rock and acceptable to the Engineer, it shall be carefully and solidly tamped by approved mechanical methods. The remainder of the trench shall be backfilled to the height indicated in the "State Maintained Streets and Roads Pavement Replacement Detail" in the Contract Drawings, with material free from rock and acceptable to the Engineer; said material shall be mechanically tamped in approximately six-inch layers to obtain the maximum possible compaction. The backfilling method is NOT a separate pay item. A 12-inch layer of dense graded aggregate shall be placed over the compacted earth backfill when a bituminous or concrete surface street or road has been trenched. The 12-inch layer of stone is not a separate pay item but such expense will be borne by the Contractor.

- D. Excavated materials from trenches and tunnels, in excess of quantity required for trench backfill, shall be disposed of by the Contractor. The Contractor may contact the Owner regarding the location of a suitable disposal site; however, if the Owner cannot recommend a site, it shall be the responsibility of the Contractor to obtain locations or permits for the disposal of the waste material. Unit prices for the various pipe sizes shall include the cost of disposing of excess excavated materials, as set forth herein, no additional compensation being allowed for hauling or overhaul.

### **3.09 CRUSHED STONE BACKFILL**

- A. The Class I granular material used in Case II and Case III backfill situations shall be No. 9 Crushed Stone aggregate (No.9 Stone). Granular material will not be paid for as a separate bid item.
- B. The twelve inches 12-inch of crushed stone backfill that is required in "City and County Maintained Streets, Roads and Driveway Pavement Replacement" or "State Maintained Streets and Roads Pavement Replacement" will not be paid for under the provisions of this article.

### 3.10 BITUMINOUS PAVEMENT REPLACEMENT

- A. Sections of pavement shall be replaced as required to install the pipelines under the work of this Section. Disturbed pavement shall be reconstructed to original lines and grades with bituminous binder as detailed on the Drawings and in such manner as to leave all such surfaces in fully as good or better condition than that which existed prior to these operations.
- B. Prior to trenching, the pavement shall be scored or cut to straight edges along each side of the proposed trench to avoid unnecessary damage to the remainder of the paving. Edges of the existing pavement shall be recut and trimmed as necessary to square, straight edges after the pipe has been installed and prior to placement of the binder course.
- C. Backfilling of trenches shall be in accordance with the applicable portions of this section.
- D. Bituminous concrete binder shall be one course construction in accordance with applicable provisions of the Kentucky Department of Highways Standard Specifications, Section 402. Placement and compaction of binder course shall be in accordance with Section 402 of the Kentucky Department of Highways Standard Specifications. Minimum thickness after compaction shall be as shown on the Drawings.

### 3.11 CRUSHED STONE SURFACE REPLACEMENT

The Class II granular material used in Case II backfill situations shall be dense graded aggregate (D.G.A.). Granular material will be included in the unit price per linear foot for "Water Mains".

### 3.12 CONCRETE SEPARATOR FOR UTILITY CROSSING OR CASING PIPE WATER/SAN. SEWER CROSSING

- A. At locations shown on the Contract Drawings, or as required by the Specifications and Contract Drawings, concrete separator shall be used when the clearance between the proposed water main and any existing non-contaminating utility pipe is one (1) foot or less. Utility pipe includes underground gas, telephone and electrical conduit, storm sewers, or any other underground utility pipe.
- B. There are two cases of non-contaminating utility crossing encasement. Case I is applicable when the proposed water main is below the existing utility line. Case II is applicable when the proposed water main is laid above the utility line. In either case, the concrete shall extend to at least the spring line of each pipe involved.
- C. When a water main crosses an existing sanitary sewer line, either above or below and less than two feet vertical or ten feet horizontal separation, the water main shall be encased as shown on the Standard Details, or as required by the Specifications and Contract Documents.
- D. Concrete shall be Class B (2500 psi) and shall be mixed sufficiently wet to permit it to flow between the pipes to form a continuous bridge. In tamping the concrete, care shall be taken not to disturb the grade of line of either pipe or damage the joints.

### 3.13 CONCRETE FOR CREEK CROSSING (Type B and C Creek Crossing)

- A. At locations shown on the Contract Drawings, or as required by the Specifications and Contract Drawings, concrete encasement shall be used when the water main crosses a stream or creek which is in rock or as directed by the Engineer.



- B. All creek crossings (Types B and C) shall be constructed as per the detail shown on the Contract Drawings.
- C. Concrete shall be Class B (3000 psi) and shall be mixed sufficiently wet to permit flow around the pipe and to form a continuous bed. In tamping the concrete, care shall be taken not to disturb the grade or line of the pipe or injure the joints. Concrete shall be protected from excess water.
- D. Concrete placed outside the specified limits or without authorization from the Engineer will not be subject to payment. Concrete will be paid under the pay items "Crossing Type B and Creek Crossing Type C."

### **3.14 TESTING OF WATER MAINS**

The completed work shall comply with the provisions listed below, or similar requirements which will insure equal or better results:

- A. Before any allowable leakage calculation are preformed the pipeline being tested must pass the hydrostatically test.
- B. The pipe shall be hydrostatically tested at 1.5 times the design pressure at the point of testing. The duration of the test(s) shall be at least 2 hours during which time the pressure shall not fall more than 5 psi. The pipe shall be tested for allowable leakage according to AWWA C-600 (latest revision) concurrently with the pressure test.
- C. Where practicable, pipelines shall be tested between line valves or plugs in lengths of not more than 3000 feet. Testing shall proceed from the source of water toward the termination of the line. The line shall be tested upon the completion of the first 3000 feet. After the completion of two consecutive tests without failure, the Contractor, at his option and with the Engineer's approval, may discontinue testing until the system is complete.
- D. Duration of test shall be not less than 2 hours.
- E. Lines which fail to meet tests shall be repaired and retested as necessary until test requirements are complied with.
- F. All pipe, fittings and other materials found to be defective under test shall be removed and replaced at the Contractor's expense.
- G. Test pressures shall not be less than 1.5 times the working pressure at the highest point along the test section, not exceed pipe or thrust restraint design pressure, not vary more than  $\pm 4$  psi and not exceed twice the rated pressure of the valves when the pressure boundary of the test sections include closed gate valves.
- H. Before applying the specified test pressure, air shall be expelled completely from the pipes and valves. If permanent air vents are not located at high points within the test section, the Contractor shall install corporation cocks at such points so that the air can be expelled as the line is filled with water.



**3.15 LEAKAGE TEST**

- A. The leakage shall be defined as the quantity of water that must be supplied to the tested section to maintain pressure within 4 psi of the specified test pressure after the air in the pipeline has been expelled and the pipe has been filled with water.
- B. The allowable leakage shall not be greater than that determined by the following formula:

$$L = \frac{SD(P)}{133,200}^{1/2}$$

Where L is the allowable leakage in gallons per hour; S is the length of the pipeline tested; D is the nominal diameter of the pipe, in inches; and P is the average test pressure during the leakage test, in pounds per square inch gage.

- C. All visible leaks are to be repaired regardless of the amount of leakage.

**3.16 DISINFECTION OF WATER LINES**

- A. New potable water lines shall not be placed into service, either temporarily or permanently, until they have been thoroughly disinfected in accordance with the following requirements and to the satisfaction of the OWNER.
- B. New or relocated water lines shall be thoroughly disinfected in accordance with AWWA C651, latest version, upon completion of construction and before being placed into service. After pressure testing, a solution of chlorine or chlorine compounds in such amounts shall be introduced into the section of the line being disinfected sufficient to insure a chlorine dosage of at least 50 parts per million (PPM) in the water main. Open and close all valves and cocks while chlorinating agent is in the piping system. The chlorinated water shall remain in the pipe for 24 hours. Disinfection shall be repeated until a minimum chlorine residual of 25 PPM is measured after 24 hours. Once a chlorine residual of 25 PPM is obtained after 24 hours, the water main shall be thoroughly flushed until the residual chlorine content is not greater than 1.0 PPM.
- C. Following disinfection of the line, bacteriological samples shall be collected and analyzed in accordance with the requirements of Kentucky Department of Natural Resources and Environmental Protection, 401 KAR 8:150. When the samples have been tested and reported safe from contamination, the water line may be connected to the system. The Contractor shall provide to OWNER written documentation that the water sample passed the bacteriological test and is safe.
- D. Bacteriological samples shall be taken in the following manner. A sample shall be taken in the newly-constructed line at each of the following points:
  - 1) Within 1,200 feet downstream of each connection point between the existing and new lines;
  - 2) One (1) mile intervals; and
  - 3) Each dead end, without omitting any branch.
- E. All sampling shall be taken in the presence of the Engineer or his representative.. All bacteriological sampling and testing shall be paid for by the Contractor and included in the unit price for the bid item "water main".

### 3.17 DECHLORINATING OF HEAVILY CHLORINATED WATER

- A. Dechlorination of heavily chlorinated water shall be in accordance with AWWA C651 and shall be accomplished using sodium bisulfite, sodium thiosulfate, sodium sulfite, or calcium thiosulfate solution of a concentration sufficient to remove all chlorine to a level not to exceed 0.019 mg/l. The solution shall be applied by a metering pump directly into the chlorinated water flow stream by injection into a discharge line or into the free discharge from a hydrant. The treated water may then be conveyed to the nearest sanitary sewer, storm sewer, or local stream.
- B. The feed rate (gpm) of solution shall be governed by the chlorine (ppm) concentration of the water to be dechlorinated and the rate (gpm) at which it can be discharged. Constant monitoring of the chlorine residual concentration shall be made using the colorimetric method to ensure the optimum solution feed rate.
  - a. Feed System
- C. The dechlorinating agent shall be fed from prepared carboys utilizing a metering pump equipped with a suitable meter and valve to adjust/monitor the feed rate.

### 3.18 PLACEMENT OF TRACING WIRE

Detectable underground copper tracing wire shall be installed with all utility lines. Insulated copper trace wire shall be attached to the top of the pipe with adhesive tape or other suitable devices. At each hydrant, valve, and end of new pipe installation, the trace wire shall be daylighted and the ends connected together with split bolt connectors covered with waterproof tape or wrap. For long runs of pipe, the maximum unbroken length of the trace wire shall be 2500 feet. Underground splicing shall be made using brass split bolt electrical connectors. The trace wire shall be #12 AWG THWN copper.

### 3.19 PLACEMENT OF IDENTIFICATION TAPE

- A. The placement of detectable underground marking tape shall be installed over all utility lines. Care shall be taken to insure that the buried marking tape is not broken when installed. SEE SECTION 01600 MATERIAL AND EQUIPMENT for APPROVED MANUFACTURE.
- B. The identification tape shall bear the printed identification of the utility line below it, such as "CAUTION - BURIED WATER LINE BELOW". Tape shall be reverse printed, surface printing will not be acceptable. The tape shall be visible in all types and colors of soil and provide maximum color contrast to the soil. The tape shall meet the APWA color code, and shall be two (2) inches in width. Colors are: yellow - gas, green - sewer, red - electric, blue - water, orange - telephone, brown - force main.
- C. The tape shall be the last equipment installed in the ditch so as to be first out. The tape shall be buried 4 - 6 inches below top of grade. After trench backfilling, the tape shall be placed in the backfill and allowed to settle into place with the backfill. The tape may be plowed in after final settlement, installed with a tool during the trench backfilling process, unrolled before final restoration or installed in any other way acceptable to the Owner or his agent or Engineer.

### 3.20 CLEAN-UP

Upon completion of the installation of the piping and appurtenances, the Contractor shall remove all debris and surplus construction materials resulting from the work. The Contractor shall grade the

ground along each side of pipe trenches in a uniform and neat manner leaving the construction area in a shape as near as possible to the original ground line.

### **3.21 CONNECTING TO THE WATER SYSTEM**

Unless otherwise directed by the OWNER, the CONTRACTOR shall connect the new water main to the existing water system. The CONTRACTOR shall notify the OWNER when the connection is to be made so that representatives of the OWNER may operate existing valves and witness the connection. A minimum notice of at least 24 hours in advance of the connection shall be given to the UTILITY. The Contractor shall coordinate all connections and other work which require disruption of water service so as to minimize the amount of time the affected water lines are out of service.

- END OF SECTION -



## SECTION 02630

### TAPPED CONNECTIONS

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. This Section includes tapping and installing of corporation stops and valves on existing or newly installed pipes without interruption of service, as shown on the Contract Drawings, complete with connections and accessories.
- B. Installing of curb stops and boxes where specified or directed.

##### 1.02 REFERENCES

- A. Materials and installation shall be in accordance with the latest revisions of the following codes, standards and specifications, except where more stringent requirements have been specified herein:
  - 1. American Water Works Association (AWWA)

##### 1.03 SUBMITTALS

- A. In addition to those submittals identified in the General Provisions, the following items shall be submitted:
  - 1. Detail drawings for each size corporation stop, curb stop, tapping sleeve and valve, and service box.

#### PART 2 PRODUCTS

##### 2.01 CORPORATION STOPS

- A. Corporation stops shall be threaded to conform to AWWA C800 with standard corporation stop thread at the inlet. The outlet shall be fitted with coupling nut for flared tube service unless otherwise specified.

SEE SECTION 01600 MATERIAL AND EQUIPMENT for APPROVED MANUFACTURE.

##### 2.02 CURB STOPS

- A. Curb stops shall be threaded to conform to AWWA C 800 with coupling nuts for flared tube service.
  - 1.  $\frac{3}{4}$ -inch shall be of the inverted new type.
  - 2. 1-inch to 2-inch shall be of the plug-type with "O" ring seals to withstand a minimum working pressure of 175 psi.
  - 3. SEE SECTION 01600 MATERIAL AND EQUIPMENT for APPROVED MANUFACTURE.

### 2.03 SERVICE CLAMPS

- A. Service clamps shall be designed for use on the type of pipe to which the connection is being made.
  - 1. Ductile iron and asbestos-cement service clamps shall be the double strap type with neoprene gaskets.
  - 2. Polyvinyl chloride pipe service clamps shall be of a full circle design with a minimum width of 2 inches.
  - 3. Prestressed concrete pipe service clamps shall be made by or approved for use by the pipe manufacturer.
  - 4. SEE SECTION 01600 MATERIAL AND EQUIPMENT for APPROVED MANUFACTURE.

### 2.04 SERVICE BOXES

- A. Service boxes shall be constructed of cast iron and sized for the curb stop upon which it is being installed.
  - 1. Stationary shut-off rod shall be provided unless otherwise specified.
  - 2. Boxes shall be telescopic with a minimum of 1-foot adjustment.
  - 3. SEE SECTION 01600 MATERIAL AND EQUIPMENT for APPROVED MANUFACTURE.

### 2.05 TAPPING SLEEVES AND VALVES

- A. Tapping sleeves and valves shall be used for connections larger than 2 inches.
  - 1. Tapping sleeves shall be designed and sized in accordance with the recommendations of the manufacturer.
  - 2. Working pressure shall be 200 psi unless higher pressures are scheduled.
  - 3. The seal of the tapping sleeve shall be mechanical joint or low lead 2.5% or less. Low lead as conforming to current regulations.
  - 4. Valves for tapping sleeves shall be designed for the intended service and shall conform to the requirements of the Section entitled "Valves".
  - 5. SEE SECTION 01600 MATERIAL AND EQUIPMENT for APPROVED MANUFACTURE.

## PART 3 EXECUTION

**3.01 INSTALLATION**

- A. Install connections and accessories under the direction of personnel who have performed at least ten similar connections in accordance with the configuration shown on the Contract Drawings and the applicable provisions of the referenced Standards.
  - 1. Threaded taps shall be made using a machine designed for cutting, threading and inserting the corporation without interruption of service.
    - a. Teflon tape may be used on corporation threads.
  - 2. Tapping sleeve connections shall be made using a machine to cut and remove the segment through the valve without interruption of service.
- B. Service boxes shall be set plumb and shall be independently supported on two bricks so no weight will be transmitted to the curb stop or carrier pipe.
- C. Service clamps and tapping sleeves installed on prestressed concrete pipe shall be encased in a minimum of 2 inches of concrete mortar after installation.

-END OF SECTION-





**SECTION 02640****VALVES****PART 1 - GENERAL****1.01 WORK INCLUDED**

- A. The Contractor shall furnish and install valves and miscellaneous piping appurtenances, as indicated on the Drawings and as herein specified.
- B. The Drawings and Specifications direct attention to certain features of the equipment, but do not purport to cover all the details of their design. The equipment furnished shall be designed and constructed equal to the high quality equipment manufactured by such firms as are mentioned hereinafter, or as permitted by the Engineer. The Contractor shall furnish and install the equipment complete in all details and ready for operation.
- C. Electrical work and equipment specified herein shall conform to the requirements of the applicable electrical sections.
- D. Enclosures shall be of a suitable type for the atmospheres in which they are installed.
- E. Sizes and capacities not specified herein are indicated on the Drawings.
- F. Valves required within pre-engineered pump stations are not covered by this specification section.

**PART 2 - PRODUCTS****2.01 BUTTERFLY VALVES**

- A. Butterfly valves and operators shall conform to the AWWA Standard Specifications for rubber seated butterfly valves, Designation C504, Class 150, except as hereinafter specified. Valves shall have a minimum 150 psi pressure rating.
- B. All butterfly valves shall be of cast iron body per ASTM A-126, Class B. Valve discs shall be of ductile iron per ASTM A-536 and provide uninterrupted 360 degree seating edge. Permanently self-lubricating body bushings shall be provided and shall be sized to withstand bearing loads. Valve shafts shall be Type 304 stainless steel with V-type packing. O-ring seals are not acceptable.
- C. Valve seats shall be full resilient seats of Buna - N or Hycar and retained in the body or on the disc edge. If the resilient seat is in the body, the disc shall conform to ASTM A-436 Type 1 (Ni-Resist) or gray/ductile iron with corrosion resistant seating surface. If the resilient seat is mounted on the disc edge, it shall be securely attached with Type 304 stainless steel retaining ring or pins. The disc seating edge shall be Type 316 stainless steel.
- D. Valve operators shall be electric actuators as specified elsewhere in the specifications. The valve shaft and actuators shall be designed for both torsional and shearing stresses when the valve is operated under its greatest torque.

- E. All valves shall conform with the latest revision of AWWA Standard for Butterfly Valves for Ordinary Water Service, AWWA C504. SEE SECTION 01600 MATERIAL AND EQUIPMENT for APPROVED MANUFACTURE.

## 2.02 GATE VALVES AND BOXES

- A. All gate valves shall be of the resilient seat wedge, iron body, non-rising stem, fully bronze mounted with O-ring seals. Valves shall be of standard manufacture and of the highest quality both as to materials and workmanship and shall conform to the latest revisions of AWWA Specification C-500. Valves shall have a rated working pressure of 250 psi.
- B. Gate valves for buried service shall be furnished with mechanical joint end connections, unless otherwise shown on the plans or specified herein. The end connections shall be suitable to receive ductile iron or PVC pipe.
- C. All gate valves shall have the name or monogram of the manufacturer, the year the valve casting was made, the size of the valve, and the working pressure cast on the body of the valve.
- D. Buried service gate valves shall be provided with a 2" square operating nut and shall be opened by turning to the left (counterclockwise).
- E. Buried service gate valves shall be installed in a vertical position with valve box as detailed on the plans. They shall be set vertically and properly adjusted so that the cover will be in the same plane as the finished surface of the ground or street. All underground gate valves which have nuts deeper than 36 inches below the valve box top shall have extended stems with nuts located within one foot of the valve box cap.
- F. Valve boxes shall be cast iron, two-piece, screw type (as shown on the drawings) with drop-cover marked "Water". They shall be set vertically and properly adjusted so that the cover will be in the same plane as the finished surface of the ground or street. A concrete pad shall be placed around the valve box cover as shown on the drawings.
- G. The Contractor shall furnish two (2) T-operating wrenches in the lengths necessary to operate the buried gate valves for an operator of average height in a normal working position.
- H. Gate valves for installation in building, drywells, pits or vaults shall be flanged ANSI B16.1, Class 125 with handwheel operator, non-rising stem or OS&Y as indicated on the drawings.
- I. Gate valves installed with tapping sleeves shall have a mechanical joint outlet and a flanged joint connection to the sleeves.
- J. All valves shall conform with the latest revision of AWWA Standard for Gate Valves for Ordinary Water Works Service, AWWA C500. SEE SECTION 01600 MATERIAL AND EQUIPMENT for APPROVED MANUFACTURE.
- K. All 24" or larger gate valves shall be supplied with spur gearing and grease case.
- L. All gate valves shall receive a two part thermosetting epoxy protective coating both inside and outside of the valve and shall be listed for use as with potable water by the Federal EPA. The epoxy coating shall meet or exceed ANSI/AWWA C550 Standard and ASTM D1763 Standard.

## 2.03 CONTROL VALVE

- A. The control valve shall be a hydraulically operated, single diaphragm-actuated, solenoid controlled, globe pattern design. A 3-way solenoid pilot valve either applies upstream pressure to the upper control chamber to close the main valve or vents the upper control chamber to atmosphere allowing the main valve to open. The solenoid and a limit switch assembly on the main valve are electrically synchronized with the telemetry controls to allow the valve to open or close to fill the tank.
- B. In the event of a power failure the valve will open immediately, regardless of the operational mode of the valve at the time of the power failure.
- C. The main valve shall be a center guided diaphragm actuated globe valve design. The body and cover shall be ductile iron, ASTM A536, with stainless steel disc guide, seat and cover bearing. The internal and external surfaces of the valve body shall be fusion bonded coated. End connections shall meet the ANSI, or other internationally recognized standard required. The body shall have a replaceable non-threaded seat ring that is held in place by set screws which tighten into a body groove. This seat should be accessible and serviceable without removing the valve from the pipeline. The seat area shall have a flow opening with no stem guides, bearings or supporting ribs.
- D. The electric solenoid valve shall be a 3-way solenoid with a manual override system to allow the valve to be operated manually should electrical power be unavailable. The solenoid and limit switch shall be properly rated for the intended service. Liquid to the pilot must be filtered and a cock valve must be provided to isolate the control loop.
- F. SEE SECTION 01600 MATERIAL AND EQUIPMENT for APPROVED MANUFACTURE.

#### **2.04 DUAL DISK VALVE**

- A. Dual Disc Check Valves shall be suitable for pressures up to 250 psig water service. The check valve shall be of the dual disc, wafer style with torsion spring induced closure. The valves shall be provided for installation between ANSI B16.1 Class 125 iron flanges.
- B. The body shall be of one piece construction incorporating a vulcanized synthetic seal. Seal design must allow for positive seating at both high and low pressures. This shall be achieved by a minimal seal contact at low pressure with progressively increased contact at higher pressures. The disc shall fully overlap the synthetic seal, preventing pressure indentations. Opening and closing of the valve must utilize a lift and pivot action to prevent seal wear and ensure long seal life. The stop and pivot pins shall be stabilized by the use of synthetic spheres to prevent wear due to vibration during operating conditions.
- C. The valve body shall be constructed of ASTM A536 Grade 65-45-12 ductile iron. The disc shall be constructed of ASTM B584, Alloy C83600 (2"-12") cast bronze or ASTM B148, Alloy C95200 (14" and larger) cast aluminum bronze. The disc pins and stop pins shall be Type 316 stainless steel. The torsion spring shall be ASTM A313 Type 316 stainless steel up to 16 in. sizes and ASTM A313 Type 17- 7 PH on 18 in. and larger sizes. The seal shall be Buna - N per ASTM D2000-BG or Viton per D2000-CA.
- D. End connections shall be full diameter threaded flanges.
- E. The valves shall be hydrostatically tested at 1.5 times their rated cold working pressure. A seat closure test at the valve rating shall be conducted to demonstrate zero leakage. The manufacturer shall provide test certificates, dimensional drawings, parts list drawings, and operation and maintenance manuals.

F. The exterior of the valve shall be coated with a universal alkyd primer.

G. SEE SECTION 01600 MATERIAL AND EQUIPMENT for APPROVED MANUFACTURE

## **2.05 CHECK VALVES**

A. The check valves shall be a swing check valve with flanged ends; outside lever and weight and function to prevent reverse flow. The valve shall be tight seating when closed and full ported when open. The hinged shaft shall be completely out of the water way employing a disc with a convex shape facing the normal flow. The valve shall be manufactured where the closing of the valve will not cause water hammer and minimize disc slam. The valve shall be capable of a tight seal at pressures above 5 psi.

B. The valve body shall be cast iron with a bronze seat ring. The valve disc shall be cast iron and suspended from a non-corrosive shaft. Valves shall be rated at a minimum working pressure of 175 psi.

C. SEE SECTION 01600 MATERIAL AND EQUIPMENT for APPROVED MANUFACTURE

## **2.06 TAPPING VALVES AND SLEEVES**

A. Tapping valves and sleeves shall be installed in the locations shown the Contract Drawings. The valves shall be a resilient seat wedge, iron body, non-rising stem, gate valve with a mechanical joint outlet and a flanged joint connection to the sleeves. They shall be provided with a valve box, counterclockwise opening and installed as described in detail on the plans.

B. Tapping Sleeves: Tapping sleeves of the sizes indicated for connection to existing main shall be the cast gray, ductile, or malleable-iron, split-sleeve type with flanged outlet, and with bolts, follower rings and gaskets on each end of the sleeve. Construction shall be suitable for a maximum working pressure of 200 psi. Bolts shall have hexagonal heads and nuts. Longitudinal gaskets and mechanical joints with gaskets shall be as recommended by the manufacturer of the sleeve. When using grooved mechanical tee, it shall consist of an upper housing with full locating collar for rigid positioning which engages a machine-cut hole in pipe, encasing an elastomeric gasket which conforms to the pipe outside diameter around the hole and a lower housing with positioning lugs, secured together during assembly by nuts and bolts as specified, pretorqued to 50 foot-pound.

C. SEE SECTION 01600 MATERIAL AND EQUIPMENT for APPROVED MANUFACTURE

D. Tapping valves shall be suitable for a maximum working pressure of 200 psi with 125 lb. flanges

## **2.07 CUSTOMER SERVICE PRESSURE REDUCING VALVE**

A. The individual customer service pressure reducing valve shall be hydraulically operated, spring loaded, diaphragm type control regulator. The valve shall be held open by the force of the compression spring above the diaphragm and shall maintain a constant delivery pressure downstream without shock or water hammer. Adjustments shall be made by an adjusting screw on top of the valve. Setting shall be as shown on the plans. The valve shall have a cast brass or bronze body and cover per ASTM B-62, stainless steel seat (Stainless Steel 303) and adjustment ranges of 40 to 300 psi.

- B. The individual pressure reducing valve shall be equipped with a built-in by-pass to prevent a closed system on the customer's side of the meter service.
- C. All valves shall be preceded by a strainer provided by the valve manufacturer and have a maximum working pressure the same as the pressure reducing valve.
- D. SEE SECTION 01600 MATERIAL AND EQUIPMENT for APPROVED MANUFACTURE

## **2.08 MAIN LINE PRESSURE REDUCING VALVE**

- A. The pressure reducing valve shall maintain a constant downstream pressure regardless of varying inlet pressure. This valve shall be a hydraulically operated, diaphragm actuated, globe pattern valve. It shall contain a resilient, synthetic rubber disc, having a rectangular cross section, contained on three and one-half sides by a disc retainer and forming a tight seal against a single removable seat insert. The diaphragm assembly containing a valve stem shall be fully guided at both ends by a bearing in the valve cover and integral bearing in the valve seat. This diaphragm assembly shall be the only moving part and shall form a sealed chamber in the upper portion of the valve, separating operating pressure from line pressure. The diaphragm shall consist of nylon fabric bonded with synthetic rubber and shall not be used as a seating surface. Packing glands and/or stuffing boxes are not permitted and there shall be no pistons operating the valve or pilot controls. All necessary repairs shall be possible without removing valve from the line.
- B. The main valve body and cover shall be Cast Iron per ASTM A48, and the main valve trim shall be 303 stainless steel. The valve shall come equipped with a valve position indicator. The valve shall be equipped with a flow clean strainer, closing speed control, opening speed control and flow stabilizer. The valve shall be equipped with a V-port diaphragm plug for low flow conditions or approved equal by the Engineer.
- C. The pilot control shall be a direct acting, adjustable, spring loaded, normally open, diaphragm valve, designed to permit flow when controlled pressure is less than the spring setting. The control system shall include a fixed orifice. The pilot control valve trim shall be 303 stainless steel.
- D. The valve shall have a maximum working pressure rating as stated on the Drawings.
- E. SEE SECTION 01600 MATERIAL AND EQUIPMENT for APPROVED MANUFACTURE

## **2.09 AIR RELEASE VALVE**

- A. The valve shall have a 1" screwed inlet diameter with a 1" corporation stop and a minimum of 3/32" size orifice. The body and cover shall be constructed of cast iron while the float shall be stainless steel. All internal parts, such as lever pins, retaining rings, screws, etc. shall be of stainless steel or bronze construction. Valves shall be suitable for use in lines with an operating pressure up to 175 psi. SEE SECTION 01600 MATERIAL AND EQUIPMENT for APPROVED MANUFACTURE
- B. A service clamp shall be used to connect the air release valve to the water main. Service clamps and corporation stops shall be those as previously specified in Section 02650, except the corporation stops shall have a female IP thread outlet.

- C. The air release valve box shall be a standard meter box with dimensions of 18" I.D. and a height of 36". The valve box cover shall be a standard water meter box cover.

### **PART 3 - EXECUTION**

#### **3.01 INSTALLATION**

- A. Valves shall be installed as nearly as possible in the positions indicated on the Drawings consistent with conveniences of operating the handwheel or wrench. All valves shall be carefully erected and supported in their respective positions free from all distortion and strain on appurtenances during handling and installation.
- B. All material shall be carefully inspected for defects in workmanship and material, all debris and foreign material cleaned out of valve openings and seats, all operating mechanisms operated to check their proper functioning, and all nuts and bolts checked for tightness.
- C. Valves and other equipment which do not operate easily or are otherwise defective shall be repaired or replaced at the Contractor's expense.
- D. Valves shall be set plumb and supported adequately in conformance with the instructions of the manufacturer. Valves mounted on the face of concrete shall be shimmed vertically and grouted in place. Valves in the control piping shall be installed so as to be easily accessible.
- E. All buried valves require a concrete collar for stability. Collar shall be no less than 4" thick and poured to flow water away from the valve. The concrete valve box protector ring is to be with copper locate pin.

#### **3.02 INTERIOR PIPING INSTALLATION**

- A. It shall be the Contractor's responsibility to furnish a complete system of pipe supports, to provide expansion joints and to anchor all piping. The pipe support system shall be installed complete with all necessary inserts, bolts, nuts, rods, washers, miscellaneous steel, and other accessories.
- B. In some instances, expansion joints have been shown on the drawings, but no attempt has been made to indicate every expansion joint for piping included under this portion of the specifications. Portions of the piping are shown on the detail drawings. Some of the piping, however, is shown only on the schematics.
- C. Reaction Anchorage and Blocking: All piping exposed in interior locations and subject to internal pressure in which flexible connectors are used shall be blocked, anchored, or harnessed, as shown on the drawings, or as directed by the Engineer to preclude separation of joints.

#### **3.03 PAINTING**

Field painting is specified in elsewhere in these specifications.

- END OF SECTION -

**SECTION 02645****HYDRANT ASSEMBLY****PART 1 - GENERAL****1.01 SCOPE**

The Contractor shall furnish and install, where shown on the plans and additional locations as directed by the Owner, hydrant assemblies and blow-hydrants manufactured and equipped as described below.

**PART 2 - PRODUCTS****2.01 FLUSHING HYDRANT ASSEMBLY**

- A. Hydrants shall conform in all respects to the requirements of AWWA C502. All hydrants shall have 6-inch mechanical joint shoe connection, two (2) 2-1/2" hose outlets, one (1) 4-1/2" pumper nozzle with caps. Connection threads and operation nuts shall conform to National Standard Specifications as adopted by National Board of Fire Underwriters. The hydrant shall be equipped with safety flanges designed to prevent barrel breakage when struck by a vehicle and an auxiliary gate valve.
- B. Each hydrant shall be fully bronze mounted with the main valve having a threaded bronze seat ring assembly of such design that it is easily removable by unscrewing from a threaded bronze drain ring. Bronze drain ring shall have multiple ports providing positive automatic drainage as the main valve is opened or closed. Drainage waterways shall be completely bronze to prevent rust or corrosion.
- C. Operating stems shall be equipped with anti-friction thrust bearing to reduce operating torque and assure easy opening. Stops shall be provided to limit stem travel. Stem threads shall be enclosed in a permanently sealed lubricant reservoir protected from weather and the waterway with O-ring seals.
- D. Hydrants shall be designed for 250 psi working pressure and shop tested to 400 psi pressure with main valve both opened and closed. Under test the valve shall not leak, the automatic drain shall function and there shall be no leakage into the bonnet. Hydrants shall have a UL/FM approved rating.
- E. Each hydrant shall be installed with an auxiliary shut-off valve and valve box; valve box cover shall be marked "WATER" as required. Hydrants shall be secured to the shut-off valve by AWWA approved restraint joints, rodding with four (4) equally spaced all thread rods and "Duc-Lugs", or other equally approved method.
- F. Inlet cover depth shall be 36" and the minimum dimension from ground to centerline of lowest opening shall be 18". Hydrants shall be supported on a poured-in-place concrete thrust block and provided with a drainage pit as indicated on Standard Detail Sheet.
- G. All hydrants shall receive two (2) field coats of Koppers Company, Inc. Glamortex enamel (red). The Owner shall be furnished with two (2) hydrant barrel wrenches, four (4) spanner wrenches and two (2) operating nut wrenches.
- H. Below ground hydrants shall be flush type with the upper barrel and nozzles contained in a cast iron box with a non locking lid.



- I. SEE SECTION 01600 MATERIAL AND EQUIPMENT for APPROVED MANUFACTURE
- J. Hydrant assemblies shall include the isolation valve and both valve and hydrant shall have a UL/FM approved rating.

## **2.02 FLUSH HYDRANT ASSEMBLY**

- A. 3-inch Hydrants shall be self-draining, non-freezing, compression type with 2 $\frac{1}{8}$ " main valve opening. Inlet connection shall be MJ. Outlet shall be 2" IP. Hydrants shall be post type SEE SECTION 01600 MATERIAL AND EQUIPMENT for APPROVED MANUFACTURE.
- B. Hydrants shall have a ductile iron pipe riser with a cast iron stock top, and non-turning operating rod. Principal interior operating parts shall be brass and removable from the hydrant for servicing without excavating the hydrant.
- C. Flushing assembly installation shall also include all excavation, backfill, thrust blocking, and #9 crushed stone.

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION**

- A. Hydrants shall be located as shown on the drawings unless otherwise specified by the Owner. Each hydrant shall be connected to the main with a 6-inch branch line having at least as much cover as the distribution main. Hydrants shall be set plumb with pumper nozzle facing the roadway and the cast-iron valve box set flush with the finished surrounding grade. Except where approved otherwise, the backfill around hydrants shall be thoroughly compacted to the finished gradeline immediately after installation to obtain beneficial use of the hydrant as soon as practicable. All hydrants shall be provided with a shut-off valve in the hydrant lateral as shown. All hydrants shall be installed in accordance with the manufacturer's directions and as detailed on the Contract Drawings.
- B. Blow-off hydrants shall be located as shown on the drawings unless otherwise specified by the Utility. Each blow-off hydrant shall be connected to the main with at least as much cover as the distribution main. Blow-off hydrants shall be set plumb with nozzle facing the roadway and with the box cover set flush with the finished surrounding grade. The backfill around each hydrant shall be thoroughly compacted to the finished gradeline immediately after installation to obtain beneficial use of the hydrant as soon as practicable. All blow-off hydrants shall be provided with a shut-off valve in the lateral as shown.

- END OF SECTION -



## SECTION 02700

### SITE RESTORATION

#### PART 1 - GENERAL

##### 1.01 CLEAN-UP

Upon completion of the installation of the water main and appurtenances, the Contractor shall remove all debris and surplus construction materials resulting from his work. The Contractor shall grade the ground along each side of the pipe trench and/or structure in a uniform and neat manner leaving the construction area in a shape as near as possible to the original ground line.

#### PART 2 - PRODUCTS

##### 2.01 SEEDING

- A. All graded areas shall be seeded at the rate of six (6) pounds of seed per 1,000 square feet. The mixture shall consist of:

Kentucky 31 Fescue	60%
Creeping Red Fescue	20%
Annual Rye Grass	20%

- B. After seed has been distributed, the Contractor shall cover areas with straw to a depth of 1-1/2". Any necessary re-seeding or repairing shall be accomplished by the Contractor before final acceptance. Seeding is not a pay item.

#### PART 3 - EXECUTION

##### 3.01 SITE RESTORATION

- A. After installation of water lines, the construction site will be restored to its original condition or better. All paved streets, roads, sidewalks, curbs, etc. removed or disturbed during construction shall be replaced, and all materials and workmanship shall conform to standard practices and specifications of the Owner, and/or to the Kentucky Department of Highways requirements, and specifications, whichever applies. Gravel, cinder or dirt streets, drives and shoulders shall be replaced and sufficiently compacted to provide a surface suitable for carrying the type of traffic normally imposed at the location.
- B. All seeded areas shall be watered daily during the germination period, unless rain supplies the required moisture. The Contractor shall replace, at his own expense, trees, shrubs, etc. disturbed during construction.
- C. The Contractor shall remove from the site all equipment, unused materials and other items at his expense. The construction site shall be left in a neat, orderly condition, clear of all unsightly items, before the Work is finally accepted.

- END OF SECTION -



**SECTION 03100**  
**CONCRETE FORMWORK**

**PART 1 - GENERAL**

**1.01 WORK INCLUDED**

- A. Formwork for cast-in-place concrete, with shoring, bracing, and anchorage.
- B. Openings for other affected work.
- C. Form accessories.
- D. Stripping forms.

**1.02 WORK INSTALLED BUT FURNISHED UNDER OTHER SECTIONS**

Section 03300 - Cast-in-Place Concrete

**1.03 RELATED WORK**

- A. Section 03210 - Reinforcing Steel
- B. Section 03330 - Cast-in-Place Concrete

**1.03 REFERENCES**

- A. ACI 301 - Specifications for Structural Concrete for Buildings.
- B. ACI 347 - Recommended Practice for Concrete Formwork.
- C. PS 1 - Construction and Industrial Plywood.
- D. ACI 318 - Building Code Requirements for Reinforced Concrete.

**1.04 SYSTEM DESCRIPTION**

Design, engineer and construct formwork, shoring, bracing to meet design and code requirements, so that resultant concrete conforms to required shapes, lines, dimensions and tolerances.

**1.05 QUALITY ASSURANCE**

Construct and erect concrete formwork in accordance with ACI 301 and 347.

**PART 2 - PRODUCTS**

**2.01 FORM MATERIALS**

- A. Plywood; Douglas Fir species; medium density overlaid one side grade; sound, undamaged sheets with straight edges.

- B. Glass fiber fabric reinforced plastic forms; matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to structural tolerances and appearance of finished concrete surface.

## **2.02 FORMWORK ACCESSORIES**

- A. Form Ties: Snap-off metal of fixed length; cone-typed; 1" break back dimension; free of defects that will leave holes no larger than 1" in diameter in concrete surface, with waterproofing washer.
- B. Form Release Agent: Colorless material which will not stain concrete, absorb moisture or impair natural bonding or color characteristics of coating intended for use on concrete. Form oil shall be placed prior to reinforced steel when possible and surplus oil on form surfaces or reinforcing steel shall be removed.
- C. Fillets for Chamfered Corners: Wood strip type to the size and shape as shown on the Drawings.
- D. Nails, spikes, lag bolts, through bolts, anchorages: Sized as required of strength and character to maintain formwork in place while placing concrete.

## **PART 3 - EXECUTION**

### **3.01 INSPECTION**

Verify lines, levels and measurements before proceeding with formwork.

### **3.02 PREPARATION**

Earth or rock forms not permitted.

### **3.03 ERECTION**

- A. Provide bracing to ensure stability of formwork. Strengthen formwork liable to be overstressed by construction loads.
- B. Provide temporary ports in formwork to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain. Close ports with tight fitting panels, flush with inside face of forms, neatly fitted so that joints will not be apparent in exposed concrete surfaces.
- C. Provide chamfer strips on external corners of all surfaces so indicated on the Drawings. Unless otherwise noted, chamfer strips shall be 1" radius with leg, polyvinyl chloride strips by Gateway Building Products, SAF-T-Grip Specialties Corp., Vinylex Corp., or equal.
- D. Concrete surfaces not exposed to view shall be formed with sound tight lumber or other material producing equivalent finish.
- E. Concrete surfaces to be exposed to view shall be formed with material that is not reactive with concrete surfaces and shall be equivalent in smoothness and appearance to that produced by new plywood panels conforming to PS 1, exterior type Grade B-B.
- F. Particular attention is directed to the requirements of paragraphs 10.2.2 and 13.3 of ACI 301. Form panels shall be provided in the maximum sizes practicable in order to minimize form joints. Wherever practicable, form joints shall occur at recessed joints. All form joints in exterior exposed to view surfaces shall be carefully caulked with an approved nonstaining

caulking compound. Joints shall not be taped. Form oil or other material which will impart a stain to the concrete shall not be allowed to contact concrete surfaces.

- G. Form ties shall remain in the walls and shall be equipped with a waterseal to prevent passage of water through the walls. Particular care shall be taken to bend tie wire ends away from exposed faces of beams, slabs and columns. In no case shall ends of tie wire project toward or touch formwork. Minimum set back of form ties shall be 1-1/2-inch from faces of wall. The hole left by removal of tie ends shall be sealed and grouted as per ACI Par. 9.3 and in accordance with the procedure described hereinafter in Section 03300 paragraph 3.01 B. Form ties will be permitted to fall within as-cast areas of architecturally treated wall surfaces (ACI Chapter 13).

### **3.04 APPLICATION OF RELEASE AGENT**

Apply form release agent on formwork in accordance with manufacturer's instructions. Apply prior to placing reinforcing steel, anchoring devices, and embedded items. Form boards shall not be wet with water prior to placing concrete.

### **3.05 INSERTS, EMBEDDED PARTS, AND OPENINGS**

- A. Provide formed openings where required for work embedded in or passing through concrete.
- B. Coordinate work of other sections in forming and setting openings, slots, recesses, chases, sleeves, bolts, anchors, and other inserts.
- C. Install accessories in accordance with manufacturer's instructions, level and plumb. Ensure items are not disturbed during concrete placement.

### **3.07 FORM REMOVAL**

- A. Do not remove forms and bracing until concrete has sufficient strength to support its own weight, and construction and design loads which may be imposed upon it. Remove load supporting forms when concrete has attained 75 percent of required 28-day compressive strength, provided construction is reshored immediately, and the shoring remains until the concrete attains its 28 day compressive strength.
- B. Do not damage concrete surfaces during form removal.

### **3.08 CLEANING**

- A. Clean forms to remove foreign matter as erection proceeds.
- B. Ensure that water and debris drain to exterior through clean out ports.
- C. During cold weather, remove ice and snow from forms. Do not use deicing salts. Do not use water to clean out completed forms, unless formwork and construction proceed within heated enclosure. Use compressed air to remove foreign matter.

- END OF SECTION -



**SECTION 03210**  
**REINFORCING STEEL**

**PART 1 - GENERAL**

**1.01 WORK INCLUDED**

- A. Reinforcing steel.
- B. Shop Drawings.

**1.02 RELATED WORK**

- A. Section 03100 - Concrete Formwork.
- B. Section 03300 - Cast-in-Place Concrete.

**1.03 REFERENCES**

- A. ASTM A-615
- B. ASTM A-616
- C. ASTM A-617
- D. ACI 351
- E. ASTM A-120
- F. ASTM A-185

**1.04 SUBMITTALS**

Shop Drawings: The Contractor shall submit a complete set of shop drawings including schedules and bending drawings for all reinforcement used in the work in accordance with the "Manual of Standard Practice for Detailing Concrete Structures" (ACI 351). Approval of drawings by the Engineer is required before shipment can be made.

**PART 2 - PRODUCTS**

**2.01 MATERIALS**

- A. The minimum yield strength of the reinforcement shall be 60,000 pounds per square inch. Bar reinforcement shall conform to the requirements of ASTM A-615, A-616, or A-617. All bar reinforcement shall be deformed.
- B. Smooth dowels shall be plain steel bars conforming to ASTM A-615, Grade 40, or steel pipe conforming to ASTM A-120, Schedule 80. Pipe, if used, shall be closed flush at each end with mortar or metal or plastic cap.
- C. Welded wire fabric shall conform to ASTM 185, welded steel wire fabric for concrete reinforcement.

- D. Reinforcement supports and other accessories in contact with the forms for members which will be exposed to view in the finished work shall have approved high density polyethylene tips so that the metal portion shall be at least one quarter of an inch from the form or surface. Supports for reinforcement, when in contact with the ground or stone fill, shall be precast stone concrete blocks. Particular attention is directed to the requirements of paragraph 5.5.3 of ACI Standard 301. These requirements apply to all reinforcement, whether in walls or other vertical elements, inclined elements or flatwork.

## 2.02 FABRICATION

- A. Reinforcement shall be bent cold. It shall be bent accurately to the dimensions and shapes shown on the plans and to within tolerances specified in the CRSI Manual of Standard Practice.
- B. Reinforcing shall be shipped with bars of the same size and shape, fastened securely with wire and with metal identification tags using size and mark.

## PART 3 - EXECUTION

### 3.01 PLACING AND FASTENING

- A. Before being placed in position, reinforcement shall be cleaned of loose mill and rust scale, dirt and other coatings that will interfere with development of proper bond.
- B. Reinforcement shall be accurately placed in positions shown on the drawings and firmly held in place during placement and hardening of concrete by using annealed wire ties. Bars shall be tied as required to prevent displacement under foot traffic and during casting operations, and shall be placed within tolerances allowed in Section 5.6.2 of ACI 301.
- C. Distance from the forms shall be maintained by means of stays, blocks, ties, hangers or other approved supports. (See paragraph 2.01 D) If fabric reinforcement is shipped in rolls, it shall be straightened into flat sheets before being placed.
- D. Before any concrete is placed, the Engineer shall have inspected the placing of the steel reinforcement and given permission to deposit the concrete. Concrete placed in violation of this provision will be rejected and thereupon shall be removed.
- E. Unless otherwise specified, reinforcement shall be furnished in the full lengths indicated on the plans. Splicing of bars, except where shown on the plans, will not be permitted without the approval of the Engineer. Where splices are made, they shall be staggered insofar as possible.
- F. Wire mesh reinforcement shall be continuous between expansion joints. Laps shall be at least one full mesh plus 2", staggered to avoid continuous lap in either direction and securely wired or clipped with standard clips.
- G. Dowels shall be installed at right angles to construction joints and expansion joints. Dowels shall be accurately aligned parallel to the finished surface, and shall be rigidly held in place and supported during placing of the concrete. One end of dowels shall be oiled or greased or dowels shall be coated with high density polyethylene with a minimum thickness of 14 mils.

- END OF SECTION -



**SECTION 03300****CAST-IN-PLACE CONCRETE****PART 1 - GENERAL****1.01 WORK INCLUDED**

The work in this section shall include all formwork, shoring, bracing, anchorage, concrete reinforcement and accessories for cast-in-place concrete.

**1.02 GENERAL REQUIREMENT**

All concrete construction shall conform to all applicable requirements of ACI 301-84 Specifications for Structural Concrete for Buildings, except as modified by the supplemental requirements specified herein.

**1.03 RELATED WORK**

Section 05500 - Miscellaneous Metals.

**1.04 REFERENCES**

A. The Contractor shall obtain and have available in the field office at all times, the following references:

1. Specifications for Structural Concrete for Buildings ACI 301-84 (latest revision).
2. Field Reference Manual SP-15 (81).
3. Manual of Standard Practice - CRSI (latest revision).
4. Placing Reinforcing Bars - CRSI (latest revision).
5. Building Code Requirements for Reinforced Concrete ACI 318 (latest revision).

B. The following standard shall also apply to this work:

1. ASTM C-143
2. ASTM C-150
3. ASTM C-33
4. ASTM C-260
5. ASTM C-494
6. ASTM A-615
7. ASTM D-638
8. ASTM D-695
9. ASTM D-570
10. ASTM D-1252
11. ANSI A-116.1
12. ASTM A-120
13. ASTM C-94
14. ASTM D-2146
15. Federal Specifications FF-S~325

## 1.05 SUBMITTALS

- A. The Contractor shall submit the following data to the Engineer for review:
  - 1. Concrete mix designs, test results and curves plotted to establish water-cement ratio if Method 1 of ACI 301 is used.
  - 2. Proposed mix designs and all necessary substantiating data used to establish proposed mix designs if Method 2 of ACI 301 is used.
  - 3. Mix designs for all mixes proposed or required to be used, including all mixes containing admixtures.
  - 4. A certified copy of the control records of the proposed production facility establishing the standard deviation as defined in Paragraph 3.8.2.3 of ACI 301.
- B. Certification attesting that admixtures equal or exceeds the physical requirements of ASTM C-494 for Type A admixture and, when required, for Type D admixture.
- C. Drawings showing locations of all proposed construction joints.
- D. Shop drawing for reinforcing steel showing bar schedules, location, and splices.

## PART 2 - PRODUCTS

### 2.01 CLASSES OF CONCRETE AND USAGE

- A. Structural concrete of the various classes required shall be proportioned by either Method 1 or 2 of ACI 301 to produce the following 28-day compressive strengths:
  - 1. Selection of Proportions for Class A Concrete:
    - a. 4,000 psi compressive for strength at 28 days.
    - b. Type I cement plus dispersing agent and air.
    - c. Maximum (water)/(cement and dispersing agent) ratio 0.50.
    - d. Minimum cement content = 564 lbs. (6.0 bags)/cu. yd. concrete.
    - e. Nominal maximum size coarse aggregate = No. 67 (3/4" maximum) or No. 57 (1/2" maximum). Walls with architectural treatment shall use No. 67 (3/4" maximum).
    - f. Air content = 5% plus or minus 1% by volume.
    - g. Slump = 211-311 in accordance with ASTM C-143.
  - 2. Selection of Proportions for Class B Concrete:
    - a. 3,000 psi compressive strength at 28 days.
    - b. Type I cement plus dispersing agent and air.

- c. Maximum (water)/(cement and dispersing agent) ratio 0.56.
  - d. Minimum cement content = 470 lbs. (5.0 bags)/cu. yd. concrete.
  - e. Nominal maximum size coarse aggregate = No. 67 (3/4" maximum) or No. 57 (111 maximum).
  - f. Air content = 6% plus or minus 1% by volume.
  - g. Slump - 311-411 in accordance with ASTM C-143.
- B. Concrete shall be used as follows:
- 1. Class A concrete for all concrete work except as noted below.
  - 2. Class B concrete for fill concrete and thrust blocks, and where indicated on the Drawings.
- C. All testing shall be or have been performed by a recognized independent testing laboratory.
- D. Cement for exposed concrete shall have a uniform color classification.
- E. Coarse aggregate shall conform to all requirements of ASTM C-33.
- F. Manufactured sand shall not be used as fine aggregate in concrete.

## 2.02 ADMIXTURES

- A. An air entraining admixture shall be used on all concrete and shall be the neutralized vinsol resin type such as Master Builders MB-VR, or Euclid Chemical Co. AIR-MIX or equal. The admixture shall meet the requirements of ASTM C-260. Certification attesting to the percent of effective solids and compliance of the material with ASTM C-260 shall be furnished, if requested.
- B. A water-reducing, set controlling admixture (non-lignin type) shall be used in all concrete. The admixture shall be a combination of polyhydroxylated polymers including catalysts and components to produce the required setting time based on job site conditions, specified early strength development, finishing characteristics required, and surface texture, as determined by the Engineer.
- C. Certification shall be furnished attesting that the admixture exceeds the physical requirements of ASTM C-494, Type A, water-reducing and normal setting admixture, and when required, for ASTM C-494, Type D, water-reducing and retarding admixture when used with local materials with which the subject concrete is composed.
- D. The admixture manufacturer, when requested, shall provide a qualified concrete technician employed by the manufacturer to assist in proportioning concrete for optimum use. He shall also be available when requested to advise on proper addition of the admixture to the concrete and on adjustment of the concrete mix proportions to meet changing job conditions.
- E. The use of admixtures to retard setting of the concrete during hot weather, to accelerate setting during cold weather, and to reduce water content without impairing workability will be permitted if the following conditions are met:

The admixture shall conform to ASTM C-494 except that the durability factor for concrete containing the admixture shall be at least 100 percent of control, the water content a maximum

of 90 percent of control and length change shall not be greater than control, as defined in ASTM C-494.

- F. Where the Contractor finds it impractical to employ fully the recommended procedures for hot weather concreting, the Engineer may at his discretion require the use of a set retardant admixture for mass concrete 2.5 feet or more thick and for all concrete whenever the temperature at the time concrete is cast exceeds 80-F. The admixture shall be selected by the Contractor subject to the review of the Engineer. The admixture and concrete containing the admixture shall meet all the requirements of these Specifications. Preliminary tests of this concrete shall be required at the Contractor's expense.
- G. Admixtures shall be used in concrete design mixes in the same manner and proportions as in the field so that the effects of the admixtures are included in preliminary tests submitted to the Engineer for review prior to the start of construction.
- H. When more than one admixture is used, all admixtures shall be compatible. They should preferably be by the same manufacturer.
- I. Calcium chloride will not be permitted as an admixture in any concrete.

### **2.03 REINFORCEMENT**

- A. The minimum yield strength of the reinforcement shall be 60,000 pounds per square inch. Bar reinforcement shall conform to the requirements of ASTM A-615. All bar reinforcement shall be deformed.
- B. Smooth dowels shall be plain steel bars conforming to ASTM A-615, Grade 60, or steel pipe conforming to ASTM A-120, Schedule 80. Pipe, if used, shall be closed flush at each end with mortar or metal or plastic cap.
- C. Reinforcement supports and other -accessories in contact with the forms for members which will be exposed to view in the finished work shall be of stainless steel or shall have approved high-density polyethylene tips so that the metal portion shall be at least one-quarter of an inch from the form or surface. Supports for reinforcement, when in contact with the ground or stone fill, shall be precast stone concrete blocks. Particular attention is directed to the requirements of Paragraph 5.5.3 of ACI Standard 301. These requirements apply to all reinforcement, whether in walls or other vertical elements, inclined elements or flatwork.

### **2.04 OTHER MATERIALS**

- A. Anchorage items shall be of standard manufacture and of type required to engage with the anchors to be installed therein under other sections of the Specifications and shall be subject to approval by the Engineer.
  - 1. Slots shall be galvanized dovetail-type as specified in Section "Masonry Work".
  - 2. Inserts shall be malleable iron or steel and of sturdy design adequate strength for the load to be carried. All inserts shall be galvanized. Adjustable wedge inserts shall have an integral loop or strap at the back or shall be provided with lugs to take reinforcing bars. They shall be slotted to receive a special-headed bolt not smaller than 5/8-inch in diameter and of the required length and fitted with hexagonal nut. Other inserts shall be either threaded or slotted as required by their usage. Threaded inserts shall have integral lugs to prevent running.

3. Concrete anchors shall be an approved expansion type conforming to Federal Specification FF-S-325, Groups I, II, III, or VIII and shall be installed in strict accordance with the manufacturer's recommendations.

Material for anchors shall be as specified in Section 05500 - Miscellaneous Metals. Anchors shall develop ultimate shear and pull out loads of not less than the following values in Class A concrete:

BOLT DIAMETER (INCHES)	MINIMUM SHEAR (POUNDS)	MINIMUM PULL-OUT LOAD (POUNDS)
-----	-----	-----
1/2	4,500	4,600
5/8	6,900	7,700
3/4	10,500	9,900

- B. Epoxy bonding adhesive used to bond fresh plastic concrete to sound, hardened concrete shall meet the following specification. Contractor shall furnish a notarized certification by the manufacturer that the proposed material meets the specification.

1. Material:

The epoxy material shall consist of a 2-component system whose components conform to the following requirements:

- a. Component A - Component A shall be a modified epoxy resin of the epichlorohydrin bisphenol A condensation type, containing suitable viscosity control agents and having an epoxide equivalent of 180-200.
- b. Component B - The B component shall be primarily a reaction product of one mole of an aliphatic polyamine and two moles of mono functional epoxide containing compounds modified with 2, 4, 6 tri(dimethylaminomethyl) phenol.
- c. The component ratio of B to A by volume shall be as specified by the manufacturer.

2. Properties of Mixed Components:

- a. Solids Content 100% by weight
- b. Pot Life 25-35 min. @  
73 degrees F
- c. Tack-Free Time (thin Film) 4-5 1/2 hrs @  
73 degrees F
- d. Final Cure ASTM D-695 3 days at  
(75% ultimate strength) 73 degrees F
- e. Initial Viscosity (A+B) 2,000 cps. min at  
73 degrees F
- f. Color Mixed Straw

3. Properties of Cured Material (Neat Material):

- a. Tensile Strength 3,000 psi min. @ 14  
ASTM D-638 days, 73 degrees F

- |    |  |   |
|----|--|---|
| b. | Tensile Elongation<br>ASTM D-638, modified | 1/2-2% at 14 days,<br>73 degrees F cure           |
| c. | Compressive Strength<br>ASTM D-695         | 12,500 psi min. at<br>73 degrees F cure           |
| d. | Compressive Modulus<br>ASTM D-695          | 470,000 psi min. at 28<br>days, 73 degrees F cure |
| e. | Compressive Strength<br>ASTM D-695         | 5,500 psi min. at 24<br>days, 73 degrees F cure   |
| f. | Water Pick-up<br>ASTM D-570                | 1.5 max.  |
- C. Flashing reglets shall be as specified in Section 07530. Reglets shall be correctly placed into forms prior to placing concrete in formwork.
- D. Premolded expansion-joint filler strips shall conform to ASTM D-1752 and shall be 3/8-inch thick unless otherwise shown.
- E. Joint sealants shall conform to ANSI A116.1. The following joint sealants are acceptable:
1. Colma by Sika Chemical Corporation.
  2. Hornflex by A.C. Horn, Inc.
  3. Sonolastic by Sonneborn Division of Contech, Inc.
- F. Nonshrink grout shall be Embeco 885 grout by Master Builders Company, Euco Firmix grout by the Euclid Chemical Company, or equal. The approved product shall be delivered to the site of the work in the original sealed containers, each bearing the trade name of the material and the name of the manufacturer.
- G. Porous fill shall be crushed rock or gravel of such size that all will pass a 1-1/2 inch screen and not more than 5 percent will pass a No. 4 screen, free from earth, clay or other foreign substances.

## **PART 3 - EXECUTION**

### **3.01 FINISHES**

- A. Exposed to Public View Concrete Surfaces:
1. All concrete exposed to view in the completed structure shall be produced using materials and workmanship to such quality that only nominal finishing will be required. The provisions of paragraphs 13.3, 13.4, and 13.6 of ACI 301 shall apply to all exterior exposed to public view concrete surfaces, including the outside surfaces of tanks.
  2. Forms for exposed concrete surfaces shall be exterior grade, high-density overlay plywood, steel, or wood forms with smooth tempered hard-board form-liners.
  3. Forms shall be coated with an approved release agent before initial pour and between subsequent pours, in accordance with the manufacturer's printed instructions. Form boards shall not be wet water prior to placing concrete.

4. Recessed joints in concrete shall be formed using lacquer-coated wood battens or forms, milled to indicated profiles. Battens and corner strips shall be carefully inspected before concrete is placed and damaged pieces replaced.
  5. Chamfer strips shall be 1 inch radius with leg, polyvinyl chloride strips by Gateway Building Products, Saf-T-Grip Specialties Corp., Vinylex Corp., or equal.
  6. Particular attention is directed to the requirements of paragraphs 10.2.2 and 13.3 of ACI 301. Form panels shall be provided in the maximum sizes practicable in order to minimize form joints. Wherever practicable, form joints shall occur at recessed joints. All form joints in exterior exposed to view surfaces shall be carefully caulked with an approved nonstaining caulking compound. Joints shall not be taped. Form oil or other material which will impart a stain to the concrete shall not be allowed to contact concrete surfaces.
  7. Care shall be taken to prevent chipping of corners or other damage to concrete when forms are removed. Exposed corners and other surfaces which may be damaged by ensuing operations shall be protected from damage by boxing, corner boards or other approved means until construction is completed.
  8. Form ties shall remain in the walls and shall be equipped with a waterseal to prevent passage of water through the walls. Particular care shall be taken to bend tie wire ends away from exposed faces of beams, slabs and columns. In no case shall ends of tie wires project toward or touch formwork. Minimum set back of form ties shall be 1-1/2-inch from faces of wall. The hole left by removal of tie ends shall be sealed and grouted as per ACI Para. 9.3 and in accordance with the procedure described hereinafter in Para. 3.01.F. Form ties will be permitted to fall within as-cast areas of architecturally treated wall surfaces (ACI Chapter 13); this does not apply to walls receiving textured decorative waterproof masonry coating.
  9. All formed exposed to public view concrete surfaces shall have a "smooth rubbed finish". Exterior vertical surfaces shall be rubbed to one foot below grade. Interior exposed to public view vertical surfaces of liquid containers shall be rubbed to one foot below the minimum liquid level that will occur during normal operations.
- B. Patching of holes due to removal of tie ends and other repairable defective areas, shall be as follows: Entire contact area of hole shall be coated with two-part moisture insensitive epoxy bonding compound as specified in Para. 2.04.B. in accordance with manufacturer's specifications, and prior to placing of freshly mixed patching mortar. Patching mortar shall be mixed and placed in general accordance with ACI Para. 9.2.2, 9.2.3, and 13.6.
  - C. For floors and slabs in which drains occur, special care shall be exercised to slope the floors uniformly to the drains. All floors with drains shall be sloped not less than 1/8 inch per foot unless otherwise shown. In all areas where quarry tile or other materials requiring more than 1/4 inch drop are to be overlaid, the concrete base slab shall be depressed as shown to provide a finished floor at the same elevation as surrounding areas.
  - D. Where not otherwise specified, finishes shall be in accordance with Paragraphs 10.4 and 11.8 of ACI 301.

### 3.02 TESTING

All testing shall be in accordance with provisions of ACI 301. Testing services listed in ACI Sections 16.3, 16.4 and 16.5 shall be performed by a testing agency acceptable to the Engineer. Testing services of ACI

Section 16.5 shall be paid for by the Contractor at his expense. Test shall be made for each 50 cubic yards of concrete and/or each day concrete is placed.

### **3.03 ADDITIONAL REQUIREMENTS**

- A. Unless otherwise directed by the Engineer, the vertical surfaces of all footings shall be formed. Excavations and reinforcement for all footings shall have been inspected by the Engineer before any concrete is placed.
- B. The installation of underground and embedded items shall be inspected before slabs are placed. Pipes and conduits shall be installed below the concrete unless otherwise indicated. Fill required to raise the subgrade shall be placed as specified in Section 02211 and 02223. Porous fill not less than 6 inches in compacted thickness shall be installed under all slabs, tank bottoms, and foundations. The fill shall be leveled and uniformly compacted to a reasonably true and even surface. The surfaces shall be clean, free from frost, ice, mud and water. Waterproof paper, polyethylene sheeting of nominal 4-mil minimum thickness, or polyethylene-coated burlap shall be laid over all surfaces receiving concrete.
- C. Concrete shall be placed in layers not over 18 inches deep and each layer shall be compacted by mechanical internal-vibrating equipment supplemented by hand spading, rodding and tamping as directed. Vibrators shall not be inserted into lower courses that have begun to set.
- D. Concrete mixed in stationary mixers and transported by nonagitating equipment shall be placed in the forms within 45 minutes from the time ingredients are charged into the mixing drum. Concrete that is truck mixed or transported in truck mixers or truck agitators shall be delivered to the site of the work and discharge completed in the forms within the time specified in Paragraph 10.7 of ASTM C-94, except that when the concrete temperature exceeds 85-F, the time shall be reduced to 45 minutes. Transmit-mixed concrete that is completely mixed at the site of concrete placement or batched cement and aggregates transported to mixers shall be placed in the forms within 1-1/2 hours after cement has been added. Concrete shall be placed in the forms within 15 minutes after discharge from the mixer at the job site.
- E. If concrete is placed by pumping, no aluminum shall be used in any parts of the pumping system which contact or might contaminate the concrete. Aluminum chutes and conveyors shall not be used.
- F. All concrete surfaces not in contact with forms shall be moist cured by the application of absorptive mats or double thicknesses of fabric kept continuously wet. Forms shall be kept continuously wet. Use of other curing methods will not be permitted unless written authorization is received from the Engineer.
- G. Formwork for beam soffits and slabs and other parts that support the weight of concrete shall remain in place until the concrete has reached its specified 28-day strength, unless otherwise specified or permitted.
- H. Column base plates, bearing plates for beams and similar structural members, machinery and equipment bases shall, after being plumbed and properly positioned, be provided with full bearing with nonshrink grout. Concrete surfaces shall be rough, clean, free of oil, grease and laitance and shall be moistened thoroughly immediately before grout is placed. Metal surfaces shall be clean and free of oil, grease and rust. Mixing and placing shall be in conformance with the material manufacturer's printed instructions.
- I. Concrete which, in the opinion of the Engineer, has excessive honeycomb, aggregate pockets or depressions will be rejected and the Contractor shall, at his own expense, remove the entire section containing such defects and replace it with acceptable concrete.



- J. Dowels shall be installed at right angles to construction joints and expansion joints. Dowels shall be accurately aligned parallel to the finished surface, and shall be rigidly held in place and supported during placing of the concrete. One end of dowels shall be oiled or greased or dowels shall be coated with high density polyethylene with a minimum thickness of 14 mils.

- END OF SECTION -



**SECTION 04100****MORTAR****PART 1 - GENERAL****1.01 WORK INCLUDED**

Mortar and grout for unit masonry.

**1.02 RELATED WORK**

- A. Section 01450 - Quality Control.
- B. Section 04200 - Reinforced Unit Masonry System.

**1.03 REFERENCES**

- A. ASTM C5 - Quicklime for Structural Purposes.
- B. ASTM C91 - Masonry Cement.
- C. ASTM C94 - Ready-Mixed Concrete.
- D. ASTM C144 - Aggregate for Masonry Mortar.
- E. ASTM C150 - Portland Cement.
- F. ASTM C207 - Hydrated Lime for Masonry Purposes
- G. ASTM C270 - Mortar for Unit Masonry.
- H. ASTM C387 - Packaged, Dry, Combined Materials for Mortar and Concrete.
- I. ASTM C476 - Grout for Reinforced and Non-Reinforced Masonry.
- J. ASTM C780 - Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
- K. International Masonry Industry All-Weather Council (IMIAC) Recommended Practices and Guide Specifications for Cold Weather Masonry Construction.

**1.04 MIX TESTS**

Sampling and testing of grout and mortar shall be the responsibility of the Contractor. Mortar and grout laboratory-proportioned and tested.

**1.05 SUBMITTALS**

- A. Submit product data under provisions of Section 01300.
- B. Include design mix, environmental conditions, and admixture limitations.
- C. Submit manufacturer's installation instructions under provisions of Section 01300.

**1.06 ENVIRONMENTAL REQUIREMENTS**

Maintain materials and surrounding air temperature to minimum 50-F prior to, during, and 48 hours after completion of masonry work.

**PART 2 - PRODUCTS****2.01 MATERIALS**

- A. Mortar mix can consist of any one of the following combinations:  
gravel.
  - 1. Portland Cement, lime and fine aggregate.
  - 2. Masonry Cement and fine aggregate.
  - 3. Portland Cement, masonry cement and fine aggregate.
  - 4. Commercially prepared premix mortar and fine aggregate.
- B. Portland Cement: ASTM C150.
- C. Masonry Cement: ASTM C98.
- D. Mortar Aggregate: ASTM C144.
- E. Grout Course Aggregate: ASTM C404, size no. 8 or 3/811 - pea
- F. Grout Fine Aggregate: ASTM C404 or C144.
- G. Hydrated Lime: ASTM C207, Type S.
- H. Quicklime: ASTM C5, non-hydraulic type.
- I. Premix Mortar: ASTM C387, using gray cement.
- J. Water: Clean and potable.

**2.03 MIXES**

- A. Mortar for Load Bearing Walls and Partitions: ASTM C27. Type-M.
- B. Mortar for Non-Load Bearing Walls and Partitions: ASTM C270, Type S.
- C. Pointing Mortar: ASTM C270, Type N, with maximum two percent ammonium stearate or calcium stearate per cement weight.
- D. Grout shall conform to ASTM C476.

**2.04 MORTAR MIXING**

- A. Thoroughly mix mortar ingredients in quantities needed for immediate use in accordance with ASTM C270.

- B. Add mortar colors and admixtures in accordance with manufacturer's instructions. Provide uniformity of mix and coloration.
- C. Do not use anti-freeze compounds to lower the freezing point of mortar or grout.
- D. If water is lost by evaporation, retemper within two hours of mixing. Do not retemper mortar after two hours of mixing.

### **PART 3 - EXECUTION**

#### **3.01 INSTALLATION**

- A. After inspection of concrete grout spaces by the Engineer, plug cleanout holes with masonry units. Brace against wet grout pressure.
- B. Install mortar and grout in accordance with 04300.
- C. Work grout into cores and cavities to eliminate voids.
- D. Do not displace reinforcing steel when placing grout.
- E. Clean concrete grout spaces of excess mortar and debris.

- END OF SECTION -



**SECTION 05500****MISCELLANEOUS METALS AND FASTENERS****PART 1 - GENERAL****1.01 WORK INCLUDED**

Provide all labor, materials, equipment and services necessary for fabrication and erection of structural steel and aluminum and for fabrication and installation of miscellaneous non-ferrous metals as shown on the Drawings and not specifically included under other sections of these Specifications.

**1.02 RELATED WORK**

- A. Section 05120 - Structural Steel.
- B. Section 09900 - Field Painting.

**1.03 REFERENCES**

All work under this section shall be governed by:

- A. Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings - American Institute of Steel Construction, 1978, including addenda.
- B. Aluminum Construction Manual, Section 1, Specifications for Aluminum Structures The Aluminum Association 1982.
- C. All welding shall conform to the latest code of the American Welding Society.
- D. ASTM A-276.
- E. ASTM A-325.
- F. ASTM F-593, 594.
- G. Federal Specification FF-S-325.
- H. ASTM A-48.
- I. Federal Specification TT-V-51F.
- J. ANSI B94.12.
- K. ASTM A-123, A-153, A-384, A-385, A-563 and A-780.
- L. SSPC SP-1, SP-2, SP-3, SP-7.

**1.04 SUBMITTALS**

- A. Shop drawings, giving complete information necessary for fabrication, layout and installation of metal work shall be submitted to the Engineer for review prior to fabrication.

- B. Preparation of shop drawings for fabricated metal items shall be coordinated by the Contractor with the manufacturers of various equipment in order to comply with details, locations, openings, and arrangements required by the manufacturers.
- C. Field measurements shall be made to verify all dimensions in the field which may affect installation of work before shop drawings are made and/or fabrication is performed.

## **PART 2 - PRODUCTS**

### **2.01 STEEL**

- A. Structural steel shall conform to the requirements of ASTM A-36. Structural tubing, where used, shall conform to the requirements of ASTM A-500, Grade B, and the ends of the tubing shall be properly sealed to protect the internal surfaces. Steel anchor bolts shall be ASTM A-36 hot-rolled threaded rod or bar stock
- B. Structural steel members as required shall conform to Section 05120 "Structural Steel".
- C. Base and bearing plates shall be provided where necessary to provide maximum bearing value of not more than 200 psi on solid concrete masonry units nor more than 750 psi on concrete, and shall be grouted in place.

### **2.02 STAINLESS STEEL**

Stainless steel shapes shall be AISI Type 304 or 316 in accordance with ASTM A-276. Miscellaneous bar stock products such as pipe straps shall be 400 Series stainless steel. Anchor bolts, nuts and washers shall be AISI Series 300 stainless steel.

### **2.03 ALUMINUM**

All structural and miscellaneous aluminum shall be Alloy 6061 (Alloy 6063 for extrusions), Temper T6, unless otherwise noted, indicated or accepted by the Engineer. Where welding is necessary in fabrication, it shall be done in conformance with Section 7 "Welded Construction" of Specifications for Aluminum Structures, referenced hereinbefore.

### **2.04 FASTENERS**

- A. Bolts, Nuts and Washers:
  - 1. Structural bolts shall be high strength ASTM A-325, Type 1, galvanized and galvanized ASTM A-325 hardened flat washers and galvanized ASTM A-325 hex nuts. Galvanized bolts, nuts and washers shall be centrifugally spun after galvanizing. Nuts shall have threads tapped oversize after galvanizing. All stainless steel bolts, nuts and washers shall be AISI Type 300 Series stainless steel in accordance with ASTM F-593, with ASTM F-594 nuts. All bolts shall have hexagonal heads.
  - 2. Anchors and Bolts, including nuts and washers, shall be provided where necessary for securing the work in place. Sizes, types and spacings of anchors and bolts not indicated or specified otherwise shall be as necessary for their purposes. Anchor bolts and anchors for the erection of structural steel shall be galvanized. Anchored bolts, nuts, and washers for all other uses including, but not limited to, underwater use and for the installation of equipment, piping, pumps and motors shall be stainless steel type 304.



- B. Expansion Anchors: All expansion anchors shall be stainless steel wedge type meeting the requirements of Fed. Spec. FF-S-325, Group II, Type 4, Class 1, and shall be Phillips Red Head, Hilti, or equal. The entire anchor (bolt, expansion clip, nut and washer) shall be AISI Type 300 Series stainless steel.

## **2.05 CASTINGS**

All miscellaneous iron castings shall be of best quality materials, free from flaws and unsightly defects. Gray cast iron shall be ASTM A-48 Class 35 (35,000 psi tensile strength). Furnish and install in the locations indicated casting of the type and size shown on the Drawings.

## **2.06 CARPENTER'S IRON WORK**

Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures. Manufacture or fabricate items of sizes, shapes, and dimensions required. Furnish malleable iron washers for heads and nuts which bear on wood structural connections; elsewhere, furnish steel washers

## **2.07 MISCELLANEOUS FRAMING AND SUPPORTS**

Provide miscellaneous steel framing and supports as required to complete the work. Fabricate miscellaneous units to the sizes, shapes, and profiles shown, or if not shown, of the required dimensions to receive adjacent grating, plates, louvers, vents, grilles, screens or other work to be retained by the framing. Except as otherwise shown, fabricate from structural steel shapes and plates and steel bars, of all welded construction using mitered corners, welded brackets and splice plates and a minimum number of joints for field connection. Cut, drill and tap units to receive hardware and similar items to be anchored to the work.

## **2.08 MISCELLANEOUS STEEL TRIM**

Provide shapes and sizes as required for the profiles shown. Except as otherwise noted, fabricate units from structural steel shapes and plates and steel bars, with continuously welded joints and smooth exposed edges. Use concealed field splices wherever possible. Provide cutouts, fittings, and anchorages as required for coordination of assembly and installation with other work.

# **PART 3 - EXECUTION**

## **3.01 ANCHORAGE ITEMS**

The Contractor shall furnish all bolts, nuts, shims, pins, screws, straps, nails and other anchors which may be required by the Drawings or job conditions to secure all items permanently in place, whether or not specifically called for or shown on the Drawings.

## **3.02 FABRICATION AND INSTALLATION OF METAL WORK**

- A. General: All metal items shall be accurately fabricated and erected with exposed joints close fitting. All joints shall be of such character and so assembled that they will be as strong and rigid as adjoining sections. Joints shall be located where least conspicuous. Items shall have smooth finished surfaces except where otherwise shown or specified.
- B. Built-In Items: Members or parts to be built in with masonry or concrete shall be in a form affording a suitable anchorage or shall be provided with approved anchors, expansion shields or other approved means of securing members.

- C. Dissimilar Metals: Ferrous and non-ferrous metals shall be insulated at all contacts with felt washers, strips or sheets, bitumastic paints, or other acceptable means. All aluminum surfaces in contact with concrete shall be coated with two (2) coats of Fed. Spec. TT-V-51F Asphalt Varnish or equal.
- D. Connections:
  - 1. All required anchors, couplings, bolts, and nuts required to support miscellaneous metal work shall be furnished and installed as required.
  - 2. Weights of connections and accessories shall be adequate to safely sustain and withstand stresses and strains to which they will be normally subjected.
  - 3. Connections shall be bolted except where welding is called for in the Drawings. Bolts shall be 3/4-inch diameter unless noted or required otherwise.
- E. Expansion Anchors:
  - 1. Expansion anchors shall be installed in holes drilled into concrete with carbide tipped drill bits conforming to ANSI B94.12-1977, using a rotary impact hammer for 1/211 and larger anchors, or a hammer drill for 1/411 and 3/811 anchors. Hole depth shall equal or exceed the anchor manufacturer's minimum recommended embedment. Should hole depth equal anchor manufacturer's minimum recommended embedment, hole shall be cleaned out by air pressure. The minimum hole depth table, following, serves only as a general guide; anchor manufacturer's recommendations shall govern. Contractor shall assure hole is perpendicular and conforms in size to anchor manufacturer's recommendations.
  - 2. Washer and nut shall be assembled on anchor so that the top of the nut is flush with the top of the anchor. Then the anchor shall be driven into the hole through the work until the washer bears against the work. The anchor shall be expanded in accordance with the manufacturer's recommendations. Edge and end distances, and spacing of anchors, defined in the table hereinafter, shall be complied with.

### **3.03 WELDING**

Welding procedures, welders and welding operators, both for shop and field welding, shall be qualified and certified in accordance with the requirements of AWS D1.1 "Welding in Building Construction" of the American Welding Society. Manufacturer's and fabricator's shop drawings shall clearly show complete information, and Contractor shall perform all field welding in conformance with this information, regarding location, type, size and length of all welds, all in accordance with AWS A2.0 "Standard Welding Symbols" of the American Welding Society. Special conditions shall be fully explained by notes and details

### **3.04 HOT DIP GALVANIZING**

- A. All fabrication, galvanizing and repair shall comply with ASTM standards as they apply in accordance with the publication "ASTM Standards for Materials Hot Dip Galvanized After Fabrication, 198111 issued by American Hot Dip Galvanizers Association, Inc. In particular, the following specific standards shall apply to work under this contract: ASTM A-123, A-153, A-384, A-385, A-563 and A-780.
- B. Items to be galvanized shall be fabricated in accordance with ASTM A-385-80

- C. Galvanizing for fabricated steel items shall conform to ASTM A-123-78 and shall be done after fabrication. Steel assemblies shall be subject to safeguarding from warpage and distortion during galvanizing per ASTM A-384-76.
- D. Galvanizing for structural steel-fasteners and hardware shall conform to ASTM A-153-80. Galvanized bolts, nuts and washers shall be centrifugally spun after galvanizing. Nuts shall have threads tapped oversize, after galvanizing, in accordance with ASTM A-563-80.
- E. Upon field erection, any damage measuring more than 1/10 inch wide shall be repaired with a zinc-based solder or zinc rich paint in accordance with ASTM A-780-80. Marred, damaged, or uncoated areas 4 square inches and less shall be patched with a zinc based solder to a thickness of 5 mils; areas greater than 4 square inches shall be patched with an organic zinc rich paint to a dry film thickness of 9 mils. The paint shall have a minimum of 94% zinc dust in the dry film, Devcon Z, LPS Instant Cold Galvanized, or equal. The Resident Project Representative shall determine the extent of damage which would require recoating.
- F. Items subject to distortion during transit, such as thin, curved members, etc., shall be stacked on edge and/or blocked to prevent radius change or other distortion while in transit to and from the galvanizing plant.

### **3.05 PAINTING**

- A. All steel items furnished under this section which are to be painted shall be shop coated with a universal primer, Koppers Pug Primer, Tnemec 77 Chem-Prime, Degracon #91453 Phenolic Primer, or equal. Refer to Section 09870 for finish painting.
- B. Painting for items in contact with potable water supplies shall comply with all applicable AWWA Standards and the "State Health" regulations of the State of the Owner. Refer to Section 09870.

**3.06 EXPANSION BOLT TABLE**

	MINIMUM HOLE DEPTH, INCHES		
SIZE, IN.	FLOOR/WALL (UNCLEANED HOLE)	CEILING (OR CLEANED HOLE)	RECOMMENDED TORQUE (STONE AGGREGATE CONCRETE) FT.-LBS.
1/4	Anchor Length Less Work Thickness Plus	Anchor Length Less Work Thickness.	10 max.
3/8			25 - 35
1/2			45 - 65
5/8			80 - 90
3/4			125 - 175
7/8			200 - 250
1			250 - 300
1-1/4			400 - 500
			Two Anchor Diameters.

Recommended spacing, edge distance, and end distance for Wedge Type anchors are given in the following table:

ANCHOR SIZE, INCHES	1/4	5/16	3/8	1/2	5/8	3/4	1	1-1/4
Spacing Distance, 4-3/8-1/4-78-3/4 Inches	1-3/4	2-1/2	2-5/8	3-1/2	4-3/8	5-1/4	7	8-3/4
Edges & End 3-1/2-1/4-45 Distances, Inches Parallel or Away from Edge	1-1/2	1-3/4	2	2-1/2	3	3-1/2	4-1/4	5
Load Toward Edge 4-1/25-1/26-1/4	2	2-3/8	2-3/4	3-1/2	4	4-1/2	5-1/2	6-1/4

- END OF SECTION -

**SECTION 05520****METAL FABRICATIONS****PART 1 - GENERAL****1.01 SCOPE OF WORK**

Furnish all labor, materials, and equipment required to construct and install metal fabrications as shown on the Drawings and specified herein. Included in this section are handrails, grating, nuts, and anchors.

**1.02 RELATED WORK NOT INCLUDED**

Concrete work is included in Division 3.

**1.03 QUALITY ASSURANCE**

- A. All fabricated materials shall be of the highest quality, free of structural, handling, and workmanship defects.
- B. Pre-assemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- C. All work under this section shall be governed by:
  - 1. Specifications for the design, fabrication and erection of structural steel for building - American Institute of Steel Construction, 1978, including addenda.
  - 2. Aluminum Construction Manual, Section 1, Specifications for Aluminum Structures - the Aluminum Association 1982.
  - 3. All welding shall conform to the latest code of the American Welding Society.
- D. Aluminum work shall be fabricated in a shop where the quality of work is in accordance with the highest standards for work of this type. All work shall be executed by mechanics skilled in the fabrication of aluminum, and shall be true to detail with sharp, clean profiles, fitted with proper joints and intersections and with finishes as specified.
- E. All miscellaneous metal work shall be formed to shape and size with sharp lines and angles. Shearing and punching shall leave clean true lines and surfaces.

**1.04 SUBMITTALS**

- A. Shop Drawings
  - 1. The CONTRACTOR shall submit to the ENGINEER in accordance with Division 1, Section 01300 detailed shop drawings of all materials to be fabricated, and shall receive the ENGINEER's certification of review before fabrication. Include plans, elevations and details of sections and connections. Show anchorage and accessory items. Provide templates for anchor bolt installation by others. Include any requirements for surface preparation, paint products, or grout.

2. Where materials or fabrications are indicated to comply with certain requirements for design loadings, include structural computations, material properties and other information needed for structural analysis. This shall not relieve the CONTRACTOR of responsibility for all errors, omissions, and deviations of his shop drawings from the Drawings and Specifications and from requirements of final results called for in the Drawings and Specifications.
  3. The general design and dimensions of the miscellaneous metal work are indicated on the drawings, but the Contractor shall be responsible for the correctness of the details and dimensions of the finished articles. He shall verify conditions at the job before fabrication and coordinate the work with that of all other trades to prevent interference.
- B. Samples: The CONTRACTOR shall submit 2 sets of representative samples of materials and finished products as may be requested by the ENGINEER, or as specified herein.

## **PART 2 - PRODUCTS**

### **2.01 MATERIALS**

- A. Steel
1. Steel plates and structural steel shapes shall conform to ASTM Standard Specification for Structural Steel, Designation A36-77a.
  2. Sheet steel shall be cold rolled or hot rolled carbon sheet steel conforming to ASTM Standard Specification for Steel, Carbon, Cold Rolled Sheet, Commercial Quality, Designation A36-72 or ASTM Standard Specification for Steel, Carbon (0.15 maximum, percent), Hot Rolled Sheet and Strip, Commercial Quality, Designation A569-72, as appropriate.
  3. Steel fabrication shall be done in conformity with the "AISC Specification for the Design, Fabrication and Erection of Structural Steel for Buildings," Eighth Edition dated December, 1980, latest revisions and supplements.
  4. Structural tubing, where used, shall conform to the requirements of ASTM A-500, Grade B, and the ends of the tubing shall be properly sealed to protect the internal surfaces. Steel anchor bolts shall be ASTM A-36 hot rolled threaded rod or bar stock. Structural steel members as required shall conform to Section 05120 "Structural Steel".
  5. Base and bearing plates shall be provided where necessary to provide maximum bearing value of not more than 200 psi on solid concrete masonry units nor more than 750 psi on concrete and shall be grouted in place.
  6. Prime and paint in accordance with Division 9, unless otherwise required or permitted.
  7. Unless otherwise noted on the Drawings or in the Specifications, galvanizing shall be by hotdip process in accordance with ASTM A 525-81, Coating Designation G90 (previous Coating Class Commercial 1.25 oz. per sq. ft.).
  8. Damaged zinc coating shall be repaired according to Federal Specification DOD-21035A (Galvanizing Repair Spec.) and ASTM A 780-80 as follows:

- a. Remove foreign matter from both damaged and contiguous undamaged area by wire brushing and cleaning with metal conditioner recommended by cold galvanizing coating manufacturer.
  - b. Apply 2 coats of cold galvanizing coating to damaged area, ensuring an overlap of the surrounding undamaged galvanizing for continuity of galvanic protection. Cold galvanizing coating shall be Z.R.C. Chemical Products Co., "Z.R.C. Cold Galvanizing" or Galvicon Corp., "Cold Galvanizing," or equal.
9. Steel pipe shall conform to ASTM Standard Specifications for Pipe, Steel, Black and Hot Dipped, Zinc Coated, Welded and Seamless Designation A53-79.

B. Aluminum:

- 1. Aluminum work shall be fabricated of plates, rolled or extruded shapes, sheets or castings conforming (unless otherwise permitted or indicated) to the following alloy and temper designations of the Aluminum Association:
  - a. Structural rolled or extruded shapes 6061-T6.
  - b. Extruded shapes 6063-T6.
  - c. Castings 214.
  - d. Sheets 3003-F.
  - e. Bolts and nuts 2024-T4.
  - f. Aluminum railings 6063-T6.
- 2. The Contractor shall furnish the Engineer/Architect with mill certificates and a signed statement from the fabricator that all aluminum work furnished is of the proper alloys, as specified above.
- 3. All structural and miscellaneous aluminum shall be Alloy 6061 (Alloy 6063 for extrusions), Temper T6, unless otherwise noted, indicated or accepted by the Architect/Engineer.
- 4. Aluminum fabrication shall be in accordance with ASCE the Aluminum Association "Specifications for Aluminum Structures", latest revision. Welding shall be done by the argon-shielded tungsten-arch method or the automatic or semi-automatic argon-shielded consumable-electrode method, or equal. Welding rods and electrodes shall be in strict accordance with above specifications.
- 5. Where anodic coating is required and type is not specified or shown on the Drawings, coating shall be Class I, A44 integral color, to be selected by Architect. Anodic coatings shall conform to the following requirements:
  - a. Class I Anodized Coatings:
    - (1) The finish shall meet quality requirements of AAMA 611-89.
    - (2) The coating shall be continuous, uniform in appearance and free from powdery areas.
    - (3) Class I coating minimum of 0.7 mil thickness.

(4) Remove any factory applied protection films immediately after installation.

(5) Provide 20-year warranty.

b. Clear Anodic Coatings (Where Indicated): The exposed surfaces of aluminum shall be cleaned of all fabricating oils and foreign matter, given a medium caustic etch pretreatment and shall receive the following clear anodized finish.

No. 2: A minimum coating thickness of 0.0008 inch (0.0018 mm) and a minimum coating weight of 27.0 mg per square inch (215R1).

## 2.02 HANDRAILS

### A. General

1. All handrail components and systems shall meet applicable federal and state regulations.
2. All handrails shall be the standard aluminum pipe handrail, unless otherwise noted on the Drawings.
3. Shop drawing submittals shall include verification that all components including base flanges, side mounting assemblies and anchor bolts can meet required strength capacities. Anchorages shall be identical to those shown on the Drawings or equal.
4. A vertical post sample with fittings and base connection shall be submitted for review and acceptance prior to preparation and submission of the shop drawings.

### B. Standard Aluminum Pipe Handrail

1. Pipe for rails and posts shall be of 6063-T6 extruded aluminum with smooth standard mill finish. Scratches and discolorations uncommon to standard mill finish and sharp edges and rough surfaces shall be removed by rubbing with stainless steel wool lubricated with neutral soap solution.
2. Joints shall be welded and/or slip-on fitting type.
3. Welded joints shall be ground smooth, buffed and rubbed to a finish similar to the pipe.
4. Slip-on fittings shall be cast of magnesium aluminum alloy meeting Aluminum Association requirements for Alloy B-535.2 and furnished with stainless steel set screws. Fittings shall be "SpeedRail" and "NuRail" as manufactured by Hollaender Manufacturing Company, Cincinnati, Ohio, or equal.

### C. Performance

1. Handrail system design, construction and installation shall meet or exceed all applicable Federal and State regulations. Handrail anchors, posts, rail and fabric shall be capable of withstanding a load of at least 200 pounds applied in any direction at any point on the top rail, with a minimum of deflection.
2. The manufacturer shall submit to the ENGINEER certified test data verifying the strength of his handrail system.



## 2.03 NUTS AND BOLTS

- A. Unless otherwise shown on the Drawings or required in other parts of these Specifications, all nuts and bolts shall be in accordance with ASTM A 307-83a, Grade A and shall be electrogalvanized according to ASTM B 633-79a.
- B. All nuts, bolts, washers and accessories in contact with water, in any moist atmosphere or damp area such as occurs above water, or embedded in concrete exposed to the weather, shall be Type 302 or 304 stainless steel. Stainless steel nuts, bolts, and washers shall be used to fasten aluminum to all materials including aluminum.
- C. Other bolts, screws and washers shall be as follows:
  - 1. Lag Bolts: Square head type, FS FF-B-561.
  - 2. Machine Screws: Cadmium plated steel, FS FS-S-92.
  - 3. Wood Screws: Flat head carbon steel, FS FF-S-111.
  - 4. Plain Washers: Round, carbon steel, FS FF-W-92.
  - 5. Masonry Anchorage Devices: Expansion shields, FS FF-S-325.
  - 6. Toggle Bolts: Tumble-wing type, FS FF-B-588, type, class and type as required.
  - 7. Lock Washers: Helical spring type carbon steel, FS FF-W-84.

## 2.03 ALUMINUM GRATINGS

- A. Gratings shall be the dimensions and at the locations as shown on the Drawings and as required to meet deflection specifications below and of aluminum Alloy 6063-T5, 6063-T6, or 6061-T6, or equal. Gratings shall be designed for an allowable uniformly distributed load of 200 lbs. per square foot and a concentrated load of 400 lbs. per foot of width with less than 0.25 inch deflection.
- B. The metal grating, if applicable, shall be IKG Borden, or equal, aluminum swage locked grating. Grating shall be constructed with bearing bars placed edgewise and joined by straight cross bars. Bearing bars to be I-Bar configuration. The size and spacing of bars shall be determined based on the design loadings above and the span of the grating. The bearing bar shall be punched to receive the cross bar. Notching, slotting or cutting the top of the top or bottom flanges of the bearing bars to receive cross bars will not be permitted. Cross bars shall be secured to the main bearing bars by a swaging process to prevent turning, twisting or coming loose. Ends of cross bars to be trimmed flush with outside face of bearing bars. Trimming will be made in such a manner as to prevent destruction of swaged lock on bearing bar. Top surface of bearing bars shall have slip-resistant surface. Gratings shall be secured in place by at least four (4) stainless steel, removable-type hold down clips per panel.
- C. If applicable gratings in concrete shall have aluminum angle frames with mitered corners and with welded joints ground smooth where exposed. The frames shall have welded anchors and shall be set in the concrete as it is placed.

**2.04 ALUMINUM LADDERS**

- A. Aluminum ladders shall be furnished and installed at the locations shown on the Contract Drawings.
- B. The ladders shall be constructed with side rails of 2-1/2" by 1/2" flat bar and brackets of 3" by 1/2" flat bar with rungs of 1" diameter bars, shouldered, driven through the side rails and peened. Maximum bracket support spacing shall be 5' - 0" on centers. The brackets shall be welded to the side rails. Rung spacing shall be 12" on centers. In general, the ladders shall extend to within 6" of the access opening. Ladders shall be constructed of 6061-T6 aluminum. Wedge type expansion anchors shall be used to attach aluminum ladders to walls as indicated on Contract Drawings.

**2.05 ALUMINUM STAIRS**

- A. The aluminum stairs shall have structural aluminum channel stringers and supports, aluminum stair treads and platforms and sheet aluminum risers as indicated on the drawings and in the details.
- B. The treads shall be formed from 1-3/4" thick aluminum tread and the risers shall be formed from .080" thick sheet aluminum. The treads shall be supported by and attached to 1-1/2" by 1-1/2" by 3/16" aluminum carrier angles bolted to the stringers. The treads shall be the widths indicated. The risers shall be bolted to the treads.
- C. All platforms shall be fabricated of aluminum grating and shall be supported on the edges by structural aluminum angles and at the midspans by structural aluminum tees.
- D. The treads and platforms shall have an acceptable nonskin pattern surface. Treads shall have a nosing.
- E. The Contractor shall provide all structural aluminum angle hangers, struts, rod hangers, closure plates and brackets indicated or necessary to complete the stairs as indicated. The stair treads and grating shall be by the same manufacturer.

**2.06 GUARD CHAINS**

Removable guard chains at openings in aluminum pipe railings shall be fabricated from wrought, non-welded aluminum chain having 12 links per foot. The chains shall be secured to aluminum eyes bolted or welded to the pipe stanchion at one end of the opening. The free ends of the chains shall be provided with hooks formed from 1/4" diameter solid aluminum rod for attaching to similar eyes in the pipe stanchion at the opposite end of the opening.

**2.07 GUARDRAIL SYSTEMS**

- A. Description: This section covers material requirements for corrugated sheet steel beams and accessories for guardrail, terminal sections, guardrail posts, offset blocks, end treatments and timber guard posts.
- B. Beams and Accessories: Conform to AASHTO 180. Hardware for Type I, II or III beams may be either hot-dip galvanized, electrogalvanized, or mechanically galvanized. Galvanize according to AASHTO M 232. The Engineer will reject beams with zinc oxide (white rust) in amounts deemed objectionable. Furnish Type II beams of either Class A, 2.67 mm thick or Class B, 3.43 mm thick as specified in the Contract.

- C. Terminal Sections: Conform to AASHTO M 180 and the details shown on the drawings. Galvanize sections after fabrication. Furnish Type 2 sections of either Class A, 2.67 mm thick or Class B, 3.43 mm thick as specified in the Contract.
- D. Guardrail Posts: Provide either steel or timber and use the same type through the project.
  - 1. Steel Guardrail Posts: Fabricate from steel conforming to AASHTO M 183 for the wide flange shapes and ASTM A 570 for C shapes except ensure that C shape posts have mechanical properties equal to those required by AASHTO M 183. Punch or drill holes for connector bolts before galvanizing. Galvanize all posts according to AASHTO M 111.
  - 2. Materials for End Treatments: Conform to paragraph 2.07.B above for common components and, except where otherwise provided, ensure they are of the same class and type as required for the guardrail to which they are attached. Galvanize all non-corrosion-resistant metals used in end treatments according to AASHTO M 111 or AASHTO M 232 as applicable.

## **2.08 CONCRETE ANCHORS**

- A. Sizes and spacings or numbers of anchors shall be shown on the Drawings and materials shall comply with exposure requirements listed under Nuts and Bolts above. All anchors used for securing moving or vibrating equipment (pumps, motors, gears, sluice gates, conveyors, etc.), shall be of the cast-in-place type.
- B. The size and number of anchors shall be approved by the equipment manufacturer.
- C. Unless specifically noted otherwise on the Drawings or Specifications, concrete anchors for other applications shall be chemical grout-type anchors equal to Hilti "HVA Adhesive Anchor," or Ramset "Chemset Chemical Anchors." Installation shall be in strict accordance with the manufacturer's recommendations which shall be available on the job site.

## **2.09 MISCELLANEOUS FRAMING AND SUPPORTS**

Provide miscellaneous steel framing and supports as required to complete the work. Fabricate miscellaneous units to the sizes, shapes, and profiles shown or if not shown, of the required dimensions to receive adjacent grating plates, louvers, vents, grilles, screens or other work to be retained by the framing. Except as otherwise shown, fabricate from structural steel shapes and plates and steel bars of all welded construction using mitered corners, welded brackets and splice plates and a minimum number of joints for field connection. Cut, drill and tap units to receive hardware and similar items to be anchored to the work.

## **PART 3 - EXECUTION**

### **3.01 GENERAL**

- A. The CONTRACTOR shall be responsible for all errors, omissions, and deviations of the shop drawings from the Drawings and Specifications. Any errors or omissions shall be brought to the attention of the ENGINEER whose interpretation and instructions shall be received before proceeding with the fabrication of that portion of the work.
- B. Similarly, manufacturers' printed installation instructions shall be strictly followed and any conflicts with the shop drawings and/or Contract Drawings shall be directed to the ENGINEER for resolution before proceeding with installation.

- C. All base plates, inserts and anchorages shown embedded in concrete shall be accurately located and secured before placing concrete as per a manufacturer supplied template. All structural members and components shall be accurately leveled, plumbed and secured at locations shown on the Drawings.
- D. Painting: Cleaning and painting of all fabricated materials shall be in strict accordance with Division 9, of these Specifications.
- E. Steel
  - 1. All fabrication and erection shall be done in conformity with the "AISC Specification for the Design, Fabrication and Erection of Structural Steel for Buildings," Eighth Edition dated December, 1980, latest revision.
  - 2. Refer to Article 2.01.A of this Specification Section for repair of galvanized surfaces.
- F. Aluminum
  - 1. The contact surfaces of aluminum with steel, dissimilar materials, and/or masonry shall be protected from corrosion by a thick coating of coal tar, Koppers Bitumastic No. 50, or equal.
  - 2. Aluminum surfaces embedded in concrete shall be protected from corrosion by a tightly adherent coating of 2 applications of zinc chromate primer.
  - 3. Areas where the paint has been damaged by abrasion or other cause shall be cleaned and repainted as directed so that the aluminum will have a complete protective paint film when brought into contact with the material against which it is being protected. Before application of coating, the surface shall be cleaned of all dirt, heavy deposits of grease or oil, and other foreign substances and shall be immersed in or swabbed with an acceptable solvent. Next the surfaces shall be rinsed with clear water and thoroughly dried.
  - 4. Where a shop coating of methacrylate lacquer has been specified on aluminum work to protect the surface from stain, the protective coating of lacquer worn off during handling or erection shall be replaced in the field by a new coating of lacquer of the same type.
  - 5. During construction care shall be taken to prevent damage to the aluminum work from splashing or the accumulation of paint, concrete, mortar, or other similar materials.

### **3.02 FABRICATION AND INSTALLATION OF METAL WORK**

- A. General: All metal items shall be accurately fabricated and erected with exposed joints close fitting. All joints shall be of such character and so assembled that they will be as strong and rigid as adjoining sections. Joints shall be located where least conspicuous. Items shall have smooth finished surfaces except where otherwise shown or specified.
- B. Built-In Items: Members or parts to be built in with masonry or concrete shall be in a form affording a suitable anchorage or shall be provided with approved anchors, expansion shields or other approved means of securing members.
- C. Dissimilar Metals: Ferrous and non-ferrous metals shall be insulated at all contacts with felt washers, strips or sheets, bitumastic paints, or other acceptable means.

**D. Connections:**

1. All required anchors, couplings, bolts, and nut required to support miscellaneous metal work shall be furnished and installed as required.
2. Weights of connections and accessories shall be adequate to safely sustain and withstand stresses and strains to which they will be normally subjected.
3. Connections shall be bolted except where welding is called for in the Drawings. Bolts shall be 3/4" diameter unless noted or required otherwise.

**E. Expansion Anchors:**

1. Expansion anchors shall be installed in holes drilled into concrete with carbide tipped drill bits conforming to ANSI B94.12-1977, using a rotary impact hammer for 1/2" and larger anchors, or a hammer drill for 1/4" and 3/8" inch. Hole depth shall equal or exceed the anchor manufacturer's minimum recommended embedment. Should hole depth equal anchor manufacturer's minimum recommended embedment, hole shall be cleaned out by air pressure. The minimum hole depth table following serves only as a general guide, anchor manufacturer's recommendations shall govern. Contractor shall assure hole is perpendicular and conforms in size to anchor manufacturer's recommendation.
2. Washer and nut shall be assembled on anchor so that the top of the nut is flush with the top of the anchor. Then the anchor shall be driven into the hole through the work until the washer bears against the work. The anchor shall be expanded in accordance with the manufacturer's recommendations. Edge and end distances and spacing of anchor table hereinafter, shall be complied with.

**3.03 WELDING**

Welding procedures, welders and welding operators, both for shop and field welding, shall be qualified and certified in accordance with the requirements of AWS D1.1 "Welding in Building Construction" of the American Welding Society. Manufacturer's and fabricator's shop drawings shall clearly show complete information and Contractor shall perform all field welding in conformance with this information regarding location, type, size and length of all welds, all in accordance with AWS A2.0 "Standard Welding Symbols" of the American Welding Society. Special conditions shall be fully explained by notes and details.

**3.04 HOT-DIP GALVANIZING**

- A. All fabrication, galvanizing and repair shall comply with ASTM Standards as they apply in accordance with the publication "ASTM Standards for Materials Hot-Dip Galvanized after Fabrication, 1981" issued by American Hot-Dip Galvanizers Association, Inc. In particular, the following specific standards shall apply to work under this contract: ASTM A-123, A-153, A-384, A-385, A-563 and A-780.
- B. Items to be galvanized shall be fabricated in accordance with ASTM A-385-80.
- C. Galvanizing for fabricated steel items shall conform to ASTM A-123-78 and shall be done after fabrication. Steel assemblies shall be subject to safe guarding from warpage and distortion during galvanizing per ASTM A-384-76.

- D. Galvanizing for structural steel fasteners and hardware shall conform to ASTM A-153-80. Galvanized bolts, nuts and washers shall be centrifugally spun after galvanizing. Nuts shall have threads tapped oversize, after galvanizing, in accordance with ASTM A-563-80.
- E. Upon field erection, any damage measuring more than 1/10" wide shall be repaired with a zinc based solder or zinc rich paint in accordance with ASTM A-780-80. Marred, damaged, or uncoated areas 4 square inches and less shall be patched with a zinc based solder to a thickness of 5 mils; areas greater than 4 square inches shall be patched with an organic zinc rich paint to a dry film thickness of 9 mils. The paint shall have a minimum of 94% zinc dust in the dry film, Devcon Z, LPS Instant Cold Galvanized, or equal. The resident project representative shall determine the extent of damage which would require recoating.
- F. Items subject to distortion during transit, shall be stacked on edge and/or blocked to prevent radius change or other distortion while in transit to and from the galvanizing plant.

### **3.05 MISCELLANEOUS METAL FABRICATIONS**

- A. Rough Hardware:
  - 1. Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware items are specified in Division 6 sections.
  - 2. Fabricate items to sizes, shapes and dimensions required. Furnish malleable iron washers for heads and nuts which bear on wood structural connections; elsewhere, furnish steel washers.
- B. Miscellaneous Steel Trim:
  - 1. Provide shapes and sizes for profiles shown. Except as otherwise indicated, fabricate units from structural steel shapes and plates and steel bars, with continuously welded joints and smooth exposed edges. Use concealed field splices wherever possible. Provide cutouts, fittings and anchorages as required for coordination of assembly and installation with other work.
  - 2. Galvanize miscellaneous steel trim where indicated.

### **3.06 HANDRAILS**

- A. General
  - 1. Refer to Article 2.02 this Section for types of handrails.
  - 2. Shop drawings and handrail manufacturer's printed instructions shall be closely followed during handrail installation. Posts shall be installed plumb and rails parallel.
  - 3. Required anchorages shall be strictly followed.
- B. Workmanship
  - 1. All rail and post cuts shall be square and accurate for minimum joint gap, clean and straight, and free of burrs and nicks.

2. In exterior and high humidity interior fabricated fitting installations, provision shall be made to drain entrapped water from inside the railing system to prevent electrolysis and/or damage from freezing. Manufacturer's printed instructions shall be strictly followed.
3. Welds and damaged areas shall be finished and coated according to Article 2 .02, this Section.
4. Where required, holes shall be drilled and countersunk the correct size for proper fit of all components.
5. In aluminum handrail systems where protection is applied for prevention of electrolysis from dissimilar materials, visibility of protective material shall be minimized.
6. Handrail system surfaces shall be protected from physical damage and discoloration during storage, assembly and installation. Manufacturer's coverings to protect anodized finishes shall be left intact until damage from construction operations no longer exists.

C. Rigidity

1. Posts shall be continuous from mounting surface to top rail.
2. Top and bottom rails shall be unspliced lengths between posts except as covered under expansion joints.
3. Railing manufacturer's instructions shall be strictly followed regarding torquing and tightening of fittings, and type and materials of fasteners.
4. Only stainless steel fasteners shall be used in aluminum installations, unless otherwise noted.

D. Expansion Joints

1. To prevent excessive stresses and misalignment in standard aluminum handrail systems, expansion joints and gaps shall be provided in top and bottom rails. Joints shall be located within 8 inches of posts and supports and the top and bottom rail joints shall be in vertical alignment. In fence-type handrail systems, top rail couplings shall be furnished with galvanized expansion compression spring as required in Part 2, this Section.
2. Where sleeve-type expansion joints are used, fasten only one side of sleeve to rail and allow other side of sleeve to slide on adjacent rail in standard aluminum handrail systems.
3. Gaps shall be provided according to the table below which is based on coefficients of expansion of 0.000013 inch/ °F for aluminum and 0.0000065 inch/°F for steel; a temperature difference of 120 °F less the minimum listed temperature; and an expansion joints spacing of 24'-0" on centers for aluminum and 40'-00" on centers for steel. Where it is known that other temperature differentials and/or expansion joint spacings will be experienced, gap dimensions can be determined by: gap in inches = (coefficient of expansion) x (temperature difference from maximum to minimum) x (distance in inches between expansion joints).

## EXPANSION JOINTS GAP TABLE

Temperature (°F) at Time of Installation	<u>Gap Dimension Required at Each Expansion Joint</u>	
	Aluminum Railing with Expansion Joints on 24'0" Centers	Steel Railing with Expansion Joints on 40'0" Centers
20 to 0	1/2"	7/16"
0 to 20	7/16"	3/8"
20 to 35	3/8"	5/16"
35 to 50	5/16"	1/4"
50 to 70	1/4"	1/4"
70 to 90	3/16"	3/16"
90 to 120	1/8"	1/8"

**3.07 NUTS AND BOLTS**

- A. Bolts embedded in concrete shall be secured with templates at the time of pouring concrete. Bolts shall be suitably protected from damage throughout the construction period.
- B. Damaged galvanized surfaces on nuts and bolts shall be repaired according to Article 2.04, this Section.

**3.08 CONCRETE ANCHORS**

Concrete anchors shall be installed strictly in accordance with manufacturer's printed instructions which shall be available on the job site.

- END OF SECTION -



**SECTION 07200****INSULATION****PART 1 - GENERAL****1.01 RELATED DOCUMENTS**

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 specification sections, apply to work of this section.

**1.02 DESCRIPTION OF WORK**

- A. Extent of insulation work is shown on Drawings. Required thickness shall be as indicated on the Drawings and by provisions of this section.
- B. Applications of insulation specified in this section, where applicable, include the following:
  - 1. Rigid insulation below grade and under slab.
  - 2. Board cavity wall insulation.
  - 3. Sound attenuation insulation.

**1.03 RELATED WORK UNDER OTHER SECTIONS****1.04 QUALITY ASSURANCE**

- A. Thermal Resistivity: Where thermal resistivity properties of insulation materials are designated by R-values they represent the rate of heat flow through a homogenous material exactly 1" thick, measured by test method included in reference material standard or for the total installation. They are expressed by the temperature difference in degrees F between the two exposed faces required to cause one BTU to flow through one square foot per hour at mean temperatures indicated.
- B. Fire Performance Characteristics: Provide insulation materials which are identical to those whose fire performance characteristics, as listed for each material or assembly of which insulation is a part, have been determined by testing, per methods indicated below, by UL or other testing and inspecting agency acceptable to authorities having jurisdiction.
- C. Surface Burning Characteristics: ASTM E 84.
- D. Fire Resistance Ratings: ASTM E 119.
- E. Combustion Characteristics: ASTM E 136.
- F. Maximum Allowable Asbestos Content of Inorganic Insulations: Provide insulations composed of mineral fibers or mineral ores which contain less than 0.25% by weight of asbestos of any type or mixture of types occurring naturally as impurities as determined by polarized light microscopy test per Appendix A of 40 CFR 763.

**1.05 DELIVERY, STORAGE AND HANDLING**

- A. General Protection: Protect insulations from physical damage and from becoming wet, soiled, or covered with ice or snow. Comply with manufacturer's recommendations for handling, storage and protection during installation.
- B. Protection for Plastic Insulation
  - 1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
  - 2. Protect against ignition at all times. Do not deliver plastic insulating materials to project ahead of installation time.
  - 3. Complete installation and concealment of plastic materials as rapidly as possible in each area of work.

**1.06 SUBMITTALS**

- A. Submit shop drawings in accordance with Division 1 requirements. Include manufacturer's installation data, limitations and any accessory products required for complete installation.
- B. Indicate where each type of insulation is to be used and provide details for respective installations.

**PART 2 - PRODUCTS****2.01 INSULATING MATERIALS**

- A. General: Provide insulating materials which comply with requirements indicated herein for materials, comply with referenced standards, other characteristics.
- B. Preformed Units: Sizes to fit applications indicated, selected from manufacturer's standard thickness, widths and lengths.
- C. Extruded Polystyrene Board Insulation: Rigid, cellular thermal insulation with closed-cells and integral high density skin, formed by the expansion of polystyrene base resin in an extrusion process to comply with ASTM C 578 for type indicated; with 5-year aged r-values of 5.4 and 5 at 40 and 75 deg. F. (4.4 and 23.9 deg.C), respectively; and as follows:
  - 1. Type IV, 1.6 lb./cu. ft. minimum density, unless otherwise indicated.
  - 2. Surface Burning Characteristics: Maximum flame spread and smoke developed values of 5 and 165, respectively.
- D. Unfaced Sound Attenuation/Batt Insulation:
  - 1. Fiber Type: Fibers manufactured from glass.
  - 2. Combustion Characteristics: Passes ASTM E 119 test.
  - 3. Surface Burning Characteristics: Maximum flame spread and smoke developed values of 25 and 50, respectively.

## **2.02 AUXILIARY INSULATING MATERIALS**

- A. Adhesive for Bonding Insulation: Type recommended by insulation manufacturer, and complying with requirements for fire performance characteristics.
- B. Mechanical Anchors: Type and size indicated or, if not indicated, as recommended by insulation manufacturer for type of application and condition of substrate.
- C. Mastic Sealer: Type recommended by insulation manufacturer for bonding edge joints between units and filling voids in work.

## **PART 3 - EXECUTION**

### **3.01 INSPECTION AND PREPARATION**

- A. Require installer to examine substrates and conditions under which insulation work is to be performed. A satisfactory substrate is one that complies with requirements of the section in which substrate and related work is specified. Obtain installer's written report listing conditions detrimental to performance of work in this section. Do not proceed with installation of insulation until unsatisfactory conditions have been corrected.
- B. Clean substrates of substances harmful to insulations.

### **3.02 INSTALLATION, GENERAL**

- A. Comply with manufacturer's instructions for particular conditions of installation in each case. If printed instructions are not available or do not apply to project conditions, consult manufacturer's technical representative for specific recommendations before proceeding with work.
- B. Extend insulation full thickness as shown over entire area to be insulated. Cut and fit tightly around obstructions, and fill voids with insulation. Remove projections which interfere with placement.
- C. Apply a single layer of insulation of required thickness, unless otherwise shown or required to make up total thickness.

### **3.03 INSTALLATION OF CAVITY-WALL**

On units of plastic insulation, install small pads of adhesive spaced approximately 1'-0" O.C. both ways on inside face, as recommended by manufacturer. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against masonry or other construction as shown.

### **3.04 INSTALLATION OF GENERAL BUILDING INSULATION**

- A. Apply insulation units to substrate by method indicated, complying with manufacturer's recommendations. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Seal joint between closed-cell (non-breathing) insulation units by applying mastic or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with mastic or sealant.

- C. Stuff loose glass fiber insulation into miscellaneous voids and cavity spaces where shown. Compact to approximately 40% of normal maximum volume (to a density of approximately 2.5 lbs. per cu. ft.).

### **3.05 PROTECTION**

General: Protect installed insulation and vapor retarders from harmful weather exposures and from possible physical abuses, where possible by nondelayed installation of concealing work or where that is not possible, by temporary covering or enclosure.

- END OF SECTION -

**SECTION 07600****FLASHING AND SHEET METAL****PART 1 - GENERAL****1.01 DESCRIPTION OF WORK**

- A. The extent of each type of flashing and sheet metal work is indicated on the drawings and by provisions of this section.
- B. The types of work specified in this section include the following:
  - 1. Metal counter flashing and base flashing.
  - 2. Miscellaneous sheet metal accessories.

**1.02 RELATED WORK SPECIFIED ELSEWHERE**

- A. Division 7 - Gutters and Downspouts.
- B. Division 7 - Metal Fascia and Copings.

**1.03 SUBMITTALS**

- A. Product data; vents, flashing, and sheet metal, accessories: Submit manufacturer's product specifications, installation instructions and general recommendations for each specified sheet material and fabricated product.
- B. Samples; flashing, sheet metal, accessories: samples indicating full range of colors available, upon selection submit to Architect/ Engineer, two 8" square samples of specified sheet materials to be exposed as finished surfaces.
- C. Shop Drawings; flashings, sheet metal accessories: Submit shop drawings showing layout, joining, profiles, and anchorages of fabricated work, including major counter flashings, trim/fascia units, layouts at 1/4" scale, details at 3" scales.

**1.04 JOB CONDITIONS**

Coordinate work of this section with interfacing and adjoining work for proper sequencing of each installation. Ensure best possible weather resistance and durability of the work and protection of materials and finishes.

**PART 2 - PRODUCTS****2.01 SHEET METAL FLASHING/TRIM**

Aluminum: ASTM B 209, alloy 3003, temper H14, AA-C22A44, Class I Kynar 500 finish, of color as selected by Architect from manufacturer's full range of available colors; 0.0332" thick (20 gauge).

## 2.02 EXTRUDED ALUMINUM

Fascias and expansion joints: Manufacturer's fabrications of sizes and profiles indicated, 6063-T52 0.08" minimum thickness for primary legs of fabrications including miter corner joints 10'-0" sections, Kynar 500. Color to be selected by Architect.

- A. These items are referenced to Architectural Products, Covington, Kentucky, and M & M Systems, but equivalent products of Aluminum Co. of America, or others shall be acceptable if approved by the Architect.
- B. All miters shall be factory welded and shall be standard or special size as indicated on the roof plans.
- C. Full height concealed 4-inch wide cover plates, aluminum compression clamp with 7 equally spaced 9/32 inch holes and NO. 12 x 1-1/4 inch, type 305, cadmium plated stainless steel screws and neoprene washers shall be furnished by the manufacturer.
- D. Standard and special miters, expansion joints and special sections required on the Drawings shall be fabricated by the manufacturer. All aluminum components shall be brushed anodized finish unless otherwise required or shown.
- E. To insure accurate installation and proper functioning, approved shop drawings and field dimensions will be required prior to fabrication.

## 2.03 MISCELLANEOUS MATERIALS AND ACCESSORIES

- A. Fasteners: Same metal as flashing/sheet metal, or other noncorrosive metal as recommended by sheet manufacturer. Match finish of exposed head with material being fastened.
- B. Bituminous Coating: FS TT-C-494 or SSPC - Paint 12, solvent type bituminous mastic, nominally free of sulfur, compounded for 15-mil dry film thickness per coat.
- C. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.
- D. Elastomeric Sealant: Generic type recommended by manufacturer of metal and fabricator of components being sealed; comply with FS TT-S-0027, TT-S-00230, or TT-S-001543.
- E. Epoxy Seam Sealer: 2-part noncorrosive metal seam cementing compound, recommended by manufacturer for exterior/interior nonmoving joints including riveted joints.
- F. Adhesives: Type recommended by flashing sheet manufacturer for waterproof/weather resistant seaming and adhesive application of flashing sheet.
- G. Paper Slip Sheet: 5-lb rosin-sized building paper.
- H. Polyethylene Underlayment: 6-mil carbonated polyethylene film; FS L-P-512.
- I. Metal Accessories: Provide sheet metal clips, straps, anchoring devices and similar accessory units as required for installation of work, matching or compatible with material being installed, noncorrosive, size and gage required for performance.
- J. Elastic Flashings Filler: Closed-cell polyethylene or other soft closed-cell material recommended by elastic flashing manufacturer as filler under flashing sheet.
- K. Roofing Cement: per roofing manufacturers requirements.

## **2.04 FABRICATED UNITS**

- A. General Metal Fabrication: Shop-fabricate work to greatest extent possible. Comply with details shown, and with applicable requirements of SMACNA "Architectural Sheet Metal Manual" and other recognized industry practices. Fabricate for waterproof and weather-resistant performance; with expansion provisions for running work, sufficient to permanently prevent leakage, damage or deterioration of the work. Form work to fit substrates. Comply with material manufacturer instructions and recommendations. Form exposed sheet metal work without excessive oil-canning, buckling and tool marks, true to line and levels as indicated, with exposed edges folded back to form hems.
- B. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams. For metal other than aluminum, thin edges to be seamed, form seams, and solder. Form aluminum strength where required.
- C. Expansion Provisions: Where lapped or bayonet-type expansion provisions in work cannot be used, or would not be sufficiently water/weatherproof, form expansion joints of intermeshing hooked flanges, not less than 1" deep, filled with mastic sealant (concealed with joints).
- D. Sealant Joints: Where movable, non-expansion type joints are indicated or required for proper performance of work, form metal to provide for proper installation of elastomeric sealant, in compliance with industry standards.
- E. Separations: Provide for separation of metal from noncompatible metal or corrosive substrates by coating concealed surfaces at locations of contact, with bituminous coating or other permanent separation as recommended by manufacturer/fabricator.
- F. Aluminum Extrusion Units: Fabricate extruded aluminum running units with formed or extruded aluminum joint covers, for installation behind main members where possible. Fabricate mitered and welded corner units.

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION REQUIREMENTS**

- A. General: Except as otherwise indicated, comply with manufacturer's installation instructions and recommendations, and with SMACNA "Architectural Sheet Metal Manual". Anchor units of work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints and seams which will be permanently watertight and weatherproof.
- B. Underlayment: Where aluminum is to be installed directly on cementitious or wood substrates, install a course of paper slip sheet and a course of polyethylene underlayment.
- C. Bed flanges of work in a thick coat of bituminous roofing cement where required for waterproof performance.

### **3.02 CLEANING AND PROTECTION**

- A. Clean exposed metal surfaces, removing substances which might cause corrosion of metal or deterioration of finishes.
- B. Protection: Installer shall advise Contractor of required procedures for surveillance and protection of flashings and sheet metal work during construction, to ensure that work will be

without damage or deterioration, other than natural weathering, at time of substantial completion.

- END OF SECTION -



**SECTION 07900****CAULKING AND SEALANTS****PART 1 - GENERAL****1.01 RELATED DOCUMENTS**

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work on this section.

**1.02 DESCRIPTION OF WORK**

- A. All caulking, sealants, etc. as required by the Drawings, and specified herein or necessary to provide weathertight construction. Caulking locations include, but are not limited to, the following:
  - 1. Perimeter of all exterior doors and louvers.
  - 2. Expansion joints.
- B. Extent of each form and type of joint sealer is indicated on drawings.

**1.03 RELATED WORK SPECIFIED ELSEWHERE**

- A. Refer to Division 8 sections for glazing requirements; not work of this section.
- B. Refer to Division 15 and 16 sections for joint sealers in mechanical and electrical work; not work of this section.

**1.04 SYSTEM PERFORMANCES**

Provide joint sealers that have been produced and installed to establish and maintain watertight and airtight continuous seals.

**1.05 QUALITY ASSURANCE**

- A. Installer Qualifications: Engage an Installer who has successfully completed within the last 3 years at least 5 joint sealer applications similar in type and size to that of this project and who will assign mechanics from these earlier applications to this project, of which one will serve as lead mechanic.
- B. Single Source Responsibility for Joint Sealer Materials: Obtain joint sealer materials from a single manufacturer for each different product required.

**1.06 GUARANTEE**

The Contractor shall guarantee all work under this Section against leakage for a period of three (3) years after final acceptance of work. This guarantee shall also be written against adhesive or cohesive failure, against crazing on surface greater than (3) mils, against staining of adjacent surfaces and against increase or decrease of Shore "A" Durometer hardness greater than 30% of 14-day value of sealant. Any defects occurring during the guarantee period shall be corrected at no additional cost to the Owner.

**1.07 SUBMITTALS**

- A. Product Data: Submit manufacturer's technical data for each product required, including instructions for joint preparation and application.
- B. Samples for Initial Selection Purposes: Submit manufacturer's standard bead samples consisting of strips of actual products showing full range of colors available, for each product exposed to view.

**1.08 DELIVERY, STORAGE AND HANDLING**

- A. Deliver materials to protect site in original unopened containers or bundles with labels informing about manufacturer, product name and designation, color, expiration period for use, pot life, curing time and mixing instructions for multi-component materials, where applicable.
- B. Store and handle materials to prevent their deterioration or damage due to moisture, temperature change, contaminants, or other causes.

**1.09 PROJECT CONDITIONS**

- A. Environmental Conditions: Do not proceed with installation of joint sealers under the following conditions:
  - 1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealer manufacturers.
  - 2. When ambient and substrate temperature conditions are outside the limits permitted by joint sealer manufacturer or below 40°F (4.4°C).
  - 3. When joint substrates are wet due to rain, frost, condensation or other causes.
- B. Joint Width Conditions: Do not proceed with installation of joint sealers when joint widths are less than allowed by joint sealer manufacturer for application indicated.

**PART 2 - PRODUCTS****2.01 MATERIALS, GENERAL**

- A. Compound for caulking and sealing above grade at doors and louvers, etc. shall be a one component urethane sealant suitable for use in both horizontal and vertical joints. Sealant shall be "Sonolastic NP 1" by Sonneborn, Mameco Sealant, Vulkem 116, or an approved equal, for elastomeric coating.
- B. Sealant for concrete and masonry expansion units shall be a one-component, urethane, self-leveling designed for use where indicated.
- C. Compatibility: Provide joint sealers, joint fillers and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by testing and field experience.
- D. Colors: Provide color of exposed joint sealer as selected by Architect from manufacturer's standard colors.

- E. Solvents and cleaners used in preparing surfaces for sealing shall be as recommended by the sealant manufacturer.
- F. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealant of base polymer indicated which complies with ASTM C-920 requirements, including those for Type, Grade, Class and Uses.

## **2.02 JOINT SEALANT BACKING**

- A. General: Provide sealant backings of material and type which are non-staining; are compatible with joint substrates, sealants, primers and other joint fillers: and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Plastic Foam Joint Fillers: (Where applicable) preformed, compressible, resilient, non-waxing, non-extruding strips of plastic foam of material indicated below, and of size, shape and density to control sealant depth and otherwise contribute to producing optimum sealant performance. Either flexible, open cell polyurethane foam or non-gassing, closed-cell polyethylene foam, unless otherwise indicated, subject to approval of sealant manufacturer.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer for preventing bond between sealant and joint filler or other materials at back (3rd) surface of joint. Provide self-adhesive tape where applicable.

## **2.03 MISCELLANEOUS MATERIALS**

- A. Primer: Provide type recommended by joint sealer manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint sealer-substrate and field tests.
- B. Cleaners for Nonporous Surfaces: Provide non-staining, chemical cleaner of type acceptable to manufacturer of sealant and sealant backing materials which are not harmful to substrates and adjacent nonporous materials.
- C. Masking Tape: Provide non-staining, non-absorbent type compatible with joint sealers and to surfaces adjacent to joint.

# **PART 3 - EXECUTION**

## **3.01 INSPECTION**

Require installer to inspect joints indicated to receive joint sealers for compliance with requirements for joint configurations, installation tolerances and other conditions affecting joint sealer performance. Obtain Installer's written report listing any conditions detrimental to performance of joint sealer work. Do not allow joint sealer to proceed until unsatisfactory conditions have been corrected.

## **3.02 PREPARATION**

- A. Pre-Installation Meeting: At Contractor's directions, Installer, joint sealer manufacturers' representatives, and other trades whose work affects installation of joint sealers shall meet at project site to review procedures and time schedule proposed for installation of joint sealers which is coordinated with other, related work.
- B. Surface Cleaning of Joints: Clean out joint immediately before installing joint sealers to comply with recommendations of joint sealer manufacturers and the following requirements:

1. Remove all foreign material from joint substrates which could interfere with adhesion of joint sealer, including dust; paints, except for permanent, protective coatings tested and approved for sealant manufacturer; oil; grease; waterproofing; water repellents; water; surface dirt and frost.
  2. Clean concrete and masonry, by brushing grinding, blast cleaning, mechanical abrading, acid washing or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealers. Remove loose particles removing from above cleaning operations by vacuuming or blowing out joints with oil free compressed air.
  3. Remove laitance and form release agents from concrete.
  4. Clean metal and glass by chemical cleaners or other means which are not harmful to substrate or leave residues capable of interfacing with adhesion of joint sealers.
- C. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealer manufacturer based on prior experience. Apply primer to comply with joint sealer manufacturer's recommendations. Confine primers to areas of joint sealer bond, do not allow spillage or migration onto adjoining surfaces.
- D. Masking Tape: Use masking tape where required to prevent contact to sealant with adjoining surfaces which otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

### 3.03 INSTALLATION OF JOINT SEALERS

- A. General: Comply with joint sealer manufacturer's printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.
- B. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:
1. Install Joint-fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint width which allow optimum sealant movement capability.
    - a. Do not leave gaps between ends of joint-fillers.
    - b. Do not stretch, twist, puncture or tear joint fillers.
    - c. Remove absorbent joint-fillers which have become wet prior to sealant application and replace with dry material.
  2. Install bond breaker tape between sealants and joint-fillers, compression seals or back of joints where required to prevent third side adhesion of sealant to back of joint and as recommended by manufacturer.
  3. Install compressible seals serving as sealant backings to comply with requirements indicated above for joint fillers.
- D. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint

configuration and providing uniform, cross-sectional shapes and depths relative to joining widths which allow optimum sealant movement capability.

- E. Tooling and Nonsag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents which discolor sealants or adjacent surfaces or are not approved by sealant manufacturer. Concave joint configuration per Figure 6A in ASTM C-962, unless otherwise indicated.

#### **3.04 PROTECTION AND CLEANING**

- A. Protect joint sealers during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of substantial completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealers immediately and reseal joints with new materials to produce joint sealer installation with repaired areas indistinguishable from original work.
- B. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers joints sealers and of products in which joints occur.

- END OF SECTION -



**SECTION 09900****FIELD PAINTING****PART 1 GENERAL****1.01 SUMMARY**

- A. This Section includes Field Painting of all work indicated on the Contract Drawings and specified herein.

**1.02 REFERENCES**

- A. Materials and installation shall be in accordance with the latest revisions of the following codes, standards and specifications, except where more stringent requirements have been specified herein:
  - 1. American Society for Testing and Materials (ASTM)
    - a. C2246 - Freeze-Thaw Test
    - b. D2247 - Humidity Test
    - c. B117 - Salt Spray Test
    - d. E84 - Surface Burning Characteristics Test
    - e. D16 - Definitions of Terms Relating to Paint, Varnish, Lacquer, and Related Products
    - f. D2805 - Contrast Ratio
    - g. D1308 - Stain Resistance
    - h. D4060 - Abrasion
    - i. D4541 - Adhesion
    - j. D522 - Conical Mandrel Elongation
  - 2. The Society for Protective Coatings
    - a. Steel Structures Painting Manual, Volume 2, Systems and Specifications

**1.03 QUALITY ASSURANCE**

- A. All materials shall remain in their original containers with manufacturer's label intact. Manufacturer's name, product name and number, and color and batch number shall appear on the label.
- B. Manufacturer's representative shall be available to advise applicator on proper application techniques and procedures.

**1.04 SUBMITTALS**

- A. In addition to those submittals identified in the General Provisions, the following items shall be submitted:
  - 1. Manufacturer's descriptive data fully describing each product to include solids by volume and V.O.C. ratings.

2. Manufacturer's certification that all materials furnished are in compliance with the applicable requirements of the referenced standards and this specification.
3. Manufacturer's application instructions.
4. Color charts illustrating range of colors [and textures] available for selection.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. The following manufacturers are named to establish a standard of quality necessary for the Project:
  1. International Protective Coatings
  2. Tnemec Company
  3. The Sherwin-Williams Company
  4. Or equal

### **2.02 GENERAL**

- A. Coatings shall be applied per manufacturer's recommendations.
- B. All coordination for compatibility between shop primers, shop finish coats, field coats, and possible tie coats, shall be the responsibility of the Contractor.
- C. All field surfaces prepared for field painting will be reviewed by the Engineer before coating application begins.
- D. All coatings specified herein are in addition to shop coatings specified elsewhere.
- E. Apply coatings with a brush or a roller. Spray paint only where scheduled or with Engineer's review.
- F. Clean damaged shop coatings and retouch before any successive field painting is performed.

### **2.03 EXTRA STOCK**

- A. [ 1 ] one gallon of unopened paint, in each type and color specified, shall be furnished to the Owner. Multi-component paints shall be supplied as a complete kit.

## **PART 3 EXECUTION**

### **3.01 PRE-APPLICATION**

- A. Examine surfaces to be coated and report any conditions that would adversely affect the appearance or performance of the coating systems, and which cannot be put into an acceptable condition by the preparatory work specified.
- B. The Contractor shall insure that moisture content of surfaces is within manufacturer's recommendations.



### 3.02 SURFACE PREPARATION

#### A. General

1. Remove dust and loose material by dusting, sweeping, vacuuming, or blowing with high-pressure air.
2. Remove oil, wax, and grease in accordance with the manufacturer's recommendations.
3. Verify with Owner's representative that all surfaces to be coated are dry, clean, and free from dirt, dust, wax, grease, or other contaminants.
4. Remove electrical plates, hardware, light fixtures, trim, and fittings prior to preparing surfaces.
5. Shellac and/or seal marks which may bleed through surface finishes that could not be removed.

#### B. Metals

1. Prepare all non-primed metal surfaces in accordance with the Steel Structures Painting Manual.
  - a. Sandblasting shall conform to The Society for Protective Coatings Surface Preparations Specifications for \*[near-white blast cleaning (SSPC-SP 10)] \*[commercial blast cleaning (SSPC-SP 6)].
  - b. Before blast cleaning begins, the Contractor shall prepare a sample which shall correspond to the photographic standards of SSPC.
  - c. Proportions of sand, grit, or shot shall be adjusted as necessary to produce a prepared surface equivalent to the reviewed sample.
  - d. Applications of protective coatings shall be within 8 hours after blast cleaning and prior to the formation of rust.
  - e. Surfaces showing any traces of rust shall be blasted again before application of protective coatings.
  - f. In areas where assemblies are to receive a sandblasted surface preparation, and portions of the assembly have been previously coated, all prior coatings shall be removed by blast cleaning to the extent necessary for proper adhesion of the specified coating.
2. Shop Primed Metals or Ferrous Metals
  - a. SSPC-SP3-Power Tool Clean field connections, welds, burned, and abraded areas to remove rust and contaminants; touch up with specified primer. Feather edges to make patches inconspicuous where exposed to view.
3. Ferrous Metal - Submerged Service
  - a. SSPC-SP10 - Near White Blast Clean

4. Ferrous Metal - Non-Submerged Service
    - a. SSPC-SP6 - Commercial Blast Clean
  5. Non-Ferrous Metal
    - a. SSPC-SP1 - Solvent Cleaning
  6. Galvanized Metal
    - a. SSPC-SP1 - Solvent Cleaning with non hydrocarbon-containing etching solutions such as SW Clean 'n' Etch or equivalent.
    - b. SSPC-SP3 - Power Tool Clean, white rust; Care shall be taken not to damage or remove galvanizing.
- C. Concrete and Masonry
1. Allow new concrete and masonry to cure [28] days.
  2. Patch holes and cracks in the concrete flush with the surface using a portland cement grout patching material or equivalent.
  3. Clean mortar joints
  4. Remove stains caused by weathering or corroding metals by cleaning with manufacturer's approved methods.
  5. Verify required acid/alkali balance and allowable moisture content of material.
  6. Abrasive Blast Cleaning: The surface shall be lightly abraded, in accordance with ASTM D4259, without entirely removing the surface or exposing the underlying aggregates. The cleaned surface shall have the uniform texture of 100 grit medium sandpaper.
  7. For concrete floors: Acid etch in accordance with ASTM D4260, abrade in accordance with paint manufacturers recommended procedures.
- D. Wood
1. Wipe off dust and grit just prior to painting.
  2. Remove or seal all pitch or deposits with a sealer compatible with the finish coating system.
  3. Seal knots and sappy sections with a sealer compatible with the finish coating system.
  4. Exterior Wood
    - a. After prime coat has been applied, fill nail holes with [tinted] caulking compound suitable for an exterior application, and compatible with the coating system.

- 5. Glue-Laminated Beams
  - a. Prior to finishing, wash surfaces as recommended by manufacturer.
- 6. Interior Wood
  - a. After primer has dried, fill nail holes and cracks with wood filler; sand between coats.
- 7. Smooth Siding and Finish Woodwork
  - a. Sand rough, irregular spots.
- E. Plaster
  - 1. Plaster must be cured and dry. Wash and neutralize high alkali surfaces.
- F. Gypsum Wall Board
  - 1. Verify surface is free of dust, and ready to receive primer.
- G. Impervious Surfaces
  - 1. Remove mildew and mold in accordance with the manufacturer's recommendation.

### **3.03 APPLICATION**

- A. Mix and thin material in accordance with the manufacturer's printed instructions.
- B. Allow each coat to dry thoroughly before recoating.
- C. Vary color slightly to indicate each successive coating.
- D. Cut in edges clean and sharp where work joins other materials or colors.
- E. Make finish coats smooth, uniform in color, and free of brush marks, laps, runs, dry spray, overspray, and missed areas.
- F. Where clear finishes are required, tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.
- G. Prime back surfaces of interior and exterior woodwork with primer paint.
- H. Prime back surfaces of interior woodwork scheduled to receive stain or varnish finish with gloss varnish reduced 25 percent with mineral spirits.

### **3.04 UNCOATED MATERIALS AND ITEMS**

- A. Glazed wall finishes, special coatings, and floor finishes are specified elsewhere.
- B. Surfaces not requiring protective coatings:
  - 1. Brass, Aluminum, PVC, Bronze, Copper

### 3.05 SCHEDULE FOR PAINTING AND FINISHING

#### Legend

- (1) Brush or roller application and spray application on metal deck and bar joist ceiling may require two coats to achieve required mil thickness.
- (2) Actual film thickness will depend on porosity of surface.
- (3) Dry Film Thickness (D.F.T.).

#### A. Steel-Structural, Tanks, Pipes and Equipment

##### 1. Exterior, Non-Immersion

#### International

D.F.T. (3)

Surface Preparation: SSPC-SP6

1st Coat: Interseal 670HS-7808 (1)

3.0 - 5.0

2nd Coat: Interseal 670HS-7808 (1)

4.0 - 6.0

3rd Coat: Interthane 870HS-7808

3.0 - 4.0

10.0 -15.0

#### Tnemec

D.F.T. (3)

Surface Preparation: SSPC-SP6

1st Coat: 66-1121 HiBuild Epoxoline (1)

3.0 - 5.0

2nd Coat: 66-color HiBuild Epoxoline (1)

4.0 - 6.0

3rd Coat: 74/75-color Endura-Shield

2.0 - 3.0

9.0 -14.0

#### Sherwin Williams

D.F.T. (3)

Surface Preparation: SSPC-SP6

1st Coat: Macropoxy 646, B58 Series (1)

3.0 - 5.0

2nd Coat: Macropoxy 646, B58 Series (1)

4.0 - 6.0

3rd Coat: Acrolon 218HS, B65 Series

2.0 - 3.0

9.0 -14.0

##### 2. Exterior, Non-Immersion

#### International

D.F.T. (3)

Surface Preparation: SSPC-SP6

1st Coat: Interseal 670HS-7808 (1)

3.0 - 5.0

2nd Coat: Interseal 670HS-7808 (1)

4.0 - 6.0

3rd Coat: Interseal 670HS-7808 (1)

4.0 - 6.0

11.0 -17.0

Tnemec D.F.T. (3)

Surface Preparation: SSPC-SP6

1st Coat: 66-1211 Hi-Build Epoxoline (1)	3.0 - 5.0
2nd Coat: 66-color Hi-Build Epoxoline (1)	4.0 - 6.0
3rd Coat: 66-color Epoxoline (1)	<u>4.0 - 6.0</u>
	11.0 -17.0

Sherwin Williams D.F.T. (3)

Surface Preparation: SSPC-SP6

1st Coat: Macropoxy 646, B58 Series (1)	3.0 - 5.0
2nd Coat: Macropoxy 646, B58 Series (1)	4.0 - 6.0
3rd Coat: Macropoxy 646, B58 Series (1)	<u>4.0 - 6.0</u>
	11.0 -17.0

## 3. Interior, Non-Immersion - Average Performance

International D.F.T. (3)

Surface Preparation: SSPC-SP6

1st Coat: Interseal 670HS-7808 (1)	3.0 - 5.0
2nd Coat: Interseal 670HS-7808 (1)	<u>4.0 - 6.0</u>
	7.0 -11.0

Tnemec D.F.T. (3)

Surface Preparation: SSPC-SP6

1st Coat: 66 Color Hi-Build Epoxoline (1)	3.0 - 5.0
2nd Coat: 66-color Hi-Build Epoxoline (1)	<u>4.0 - 6.0</u>
	7.0 -11.0

Sherwin Williams D.F.T. (3)

Surface Preparation: SSPC-SP6

1st Coat: Macropoxy 646, B58 Series (1)	3.0 - 5.0
2nd Coat: Macropoxy 646, B58 Series (1)	<u>4.0 - 6.0</u>
	7.0 -11.0

## 4. Immersion, Potable Water

International D.F.T. (3)

Surface Preparation: SSPC-SP10

1st Coat: Interline 850-7808 (1)	5.0 - 6.0
2nd Coat: Interline 850-7808 (1)	<u>5.0 - 6.0</u>
	10.0 -12.0

TnemecD.F.T. (3)

Surface Preparation: SSPC-SP10

Roughen the surface before topcoating if the 139-1255 has been exposed exterior for 14 days or longer

1st Coat: 139-1255 Pota-Pox II (1)

6.0 - 8.0

2nd Coat: 139-AA90 Pota-Pox II (1)

6.0 - 8.0

12.0 - 16.0

Sherwin WilliamsD.F.T. (3)

Surface Preparation: SSPC-SP10

1st Coat: Macropoxy 646 NSF (1)

5.0 - 6.0

2nd Coat: Macropoxy 646 NSF (1)

5.0 - 6.0

10.0 - 12.0

## 5. Immersion, Non-Potable Water

InternationalD.F.T. (3)

Surface Preparation: SSPC-SP10

1st Coat: Interseal 670HS-7808 (1)

6.0 - 8.0

2nd Coat: Interseal 670HS-7808 (1)

6.0 - 8.0

12.0 - 16.0

TnemecD.F.T. (3)

Surface Preparation: SSPC-SP10

Roughen the surface before topcoating if the 104-1211 has been exposed exterior for 14 days or longer.

1st Coat: 104-1211 H.S. Epoxy (1)

8.0 - 10.0

2nd Coat: 104-color H.S. Epoxy (1)

8.0 - 10.0

16.0 - 20.0

Sherwin WilliamsD.F.T. (3)

Surface Preparation: SSPC-SP10

1st Coat: Macropoxy 646, B58 Series (1)

5.0 - 6.0

2nd Coat: Macropoxy 646, B58 Series (1)

5.0 - 6.0

12.0 - 16.0

## 6. High Temperature Surfaces Up To 800°F

International D.F.T. (3)

Surface Preparation: SSPC-SP10

1st Coat: Intertherm 50-7808

1.0 - 1.5

2nd Coat: Intertherm 50-7808

1.0 - 1.5

2.0 - 3.0

Tnemec

D.F.T. (3)

Surface Preparation: SSPC-SP10

1st Coat: 39-1261 Silicone Aluminum

1.0 - 1.5

2nd Coat: 39-1261 Silicone Aluminum

1.0 - 1.5

2.0 - 3.0

Sherwin Williams

D.F.T. (3)

Surface Preparation: SSPC-SP10

1st Coat: Kem Hi-Temp

1.0 - 1.5

2nd Coat: Kem Hi-Temp

1.0 - 1.5

2.0 - 3.0

## 7. Low Temperature Curing Applications - High Performance Below 40°F

International D.F.T. (3)

Surface Preparation: SSPC-SP6

1st Coat: Intergard 345-7808

3.0 - 5.0

2nd Coat: Intergard 345-7808

4.0 - 6.0

3rd Coat: Intergard 345-7808 (Interior)

4.0 - 6.0

3rd Coat: Interthane 870HS-7808

3.0 - 4.0

11.0 - 17.0

or

10.0 - 15.0

Tnemec

D.F.T. (3)

Surface Preparation: SSPC-SP6

1st Coat: 161-1211 Tneme-Fascure (1)

3.0 - 5.0

2nd Coat: 161-color Tneme-Fascure (1)

4.0 - 6.0

3rd Coat: 161-color Tneme-Fascure (1)

4.0 - 6.0

or 3rd Coat: 74/75 End.-Shield (exterior)

(interior)

4.0 - 6.0

2.0 - 3.0

11.0 - 17.0

or

9.0 - 14.0

Sherwin WilliamsD.F.T. (3)

Surface Preparation: SSPC-SP6

1st Coat: Macropoxy 846, B58 Series (1)

3.0 - 5.0

2nd Coat: Macropoxy 846, B58 Series (1)

4.0 - 6.0

3rd Coat: Macropoxy 846, B58 Series (1) (interior)

4.0 - 6.0

or 3rd Coat: Acrolon 218HS, B65 series (exterior)

2.0 - 3.0

11.0 -17.0

or

9.0 -14.0

## 8. Low Temperature Curing Applications - Average Performance Below 40°F

InternationalD.F.T. (3)

Surface Preparation: SSPC-SP6

3.0 - 5.0

1st Coat: Intergard 345-7808

4.0 - 6.0

2nd Coat: Intergard 345-7808

7.0 -11.0

TnemecD.F.T. (3)

Surface Preparation: SSPC-SP6

1st Coat: 161-color Tneme-Fascure (1)

4.0 - 6.0

2nd Coat: 161-color Tneme-Fascure (1)

4.0 - 6.0

8.0 -11.0

Sherwin WilliamsD.F.T. (3)

Surface Preparation: SSPC-SP6

1st Coat: Macropoxy 846, B58 Series (1)

3.0 - 6.0

2nd Coat: Macropoxy 846, B58 Series (1)

4.0 - 6.0

7.0 -11.0

InternationalD.F.T. (3)

Surface Preparation: SSPC-SP2

1st Coat: Intergard 345-7808

4.0 - 6.0

2nd Coat: Intergard 345-7808

4.0 - 6.0

8.0 -12.0



Tnemec D.F.T. (3)

Surface Preparation: SSPC-SP2

1st Coat: 135-color Chembuild (1)

4.0 - 6.0

2nd Coat: 135-color Chembuild (1)

4.0 - 6.0

8.0 -12.0

Sherwin Williams D.F.T. (3)

Surface Preparation: SSPC-SP2

1st Coat: Macropoxy 646, B58 Series (1)

4.0 - 6.0

2nd Coat: Macropoxy 646, B58 Series (1)

4.0 - 6.0

8.0 -12.0

## B. Galvanized Steel, Non-Ferrous Metal, Pipe, Roof Deck and Miscellaneous Fabrications

## 1. Exterior, Non-Immersion

International D.F.T. \* (3)

Surface Preparation: SSPC-SP1

1st Coat: Interseal 670HS-7808

4.0 - 6.0

2nd Coat: Interthane 870HS-7808

3.0 - 4.0

7.0 -10.0

Tnemec D.F.T. (3)

Surface Preparation: SSPC-SP1

1st Coat: 66-color Hi-Build Epoxoline (1)

4.0 - 6.0

2nd Coat: 74/75-color Endura-Shield

2.0 - 3.0

6.0 - 9.0

Sherwin Williams D.F.T. (3)

Surface Preparation: SSPC-SP1

1st Coat: Macropoxy 646, B58 Series (1)

4.0 - 6.0

2nd Coat: Acrolon 218 HS, B65 Series

2.0 - 3.0

6.0 - 9.0

## 2. Interior, Non-Immersion

International D.F.T. (3)

Surface Preparation: SSPC-SP1

1st Coat: Interseal 670HS-7808 (1)

4.0 - 6.0

2nd Coat: Interseal 670HS-7808. (1)

4.0 - 6.0

8.0 -12.0

Tnemec D.F.T. (3)

Surface Preparation: SSPC-SP1

1st Coat: 66-color Hi-Build Epoxoline (1) 4.0 - 6.0

2nd Coat: 66-color Hi-Build Epoxoline (1) 4.0 - 6.0

8.0 -12.0

Sherwin Williams D.F.T. (3)

Surface Preparation: SSPC-SP1

1st Coat: Macropoxy 646, B58 Series (1) 4.0 - 6.0

2nd Coat: Macropoxy 646, B58 Series (1) 4.0 - 6.0

8.0 -12.0

## C. Concrete

## 1. Exterior, Below Grade

Note: Recommend surface preparation to compare with ICRI CSP 3 to 5

International D.F.T. (3)

Surface Preparation: clean and dry

1st Coat: Intertuf 708-7808 16.0 - 20.0

16.0 - 20.0

Tnemec D.F.T. (3)

Surface Preparation: Clean and dry.

1st Coat: 46H-413 Hi-Build Tneme-Tar (1) 16.0-20.0

16.0-20.0

Sherwin Williams D.F.T. (3)

Surface Preparation: Clean and dry.

1st Coat: Hi-Mil Sher-Tar (1) 16.0-20.0

16.0-20.0

## 2. Exterior, Above Grade

International D.F.T. (3)

Surface Preparation: clean and dry

1st Coat: 898-7808 Pigmented Bonding Coat

2nd Coat: Porterflex 6000-7808 15.0

15.0

Tnemec D.F.T. (3)

Surface Preparation: Clean and dry  
 1st Coat: 156-color Enviro-Crete TX 8.0- 9.0  
 2nd Coat: 156-color Enviro-Crete TX 8.0- 9.0  
 16.0-18.0

Sherwin Williams D.F.T. (3)

Surface Preparation: Clean and dry  
 1st Coat: Ultra-Crete 8.0- 9.0  
 2nd Coat: Ultra-Crete 8.0- 9.0  
 16.0-18.0

3. Immersion, Potable Water

International D.F.T. (3)

Surface Preparation: Brush-Off Blast  
 1st Coat: Interline 850-7808 5.0 - 6.0  
 2nd Coat: Interline 850-7808 5.0 - 6.0  
 10.0 -12.0

Tnemec D.F.T. (3)

Surface Preparation: Brush-Off Blast  
 Roughen the surface before topcoating if the 139-1255 has  
 been exposed exterior for 14 days or longer.

1st Coat: 139-1255 Pota-Pox II (1) 4.0 - 6.0  
 2nd Coat: 139-AA90 Pota-Pox II (1) 8.0 -10.0  
 12.0 -16.0

Sherwin Williams D.F.T. (3)

Surface Preparation: Abrasive Blast to achieve ICRI CSP 3 to 5

1st Coat: Macropoxy 646 NSF (1) 4.0 - 6.0  
 2nd Coat: Macropoxy 646 NSF (1) 4.0 - 6.0  
 8.0 - 12.0

4. Immersion, Non-Potable Water

International D.F.T. (3)

Surface Preparation: Brush-Off Blast  
 1st Coat: Interseal 670HS-7808 6.0 - 8.0  
 2nd Coat: Interseal 670HS-7808 6.0 - 8.0  
 12.0 -16.0

TnemecD.F.T. (3)

Surface Preparation: Brush-Off Blast

Roughen the surface before topcoating if the 104-color has been exposed exterior for 14 days or longer

1st Coat: 104-color H.S. Epoxy (1)

8.0-10.0

2nd Coat: 104-color H.S. Epoxy (1)

8.0-10.0

16.0-20.0

Sherwin WilliamsD.F.T. (3)

Surface Preparation: Abrasive Blast to achieve ICRI CSP 3 to 5

1st Coat: Macropoxy 646 NSF (1)

4.0 - 6.0

2nd Coat: Macropoxy 646 NSF (1)

4.0 - 6.0

8.0 - 12.0

## 5. Interior

InternationalD.F.T. (3)

Surface Preparation: clean and dry

1st Coat: Intergard 475HS-7808

4.0 - 6.0

2nd Coat: Intergard 475HS-7808

4.0 - 6.0

8.0 -12.0

TnemecD.F.T. (3)

Surface Preparation: Clean and dry

1st Coat: 66-color Hi-Build Epoxoline

4.0 - 6.0

2nd Coat: 66-color Hi-Build Epoxoline

4.0 - 6.0

8.0 -12.0

Sherwin WilliamsD.F.T. (3)

Surface Preparation: Clean and dry

1st Coat: Macropoxy 646, B58 Series

4.0 - 6.0

2nd Coat: Macropoxy 646, B58 Series

4.0 - 6.0

8.0 -12.0

## 6. Interior, Low Odor

InternationalD.F.T. (3)

Surface Preparation: clean and dry

1st Coat: Intergard 735-7808

2.0 -2.5

2nd Coat: Intergard 735-7808

2.0 - 2.5

6.0-7.5

TnemecD.F.T. (3)

Surface Preparation: Clean and dry

1st Coat: 111/112 Tneme-Tufcoat

2.0 - 2.5

2nd Coat: 111/112 Tneme-Tufcoat

2.0 - 2.5

3rd Coat: 111/112 Tneme-Tufcoat

2.0 - 2.5

6.0 - 7.5

## 7. Floors, Interior

Note: Achieve ICRI CSP 1 to 3

InternationalD.F.T. (3)

Surface Preparation: Brush-off Blast or Blast Track

1st Coat: Intergard 345-7808

4.0 - 6.0

2nd Coat: Intergard 345-7808

4.0 - 6.0

8.0 -12.0

TnemecD.F.T. (3)

Surface Preparation: Brush-off Blast or Blast Track

Should a non-skid surface be desired the 1st coat of 66 should be designated NS. The second coat should remain as specified.

1st Coat: 66-color Hi-Build Epoxoline

4.0 - 6.0

2nd Coat: 66-color Hi-Build Epoxoline

4.0 - 6.0

8.0 -12.0

Sherwin WilliamsD.F.T. (3)

Surface Preparation: Brush-off Blast or Blast Track

To achieve ICRI CSP 1 to 3

Should a non-skid surface be desired the 1st coat of AS 1000 HS should be designated NS. The second coat should remain as specified.

1st Coat: ArmorSeal 1000 HS, B67-2000 Series

4.0 - 6.0

2nd Coat: ArmorSeal 1000 HS, B67-2000 Series

4.0 - 6.0

8.0 -12.0

## D. Concrete Block &amp; Porous Masonry

## 1. Exterior

InternationalD.F.T. (3)

Surface Preparation: clean and dry

1st Coat: 895-7808 Unifill Block Filler

2nd Coat: Porterflex-7808

15.0

15.0

<u>Tnemec</u>	<u>D.F.T.</u> (3)
Surface Preparation: Clean and dry	
1st Coat: 157-color Enviro-Crete TX	8.0 - 9.0
2nd Coat: 157-color Enviro-Crete TX	<u>8.0 - 9.0</u>
	16.0 -18.0

<u>Sherwin Williams</u>	<u>D.F.T.</u> (3)
Surface Preparation: Clean and dry	
1st Coat: Ultra-Crete	8.0 - 9.0
2nd Coat: Ultra-Crete	<u>8.0 - 9.0</u>
	16.0 -18.0

## 2. Interior

<u>International</u>	<u>D.F.T.</u> (3)
Surface Preparation: clean and dry	
1st Coat: 895-7808 Unifill Block Filler	-
2nd Coat: Intergard 475HS-7808	4.0 - 6.0
3rd Coat: Intergard 475HS-7808	<u>4.0 - 6.0</u>
	8.0 -12.0

<u>Tnemec</u>	<u>D.F.T.</u> (3)
Surface Preparation: Clean and dry	
1st Coat: 130-6601 Envirofill (2) 100 sq. ft. per gal.	-
2nd Coat: 66-color Hi-Build Epoxoline	4.0 - 6.0
3rd Coat: 66-color Hi-Build Epoxoline	<u>4.0 - 6.0</u>
	8.0 -12.0
	(over filler)

<u>Sherwin Williams</u>	<u>D.F.T.</u> (3)
Surface Preparation: Clean and dry	
1st Coat: Cement-Plex 875 (2) 100 sq. ft. per gal.	-
2nd Coat: Macropoxy 646, B58 Series	4.0 - 6.0
3rd Coat: Macropoxy 646, B58 Series	<u>4.0 - 6.0</u>
	8.0 -12.0
	(over filler)

## 3. Interior, Low Odor

InternationalD.F.T. (3)

Surface Preparation: clean and dry

1st Coat: Interlac 895-7808

-

2nd Coat: Intergard 735-7808

2.0 - 3.0

3rd Coat: Intergard 735-7808

2.0 - 3.0

4.0 - 6.0

TnemecD.F.T. (3)

Surface Preparation: Clean and dry

1st Coat: 130-6601 Envirofill (2) 100 sq. ft. per gal.

2nd Coat: 111-color Tneme-Tufcoat

2.0 - 2.5

3rd Coat: 111-color Tneme-Tufcoat

2.0 - 2.5

4.0 - 5.0

(over filler)

Sherwin WilliamsD.F.T. (3)

Surface Preparation: Clean and dry

1st Coat: Cement-Plex 875 (2) 100 sq. ft. per gal.

2nd Coat: Epo-Plex Multi-Mil

2.0 - 2.5

3rd Coat: Epo-Plex Multi-Mil

2.0 - 2.5

4.0 - 5.0

(over filler)

## E. Dry Wall

## 1. Interior, Low Odor

InternationalD.F.T. (3)

Surface Preparation: clean and dry

1st Coat: Intergard 735-7808

1.5 - 2.0

2nd Coat: Intergard 735-7808

2.0 - 3.0

3rd Coat: Intergard 735-7808

2.0 - 3.0

5.5 - 8.0

TnemecD.F.T. (3)

Surface Preparation: Clean and dry

1st Coat: 51-792 PVA Sealer

1.5 - 2.0

2nd Coat: 111-color Tneme-Tufcoat

2.0 - 2.5

3rd Coat: 111-color Tneme-Tufcoat

2.0 - 2.5

5.5 - 7.0

Sherwin WilliamsD.F.T. (3)

Surface Preparation: Clean and dry

1st Coat: PrepRite 200 Primer, B28W200

1.5 - 2.0

2nd Coat: Epo-Plex Multi-Mil

2.0 - 2.5

3rd Coat: Epo-Plex Multi-Mil

2.0 - 2.5

5.5 - 7.0

## F. Insulated Pipe

## 1. Interior

InternationalD.F.T. (3)

Surface Preparation: clean and dry

1st Coat: Interseal 670HS-7808

5.0 - 6.0

2nd Coat: Interseal 670HS-7808

5.0 - 6.0

10.0 - 12.0

TnemecD.F.T. (3)

Surface Preparation: Clean and dry

1st Coat: 51-792 PVA Sealer

1.5 - 2.0

2nd Coat: 66-color Hi-Build Epoxoline

2.0 - 3.0

3rd Coat: 66-color Hi-Build Epoxoline

2.0 - 3.0

5.5 - 8.0

Sherwin WilliamsD.F.T. (3)

Surface Preparation: Clean and dry

1st Coat: PrepRite 200 Primer, B28W200

1.5 - 2.0

2nd Coat: Epo-Plex Multi-Mil

2.0 - 2.5

3rd Coat: Epo-Plex Multi-Mil

2.0 - 2.5

5.5 - 7.0

## G. Wood

## 1. Interior

InternationalD.F.T. (3)

Surface Preparation: clean and dry

1st Coat: Intercryl 530-7808

2.0 - 3.0

2nd Coat: Intercryl 530-7808

2.0 - 3.0

4.0 - 6.0

TnemecD.F.T. (3)

Surface Preparation: Clean and dry

1st Coat: 111-color Tneme-Tufcoat

2.0 - 2.5

2nd Coat: 111-color Tneme-Tufcoat

2.0 - 2.5

4.0 - 5.0



Sherwin Williams D.F.T. (3)

Surface Preparation: Clean and dry

1st Coat: Epo-Plex Multi-Mil 2.0 - 2.5

2nd Coat: Epo-Plex Multi-Mil 2.0 - 2.5

4.0 - 5.0

2. Exterior

International D.F.T. (3)

Surface Preparation: Remove loose paint and caulk, dry

1st Coat: Intercryl 530-7808 2.0 - 3.0

2nd Coat: Intercryl 530-7808 2.0 - 3.0

4.0 - 6.0

Tnemec D.F.T. (3)

Surface Preparation: Remove loose paint and caulk, dry

1st Coat: 6-color Tneme-Cryl 2.5 - 3.0

2nd Coat: 6-color Tneme-Cryl 2.5 - 3.0

5.0 - 6.0

Sherwin Williams D.F.T. (3)

Surface Preparation: Remove loose paint and caulk, dry

1st Coat: DTM Primer/Finish, B66 Series 2.5 - 3.0

2nd Coat: DTM Primer/Finish, B66 Series 2.5 - 3.0

5.0 - 6.0

- H. Ferrous piping, valves, operators, misc. appurtenances installed within the pipeline. All of the following systems are for the coating of the exterior of pipe, valves, etc. only.

1. Interior, Immersion, Non-Potable

International D.F.T. (3)

Surface Preparation: SSPC-SP10

1st Coat: Interseal 670HS-7808 (1) 3.0 - 5.0

2nd Coat: Interseal 670HS-7808 (1) 4.0 - 6.0

3rd Coat: Interseal 670HS-7808 (1) 4.0 - 6.0

11.0 - 17.0

Tnemec D.F.T. (3)

Surface Preparation: SSPC-SP10

1st Coat: 66-1211 Hi-Build Epoxoline (1) 3.0 - 5.0

2nd Coat: 66-color Hi-Build Epoxoline (1) 4.0 - 6.0

3rd Coat: 66-color Hi-Build Epoxoline (1) 4.0 - 6.0

11.0 - 17.0

Sherwin WilliamsD.F.T. (3)

Surface Preparation: SSPC-SP10

1st Coat: Macropoxy 646, B58 Series (1)

3.0 - 5.0

2nd Coat: Macropoxy 646, B58 Series (1)

4.0 - 6.0

3rd Coat: Macropoxy 646, B58 Series (1)

4.0 - 6.0

11.0 -17.0

## 2. Immersion, Potable Water

InternationalD.F.T. (3)

Surface Preparation: SSPC-SP10

1st Coat: Interline 850-7808 (1)

5.0 - 6.0

2nd Coat: Interline 850-7808 (1)

5.0 - 6.0

10.0 -12.0

TnemecD.F.T. (3)

Surface Preparation: SSPC-SP10

Roughen the surface before topcoating if the 139-1255  
has been exterior exposed for 14 days or longer

1st Coat: 139-1255 Pota-Pox II (1)

6.0 - 8.0

2nd Coat: 139-AA90 Pota-Pox II (1)

6.0 - 8.0

12.0 -16.0

Sherwin WilliamsD.F.T. (3)

Surface Preparation: SSPC-SP10

1st Coat: Macropoxy 646 NSF (1)

6.0 - 8.0

2nd Coat: Macropoxy 646 NSF (1)

6.0 - 8.0

12.0 -16.0

## 3. Interior, Non-Immersion - Average Performance

InternationalD.F.T. (3)

Surface Preparation: SSPC-SP6

1st Coat: Interseal 670HS-7808 (1)

3.0 - 5.0

2nd Coat: Intergard 475HS-7808 (1)

4.0 - 6.0

7.0 -11.0

TnemecD.F.T. (3)

Surface Preparation: SSPC-SP6

1st Coat: 66-color Hi-Build Epoxoline (1)

3.0 - 5.0

2nd Coat: 66-color Hi-Build Epoxoline (1)

4.0 - 6.0

7.0 -11.0

Sherwin WilliamsD.F.T. (3)

Surface Preparation: SSPC-SP6

1st Coat: Macropoxy 646, B58 Series (1)

3.0 - 5.0

2nd Coat: Macropoxy 646, B58 Series (1)

4.0 - 6.0

7.0 -11.0

## 4. Exterior, Non-Immersion

InternationalD.F.T. (3)

Surface Preparation: SSPC-SP6

1st Coat: Interseal 670HS-7808 (1)

3.0 - 5.0

2nd Coat: Intergard 475HS-7808 (1)

4.0 - 6.0

3rd Coat: Interthane 870HS-7808

3.0 - 4.0

10.0 -15.0

TnemecD.F.T. (3)

Surface Preparation: SSPC-SP6

1st Coat: 66-1211 Hi-Build Epoxoline (1)

3.0 - 5.0

2nd Coat: 66-color Hi-Build Epoxoline (1)

4.0 - 6.0

3rd Coat: 74/75 - color Endura-Shield

2.0 - 3.0

9.0 -14.0

## 5. Exterior, Below Grade

InternationalD.F.T. (3)

Surface Preparation: Clean and Dry

1st Coat: Intertuf 708-7808

16.0 -20.0

16.0 -20.0

TnemecD.F.T. (3)

Surface Preparation: Clean and Dry

1st Coat: 46H-413 Hi-Build Tneme-Tar (1)

16.0 -20.0

16.0 -20.0

Sherwin WilliamsD.F.T. (3)

Surface Preparation: Clean and Dry

1st Coat: Hi-Mil Sher-Tar (1)

16.0 -20.0

16.0 -20.0

- I. Galvanized, Non-Ferrous, Wrought piping, valves, operators, misc. appurtenances installed within the pipeline. All of the following systems are for the coating of the exterior of pipe, valves, etc. only.

1.	Exterior, Non-Immersion	
	<u>International</u>	<u>D.F.T.</u> (3)
	Surface Preparation: SSPC-SP1	
	1st Coat: Interseal 670HS-7808 (1)	4.0 - 6.0
	2nd Coat: Interthane 870HS-7808	<u>3.0 - 4.0</u>
		7.0 -10.0
	<u>Tnemec</u>	<u>D.F.T.</u> (3)
	Surface Preparation: SSPC-SP1	
	1st Coat: 66-color Hi-Build Epoxoline (1)	4.0 - 6.0
	2nd Coat: 74/75-color Endura-Shield	<u>2.0 - 3.0</u>
		6.0 - 9.0
	<u>Sherwin Williams</u>	<u>D.F.T.</u> (3)
	Surface Preparation: SSPC-SP1	4.0 - 6.0
	1st Coat: Macropoxy 646, B58 Series (1)	<u>2.0 - 3.0</u>
	2nd Coat: Acrolon 218HS, B65 Series	6.0 - 9.0
2.	Exterior, Below Grade	
	<u>International</u>	<u>D.F.T.</u> (3)
	Surface Preparation: Clean and Dry	
	1st Coat: Intertuf 708-7808	<u>16.0 -20.0</u>
		16.0 -20.0
	<u>Tnemec</u>	<u>D.F.T.</u> (3)
	Surface Preparation: Clean and Dry	
	1st Coat: 46H-413 Hi-Build Tneme-Tar (1)	<u>16.0 -20.0</u>
		16.0 -20.0
	<u>Sherwin Williams</u>	<u>D.F.T.</u> (3)
	Surface Preparation: Clean and Dry	
	1st Coat: Hil-Mil Sher-Tar (1)	<u>16.0 -20.0</u>
		16.0 -20.0
3.	Interior, Non-Immersion - Average Performance	
	<u>International</u>	<u>D.F.T.</u> (3)
	Surface Preparation: SSPC-SP6	
	1st Coat: Interseal 670HS-7808 (1)	3.0 - 5.0
	2nd Coat: Intergard 475HS-7808 (1)	<u>4.0 - 6.0</u>
		7.0 -11.0

Tnemec D.F.T. (3)

Surface Preparation: SSPC-SP6

1st Coat: 66-color Hi-Build Epoxoline (1) 3.0 - 5.0

2nd Coat: 66-color Hi-Build Epoxoline (1) 4.0 - 6.0  
7.0 - 11.0

Sherwin Williams D.F.T. (3)

Surface Preparation: SSPC-SP6 3.0 - 5.0

1st Coat: Macropoxy 646, B58 Series (1) 4.0 - 6.0

2nd Coat: Macropoxy 646, B58 Series (1) 7.0 - 11.0

4. Interior, Immersion, Non-Potable

International D.F.T. (3)

Surface Preparation: SSPC-SP10

1st Coat: Interseal 670HS-7808 (1) 3.0 - 5.0

2nd Coat: Interseal 670HS-7808 (1) 4.0 - 6.0

3rd Coat: Interseal 670HS-7808 (1) 4.0 - 6.0  
11.0 - 17.0

Tnemec D.F.T. (3)

Surface Preparation: SSPC-SP10

1st Coat: 66-1211 Hi-Build Epoxoline (1) 3.0 - 5.0

2nd Coat: 66-color Hi-Build Epoxoline (1) 4.0 - 6.0

3rd Coat: 66-color Hi-Build Epoxoline (1) 4.0 - 6.0  
11.0 - 17.0

Sherwin Williams D.F.T. (3)

Surface Preparation: SSPC-SP10

1st Coat: Macropoxy 646, B58 Series (1) 3.0 - 5.0

2nd Coat: Macropoxy 646, B58 Series (1) 4.0 - 6.0

3rd Coat: Macropoxy 646, B58 Series (1) 4.0 - 6.0  
11.0 - 17.0

### 3.06 COLOR CODED AND MARKED PIPING

- A. All exposed piping shall be painted, color coded, and marked as scheduled.
1. Piping in exposed trenches shall be considered exposed.
  2. Markers shall be of an all temperature adhesive tape, suitable for any pipe finish or covering.
  3. Printing on markers shall be of sufficient size and style as reviewed by Engineer.
  4. A flow arrow shall be installed with each pipe marker at a minimum spacing of 10 ft.

5. Where two colors do not have sufficient contrast to easily differentiate between them, a six-inch band of contrasting color shall be on one of the pipes at 30 inch intervals.
- B. On fiberglass, plastic, stainless steel, copper pipe, or other uncoated piping, a combination of wide banding tape and narrow banding tape shall be used for the pipe color and band.

### 3.07 PIPING COLOR CODE

#### A. Water Lines

Raw	Olive Green
Settled or Clarified	Aqua
Finished or Potable	Dark Blue
[ _____ ]	[ _____ ]

#### B. Chemical Lines

Alum or Primary Coagulant	Orange
Ammonia	White
Carbon Slurry	Black
Caustic	Yellow with Green Band
Chlorine (Gas and Solution)	Yellow
Fluoride	Light Blue with Red Band
Lime Slurry	Light Green
Ozone	Yellow with Orange Band
Phosphate Compounds	Light Green with Red Band
Polymers or Coagulant Aids	Orange with Green Band
Potassium Permanganate	Violet
Soda Ash	Light Green with Orange Band
Sulfuric Acid	Yellow with Red Band
Sulfur Dioxide	Light Green with Yellow Band
[ _____ ]	[ _____ ]

#### C. Waste Lines

Backwash Waste	Light Brown
Sludge	Dark Brown
Sewer (Sanitary or Other)	Dark Gray
[ _____ ]	[ _____ ]

D. Other

Compressed Air

Dark Green

Gas

Red

Other Lines

Light Gray

[ \_\_\_\_\_ ]

[ \_\_\_\_\_ ]

- END OF SECTION -





**SECTION 11290****INTERIOR PROCESS PIPING****PART 1 - GENERAL****1.01 SCOPE OF WORK**

- A. Provide all labor, materials, equipment and services required to furnish and install all plant process piping as shown on the Drawings and specified herein.

**1.02 RELATED WORK SPECIFIED ELSEWHERE**

- A. Interior Process Valves: Section 11295
- B. Valves: Section 02640
- C. Piping furnished with equipment is included in the specific equipment item.

**1.03 SUBMITTALS**

- A. The Contractor shall comply with the requirements of Section 01340 of these specifications.
- B. A notarized certification shall be furnished for all pipe and fittings which verifies compliance with all applicable specifications.

**PART 2 - PRODUCTS****2.01 DUCTILE IRON PIPE/DUCTILE IRON FITTINGS**

- A. Unless otherwise noted or required, all inside ductile iron piping shall be flanged pipe with threaded flanges in accordance with AWWA C 115. All piping flanges shall have ring gaskets, 1/8-inch thick.
- B. All exposed iron pipe to be field painted shall be furnished with an external coating of rust inhibitive primer, such as Tnemec Series 1 OmniThane, Sherwin-Williams Corothane I GalvaPac, or equal. Pipe manufacturer shall be responsible for compatibility of shop applied coatings with the field paint systems and products specified in Division 9, Section 09960. Do not apply asphalt or bituminous coatings on pipe to be painted.
- C. The interior of all ductile iron pipe shall be cement-mortar lined with bituminous seal coat in accordance with AWWA C 104. Thickness of the lining shall be as set forth in Section 4.8.1 of the aforementioned specification unless otherwise directed by the Engineer.
- D. Ductile iron fittings shall conform to AWWA C 110 with flanges faced and drilled to Class 300 or Class 125 as indicated on the Drawings. Fittings shall have interior lining and exterior coating same as the pipe.

**2.02 POLYVINYL CHLORIDE (PVC) PLASTIC PRESSURE PIPE**

- A. PVC Pressure Pipe, 3" and Smaller: Polyvinyl chloride plastic pipe shall be ASTM D 1785 Schedule 80 or F441 CPVC, Schedule 80 with solvent weld joints. Fittings shall be ASTM D 2467 Schedule 80 socket type. All socket type connections shall be made with PVC solvent

INTERIOR PROCESS PIPING

cement complying with ASTM D 2564 PVC solvent cement shall be furnished from the same supplier as the PVC pipe. Provide socket-threaded adapters for connection to threaded appurtenances where required.

### **2.03 COPPER PIPING**

- A. Copper piping shall be ASTM B 88 Type L seamless copper water tube, with ANSI B16.18 cast brass solder joint pressure fittings. Provide solder joint-threaded unions at all threaded valves and appurtenances.

### **2.04 STAINLESS STEEL**

- A. Stainless steel pipe shall be ASTM A 312, AISI Type 316. Schedule 40, threaded. Stainless steel fittings shall be AISI Type 316, 150-lb., threaded, as manufactured by Camco Fittings Company, Hamden, Connecticut, or equal.

### **2.05 CHEMICAL FEED PIPING**

- A. Chemical feed piping shall be as specified in Section 11240 Chemical Feed Equipment, included hereinafter.

### **2.06 WALL PIPE AND SLEEVES**

- A. All wall pipe shall be furnished with cast or welded collar water stops in the positions shown on the Drawings. Welding of water stop collars on pipe shall be accomplished by the wall pipe manufacturer in their shop. All centrifugally cast wall pipe shall be ductile iron meeting the requirements of AWWA C151 for the pipe barrel, conforming to the pressure rating of the pipeline in which installed, and in no case be lighter than Class 53.
- B. All statically cast wall pipe shall be ductile iron meeting the requirements of AWWA C110 for fittings. Mechanical joint end and cast-on flange end wall pipe shall conform to AWWA C110 and threaded flange wall pipe shall conform to AWWA C115. Where flanged or mechanical joint bell ends are flush with the wall, they shall be drilled and tapped for stud bolts which are to be of 300 Series stainless steel.
- C. The length of all wall pipe shall be not less than the thickness of the wall in which installed. Wall pipe shall have the same pressure rating as connecting pipe. All wall pipe shall be cement-mortar lined per AWWA C104. The outside of wall pipes shall be left uncoated and shall be field primed for painting on the portion exposed, uncoated where embedded and field coated with standard bituminous coated where buried.
- D. Contractor may have the option to install wall pipe flush face-to-face of wall in lieu of the dimensioned length wall pipe shown on the Drawings, in order to eliminate form penetrations. This option will be subject to Engineer's review at each wall pipe location and covers both flanged and mechanical-joint bell-end wall pipe. Embedded flanged and M.J. bell-end bolt holes shall be tapped for stud bolts; tapped bolt holes in embedded flanges shall be plugged for protection during concrete pouring.
- E. All pipe wall sleeves shall be plain end galvanized steel pipe of diameter noted on Drawings and length to fit flush face-to-face of wall.

### **2.07 INTERLOCKING LINK PIPE SEALS**

- A. In all locations indicated on the Drawings, interlocking link pipe seals shall be used in lieu of lead packing a pipe wall sleeve. Seals shall be modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and wall sleeve. Links shall be loosely assembled with bolts to form a continuous rubber belt around the pipe with a pressure plate under each bolt head and nut. After the

seal assembly is positioned in the sleeve, tightening of the bolts shall cause the rubber sealing elements to expand and provide an absolutely water-tight seal between the pipe and wall sleeve. Seals shall be "Link-Seal" as manufactured by Thunderline Corporation, Wayne, Michigan, or approved equal.

- B. The Contractor shall determine the required diameter of each individual wall opening according to the manufacturer's recommendations before ordering and installing the seal. Pipe shall be accurately centered in the sleeve and the link seals shall be sized, installed and tightened in accordance with the manufacturer's instructions.

## 2.08 COUPLINGS AND ADAPTERS

- A. Flexible couplings shall be of the sleeve type with a middle ring, two round-wedge shaped rubber gaskets at each end, two following rings together and compress the gasket against the pipe. Flexible couplings shall be steel with minimum wall thickness of the middle ring or sleeve installed on pipe being 5/16-inch for pipe smaller than 10 inches, 3/8-inch for pipe 10 inches or larger. The minimum length of the middle ring shall be 5-inches for pipe sizes up to 10 inches and 7 inches for pipe 10 inches to 30 inches. The pipe stop shall be removed. Gaskets shall be suitable for 250 psi pressure rating or at rated working pressure of the connecting pipe. Couplings shall be harnessed and be designed for 250 psi.
- B. Flanged adapters shall have one end suitable for bolting to a pipe flange and the other end of flexible coupling similar to that described hereinbefore. All pressure piping with couplings or adapters shall be harnessed with full threaded rods spanning across the couplings or adapters. The adapters shall be furnished with bolts of an approved corrosion resistant steel alloy, extending to the adjacent pipe flanges. Flanges on flanged adapter (unless otherwise indicated or required) shall be faced and drilled ANSI B16.1 Class 125.
- C. Flexible couplings and flanged adapters shall be as manufactured by Dresser, Rockwell, or equal, per the following, unless otherwise specified and/or noted on the Drawings:

1. Steel couplings for joining same size, plain-end, steel, cast iron, and PVC plastic pipe -

Dresser	Smith-Blair
Style 253 (2"-15")	411
Style 38/138 (18" & above)	

2. Transition couplings for joining pipe of different outside diameters-

Dresser	Smith-Blair
Style 162 (4"-12")	413 steel (2"-24")
Style 62 (2"-24")	415 steel (6"-48")
	433 cast (2"-16")
	435 cast (2"-12")

3. Flanged adapters for joining plain-end pipe to flanged pipe, fittings, valves and equipment.

Dresser	Smith-Blair
Style 227 cast (3"-12")	912 cast (3"-12")
Style 128 steel (3"-48" D.I. Pipe)	913 steel (3" and C.I. Pipe)
Style 128 steel (2"-96" steel pipe)	

## 2.09 FLANGED JOINTS

- A. Flange bolts and nuts shall be ASTM A 307, Grade B and shall have hexagonal heads. All bolts, nuts and studs for flanged pipe in submerged locations shall be of 300 Series stainless steel.

steel. The flanges shall be drawn together until the joint is perfectly tight, with bolts of a length such that they will not project greater than 1/4-inch from the nut nor fall short of the end of the nut when drawn up. No washers shall be used. Gaskets shall be carefully fabricated prior to installation and must be suitable for pressure rating for the pipe for which it is used.

- B. All flanges (unless otherwise indicated or required) shall be faced and drilled ANSI B16.1 125-pound for ductile iron and ANSI B16.5 150-pound for steel.
- C. At the Contractor's option, and at no additional expense to the Owner, the following patented SBR flange gaskets or approved equal may be substituted for standard sheet packing ring gaskets in ductile iron flanged pipe:
  - 1. TORUSEAL by American Cast Iron Pipe Company
  - 2. FLANGE-TYTE by United States Pipe & Foundry Company

When using such gaskets, flange bolts shall be torqued to manufacturer's recommended torque values.

## **2.10 METAL PIPE SUPPORTS AND HANGERS**

- A. The Contractor shall furnish and install all pipe hangers, inserts, brackets, plates, anchors, and other supports not specifically included under other items. Generally pipe supports are not shown on the Drawings, but shall be supplied as specified herein. However, any bracing or support details shown on the Drawings shall be followed.
- B. Prior to installation, the Contractor shall submit to the Engineer for review, manufacturer's data sheets on all catalogued items to be used and sketches covering all specially designed hanger and support assemblies and fabrications.
- C. Supports and hangers shall be as manufactured by Grinnell, Elcen, or Fee & Mason, or equal or fabricated by the Contractor. Field fabricated supports may be used only for special conditions where manufactured items may not be suitable. In such cases, details of proposed supports shall be submitted to the Engineer for review. All such supports shall be galvanized.
- D. Except as shown on the Drawings or as directed by the Engineer, supports and hangers shall be as follows:
  - 1. Pipes with centerlines less than 24 inches from a wall shall be supported by a typical wall support bracket. Pipes with centerlines less than 6 feet above a floor shall be supported from below. All other pipes shall be hung from above. Piping shall be supported at no greater than 10 feet 0 inches on centers.
  - 2. Pipe supported from underneath shall have adjustable pipe saddle supports on properly sized pipe stanchions. The saddle assembly shall be of cast iron. Standard pipe stanchions with hold-down "U" bolts shall be Grinnell Fig. 259, Elcen Fig. 49, Fee & Mason Fig. 2595, or equal.
  - 3. Hangers are to be suspended from concrete work. Hangers shall be supported from approved metal inserts placed in concrete before the concrete is placed. Standard concrete inserts shall be Grinnell Fig. 281 or 282, Elcen Fig. 86 or 65, Fee & Mason Fig. 186 or 2570, or equal. If special support from overhead concrete is necessary due to unusually heavy loads, support shall be as detailed on the Drawings. In no case shall standard concrete inserts be used where pipe load exceeds the manufacturer's recommended load for the insert, or where the hanger rod exceeds 7/8" diameter.

4. All pipe hangers, inserts, clamps, supports and other like items shall be submitted for review by the Engineer prior to installation.
5. All inside horizontal flanged piping shall be supported with approved split ring type adjustable hangers of malleable iron with suitable hanger rods unless shown otherwise on the Drawings. Special supports shall be constructed in accordance with details shown on the Drawings. Wall supports and/or hangers shall be placed not over 10 feet apart. All piping shall be rigidly supported to prevent loosening under vibration.
6. Pipe, valve operating stems, fixtures and conduits shall be bracketed or suspended from walls, ceilings, and beams at or near valves and fittings and where needed for firm support, by standard brackets, rods, turnbuckles, and rings made especially for pipe of sizes supported. Perforated strap iron and/or copper will not be acceptable.
7. Clevis hangers for "iron pipe size" O.D. pipe shall be Grinnell Figure 65, Elcen Figure 12, Fee & Mason Figure 239, or equal. Clevis hangers for Cast Iron O.D. pipe shall be Grinnell Figure 260, Elcen Figure 12C, Fee & Mason Figure 104, or equal. All clevis hangers shall be galvanized.
8. Turnbuckles shall be forged steel. Rods shall be of black steel, machine threaded of following sizes:

Pipe Size	Rod Diameter
1/2" - 2"	3/8"
2 1/2" - 3"	1/2"
4" - 5"	5/8"
6"	3/4"
8" - 12"	7/8"
14" - 16"	1"
18"	1 - 1/8"
20" - 24"	1 - 1/4"

9. Brackets shall be of standard castings of fabricated steel and shall be reviewed by the Engineer. Standard catalogued bracket shall be medium duty Grinnell Fig. 195, Elcen Fig. 57, Fee & Mason Fig. 151, or equal, galvanized, size as noted on Drawings. Provide light or heavy duty brackets if specifically noted on Drawings. "U" bolts shall be Grinnell Fig. 137, Elcen Fig. 68 or 68A, Fee & Mason Fig. 176, or equal.
10. Column type pipe supports shall consist of pipe columns of size required to carry the full pipe and standard cast iron bases and saddles as required. Saddles shall be of proper size to fit the pipe being supported.

## 2.11 INSULATION AND HEAT TRACING

Where indicated on the Contract Drawings or stated in the specifications, process piping shall be provided with insulation and heat tracing cables.

- A. Insulation shall be one-piece fiberglass section insulation (K=0.23 at 75 degrees F.) with factory applied white reinforced kraft/foil vapor barrier jacket. Longitudinal jacket laps and butt joints shall be self-sealing using 3" wide lap strips. Insulation shall be one of the following:
  1. Johns-Manville "Flame Safe AP-T 500 degrees F."
  2. Owens/Corning "Fiberglass 25 ASJ/SSL".
  3. Certainteed "Fiberglass 500 Degree Snap-On".

Insulation shall be 1" thick, minimum.

**B. Finishing Materials:**

1. Acceptable manufacturers, insulating cement:
  - a. Johns-Mansville No. 375.
  - b. 48 Insulations "Quik-Set".
  - c. Rockwood Mfg. Co. "Delta-Maid One Shot".
2. Acceptable manufacturers, breather mastic:
  - a. Benjamin Foster "Sealfas 30-36".
  - b. Insul-Coustic "Permsure IC-102".
  - c. Vimasco No. 713.
  - d. Childers "Chil-Seal CP-50".
  - e. Epolux "Cadalog 336".
3. Acceptable manufacturers, PVC premolded covers:
  - a. Johns-Manville "Zeston".
  - b. Ceel-Co.

- C. Heat tracing system shall be as specified in Division 15, Thermal Insulation, suitable for use on CPVC or stainless steel pipe, as applicable, and for a temperature range of 40 degrees to 102 degrees. Components of the heat tracing system shall be coordinated as to type, wattage and quantity of cables, type and thickness of insulation, type and diameter of pipe per manufacturer's recommendation.

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION OF PIPING**

- A. Materials shall be new and of the best grade and quality; workmanship shall be first class in every respect.
- B. Each piece of iron pipe and each fitting shall be plainly marked at the foundry with class number and weight.
- C. Where indicated on the Drawings, plain-end pipe shall be joined by means of flanged adapters or flexible couplings which shall be Rockwell, Dresser, or equal.
- D. All pipe couplings shall be designed to safely withstand the operating pressure of the lines in which they are installed. All couplings shall be shop primed with an approved rust inhibitive primer.
- E. Taps and connections to piping shall be made as required to connect equipment, sample lines, etc., and where otherwise shown on the Drawings.

INTERIOR PROCESS PIPING

- F. Piping shall be installed straight and true, parallel or perpendicular to walls, with approved offsets around obstructions. Standard pipe fittings shall be used for changing direction of piping. No mitered joints or field fabricated pipe bends are permitted unless accepted by the Engineer.
- G. All piping, fittings, valves and other accessories shall be thoroughly cleaned of dirt, chips and foreign matter before joint connections are made.
- H. All plastic pipe shall be adequately supported and braced. Support spacing shall not exceed the recommendations of the Plastics Pipe Institute.
- I. Teflon tape shall be used on all plastic pipe threaded connections.
- J. Field cut male threads on plastic pipe shall be made with plastic pipe threading dies.
- K. The annular space of plain wall sleeves shall be packed tight with lead wool to within 3/4" of wall face and then patch grouted flush to wall face with non-staining nonshrink grout, Masterflow 713 by Master Builders, SonogROUT by Sonneborn-Contech, or equal.
- L. All pipe sleeves passing through walls or floors of chlorine feed and storage areas shall be provided with gas tight seals.
- M. All pipe threads shall conform to ANSI B2.1.
- N. Piping shall be erected to provide for expansion and contraction.
- O. Screwed or soldered unions shall be provided in all small piping as required to permit convenient removal of equipment, valves and piping accessories from the piping system.
- P. Dielectric insulating couplings or brass adapters shall be used whenever the adjoining materials being connected are of dissimilar material such as connections between copper tubing and steel pipe.
- Q. All inside piping shall be color coded, stenciled and label tagged for identification as specified in Section 09900.

### **3.02 INSTALLATION OF PIPELINE INSULATION**

- A. Piping:  
  
Butt all joints firmly together and secure all "self-seal" jacket laps with lap adhesive. Seal all butt joints with joint strips furnished with insulation. Taper all pipe insulation ends and cover with insulating cement.
- B. Fittings and valves:
  - 1. Hot lines 2" and smaller: Valves, unions, and flanges shall not be insulated.
  - 2. Hot and cold lines 2-1/2" and larger and cold lines 2" and smaller: Valves, unions, and flanges shall be insulated as follows, but insulation shall be removable to facilitate maintenance.
  - 3. Insulate with molded fiberglass fitting segments of pipe covering, or with firmly compressed fiberglass blanket. Secure in-place with 20 gauge galvanized steel wire and finish with a smooth coating of insulating cement. Pipe sizes under 4" may be insulated with hydraulic cement. All thicknesses shall be equal to that of adjoining pipe insulation.

4. Finish insulation with two (2) 1/16" thick coats of mastic, applied at not more than 15 sq. ft. per gallon and reinforced with white glass fabric embedded between the coats. (Use breather mastic on hot pipe lines and vapor barrier mastic on cold pipelines). Lap the glass fabric on itself and on adjoining pipe insulation.
5. Option: Factory premolded PVC fitting covers may be used. Premolded covers shall overlap the adjoining pipe insulation and jackets and shall be secured at all edges with vapor barrier adhesive on cold pipes. Secure ends of all covers with pressure sensitive vinyl tape which shall overlap both the jacket and the cover at least 1". On fittings where temperature exceeds 250 degrees F., two layers of insulation shall be applied with a few wrappings of twine on the first layer to eliminate any voids or hot spots.

### **3.03 HEAT TRACING SYSTEM INSTALLATION**

- A. Heat tracing system shall be coordinated and installed per manufacturer's recommendations.

END OF SECTION



**SECTION 11295****INTERIOR PROCESS VALVES****PART 1 - GENERAL****1.01 SCOPE OF WORK**

- A. Provide all labor, materials, equipment and services required to furnish and install all new valves as shown on the Drawings and/or specified herein.

**1.02 RELATED WORK SPECIFIED ELSEWHERE**

- A. Pipe, Fittings & Installation: Section 02600
- B. Valves: Section 02640
- C. Interior Process Piping: Section 11290
- D. Valves furnished with equipment are included with equipment specifications.

**1.03 SUBMITTALS**

- A. Descriptive literature, catalog cuts, and dimensional prints clearly indicating all dimensions and materials of construction, shall be submitted on all items specified herein to the Engineer for review before ordering. Comply with provisions of Section 01340.
- B. At the time of submission, the Contractor shall, in writing, call Engineer's attention to any deviations that the submittals may have from the requirements of the Engineer's Contract Drawings and Specifications.

**PART 2 - PRODUCTS****2.01 PLUG VALVES**

- A. All plug valves shall be eccentric plug valves unless otherwise specified.
- B. Valves shall be of the non-lubricated eccentric type with flanged ends faced and drilled per ANSI B16.1 125 lb.
- C. Valve bodies shall be flushing body type and made of ASTM A126 Class B cast iron. Valves shall be furnished with a 1/8" welded overlay seat of not less than 95% pure nickel. Seat area shall be raised, with raised surface completely covered with weld to insure that the plug face contacts only nickel. Screwed-in seats shall not be acceptable.
- D. Plugs shall be made of ductile iron and have a cylindrical seating surface eccentrically offset from the center of the plug shaft. The interference between the plug face and body seat, with the plug in the closed position, shall be externally adjustable in the field with the valve in the line under pressure. Plug shall be resilient faced with neoprene or hycar, suitable for use with sewage.

- E. Valves shall have replaceable sleeve type bearings and grit seals at the upper and lower journals.
- F. Valve shaft seals shall be of the multiple V-ring type and shall be externally adjustable and repackable without removing the bonnet or actuator from the valve under pressure. Valves utilizing O-ring seals or non-adjustable packing shall not be acceptable.
- G. Valve pressure ratings shall be 175 psi through 12" and 150 psi for 14" through 72". Each valve shall be given a hydrostatic and seat test with test results being certified when required by the specifications.
- H. Manually operated valves 4-inch and larger shall have a worm gear actuator, stainless steel input shaft and handwheel operator. Manually operated valves 3-inch and smaller shall have a lever operator. All gearing shall be enclosed in a semi-steel housing and be suitable for running in a lubricant with seals provided on all shafts to prevent entry of dirt and water into the actuator. The actuator shaft shall be stainless steel and the quadrant shall be supported on permanently lubricated bronze bearings. Actuators shall clearly indicate valve position and an adjustable stop shall be provided to set closing torque and to provide seat adjustment to compensate for change in pressure differential or flow direction change. All exposed nuts, bolts and washers shall be stainless steel.
- I. Any cylinder actuators shall be equipped with 2-inch square operating nuts to allow manual valve operation in case of supply failure. Electric motor actuated valves shall comply with specification Section 13400.
- J. Valves shall provide drip tight shutoff up to the full pressure rating. Valves shall be provided with adjustable limit stops and rotate 90 degrees from fully opened to fully closed.
- K. Valves located 6 feet or more above the floor shall be furnished with chain wheel operators.
- L. Valves shall have rectangular port openings for throttling service, and shall open to 100% of the corresponding pipe diameter.
- M. Plug valves shall be as manufactured by DeZurik, GA Industries, Inc., or approved equal,

## **2.02 GATE VALVES**

- A. Gate valves 4" and larger shall conform with AWWA C-509 standard, and shall be of the resilient seat type, iron body, fully bronze mounted, non-rising stem and have a design working pressure of 200 psi. Valves shall be of standard manufacturer and of the highest quality both as to materials and workmanship.
- B. Valves ends shall be flanged and shall conform to ANSI B16.1 class 125 and be handwheel operated, unless otherwise shown on the Drawings or specified hereinafter.
- C. An epoxy coating conforming to AWWA C-550 shall be applied to the interior and exterior ferrous surfaces of the valve except for finished or seating surfaces.
- D. All gate valves shall have the name or monogram of the manufacturer, the year the valve casting was made, the size of the valve, and the working water pressure cast on the body of the valve.
- E. Gate valves shall be as manufactured by Mueller Co., M&H, Clow, American Valve & Hydrant, Kennedy, or equal.

**2.03 CHECK VALVES**

- A. The valve is a counterweighted, rubber seated check valve with attached cushion chamber whose function is to permit flow in only one direction, close tightly when its discharge side pressure exceeds its inlet pressure, and to close without a slam or bang.
- B. The swing check valve shall be constructed with heavy cast iron or cast steel body with a bronze or stainless steel seat ring, a non-corrosive shaft for attachment of weight and lever, and complete non-corrosive shockless chamber.
- C. It shall absolutely prevent the return of water, oil or gas back through the valve when the inlet pressure decreases below the delivery pressure. The valve must be tight seating, and must be shockless in operation. The seat ring must be renewable.
- D. The cushion chamber shall be attached to the side of the valve body externally and so constructed with a piston operating in a chamber that will effectively permit the valve to be operated without any hammering action. The shock absorption shall be by air, and the cushion chamber shall be so arranged that the closing speed will be adjustable to meet the service requirements.
- E. The valve disc shall be of cast iron or cast steel and shall be suspended from a non-corrosive shaft which will pass through a stuffing box and be connected to the cushion chamber on the outside of the valve.
- F. All material and workmanship shall be first class throughout and the purchaser reserves the right to inspect this valve before shipment.
- G. The valves will be GA Industries, Inc. Fig. No. 250-D, 125# or equal.

**2.04 ELECTRONIC SURGE ANTICIPATOR VALVES**

- A. Surge Anticipator shall consist of a main valve assembly with a pilot system of electro-hydraulic controls, and a pre-wired electronic control panel, each completely assembled, tested and ready for field installation and wiring.
  - 1. Main valve body shall be globe style, constructed of ductile iron conforming to ASTM A536 with integral flanges faced and drilled to ANSI B16.42 Class 300 or Class 125 as indicated on the drawings. The valve shall be "full-ported" with a flow area through the valve no less than the area of its nominal pipe size and have an integral bottom pad or feet to permit support directly beneath the body.
  - 2. The main valve shall operate on the differential piston principle such that the area on the underside of the piston is no less than the pipe area and the area on the upper surface is greater than that of the underside. There shall be no diaphragms or springs in the main valve.
  - 3. The valve piston shall be fully guided on its outside diameter and all guiding and sealing surfaces shall be bronze. To minimize the consequences of throttling, throttling shall be by long, stationary vee-ports located downstream of the seat and not by the seat itself. Sawtooth attachments or other add-on devices are not permitted.
  - 4. The valve shall be fully capable of operating in any position without the need of springs and shall not incorporate stems, stem guides or spokes in the waterway. A visual position indicator shall be provided.

5. The main valve shall be serviceable in the line through a single flanged cover which provides easy access to all internal components.

#### B. Pilot System

1. Provide a system of pilots and controls to enable the valve to perform the function listed below.
2. System shall include a normally closed, direct-acting, diaphragm operated, spring loaded bronze pressure relief pilot. Pilot shall be easily field adjustable from near zero to a minimum of 10% above the factory setting. Controls shall include 24VDC solenoid, adjustable closing speed control, y-strainer, pilot isolating valves a SPDT double break limit switch mounted on the valve cover and actuated by the indicator rod, a SPDT pressure switch and pressure gauge.
3. All controls and control piping shall be non-corrosive and suitable for the working pressure.

#### C. Electronic Control Panel

1. The electronic controls shall be housed in a NEMA 12 steel enclosure with a provision for a padlock. All components shall be of industrial or military quality. All components shall be mounted on a removable sub-panel and pre-wired to plainly labeled terminal blocks with grounding terminal and connections to external 120VAC power supply.
2. Electric power for the operation of the control panel shall come from an internal power supply consisting of a fused 24VDC heavy duty NiCad battery of one ampere-hour capacity. A constant current battery charging circuit shall assure the battery is fully charged. A battery condition circuit shall monitor the battery status and indicate the battery condition by means of an LED in the enclosure door. A green light indicates normal battery and charging circuit condition, a red light indicates abnormal battery or charging circuit condition or a blown fuse.
3. A manual test switch shall be provided with a guard to prevent inadvertent operation and an easily accessible mode switch shall allow the selection of one of two operating modes.
4. A manually adjustable, digital surge wave timer with visual indication of the timing sequence shall be provided with a range of 0 to 99.9 seconds. Timers requiring programming to set or change adjustment are not acceptable. An adjustable valve delay timer shall be provided to preclude premature valve operation during pump start-up.
5. Provisions shall be made for a "last pump off" feature to preclude valve operation when no pumps are running.
6. The control panel shall indicate valve status by means of amber, green and red indicating lights in the enclosure door. Lights shall be 20,000 hour rated and oil-tight. The red and green light shall be "split lens." An auxiliary relay shall provide a means of remote indication of any "red" emergency conditions.

#### D. Function

1. The electronic surge anticipator valve shall function to control surges associated with the stopping of pumps. The valve shall have two operating modes selected by the position of a switch inside the control panel. In Mode "A" the control panel shall open the valve fully in response to a sensed downsurge pressure as set on a pressure switch, whenever a pump is running and for 30 seconds after a power failure or the last pump is shut down. The valve shall remain open for a pre-

determined period of time as set on the digital surge wave timer, and then close slowly at an adjustable speed as set on the closing speed control. In mode "B" the control panel shall respond as in "A" with the additional feature of opening the valve fully anytime there is a power outage when a pump is running and for 30" seconds after the last pump is shut down. The valve shall also open as necessary in response to a surge pressure not preceded by a power outage or a downsurge low enough to trip the pressure switch.

E. Manufacturer

1. The equipment shall be GA Industries, Inc. Figure EG5001-U Surge Sentinel, or approved equal.

## **2.05 VALVE OPERATORS**

- A. Valve operators shall be as shown on the plans and specified herein and in Section 13420. Special operators where shown on the plans shall be furnished under this item and Section 13420. Valves shall be positioned to provide for the most convenient position of the actuator possible.
- B. Valves located six (6) feet or more from floor level shall be furnished with chain wheel operators or chainlevel operators. Chains shall extend to within four (4) feet off the floor. All NRS floor stands and geared operators shall be indicating type.

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION**

- A. All valves shall be installed in accordance with the manufacturer's recommendations.

### **3.02 MANUFACTURER'S FIELD SERVICE**

- A. Manufacturer's authorized representative shall be present at the jobsite for assistance during equipment start-up and to train owner's personnel in the operation, maintenance and troubleshooting of the equipment provided.

END OF SECTION



## SECTION 13300

### TELEMETRY

#### SECTION 13300 – TELEMETRY EQUIPMENT

##### PART 1 - GENERAL

###### 1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions apply to work of this section.
- B. Division 16 Basic Electrical Materials and Methods sections apply to work specified in this section.

###### 1.2 SUMMARY:

- A. Extent of instrumentation and control equipment work is indicated by drawings and schematics, and is hereby defined to include, but not by way of limitation, control panels, recorders, transmitters, flow meters etc.
- B. Types of instrumentation and control equipment specified in this section include the following:
  - 1. **Diamond Ridge Tank RTU-6 Upgrade**
  - 2. **Diamond Ridge Booster Station RTU-12 Upgrade**
  - 3. **New Tank Level Transmitter Panels (3 ea.)**
  - 4. **New Radio's for Existing RTU's (7 ea)**
  - 5. **Rt. 504 West Tank Remote Transceiver Unit 7 (RTU-7) Upgrade**
  - 6. **Rt. 504 East Tank RTU-8 Upgrade**
  - 7. **New RTU Antennas on KY 504 East and West**

**The radio modems shall be Calamp Guardian 100 VHF radio modems, and each shall include A male DB9 to RG45 adapter with 3' cat5e cable, and coax jumper cable with male TNC and male N connections, 3 foot long.**

- C. Refer to other Division-16 sections for wires/cables, electrical boxes and fittings, and wiring devices which are required in conjunction with instrumentation and control equipment work; not work of this section.
- D. The Electrical Contractor shall have the responsibility for the installation of instrumentation and control wiring conduits and cables. This work to be part of the electrical work specified elsewhere under Division 16. Such electrical work must be installed in accordance with the requirements of the Instrumentation and Controls System supplier.

###### 1.3 SUBMITTALS:

- A. Product Data: Submit manufacturer's data on instrumentation and control equipment and

## SECTION 13300

### TELEMETRY

components.

- B. Shop Drawings: Submittals shall be bound in 8-1/2" x 11" booklet with fold-out 11" x 17" wiring schematics. The booklet shall contain a list of all components proposed in the pump control and monitoring system and contain manufacturer's specifications and information on each item.
- C. Wiring Diagrams: Submit wiring diagrams for instrumentation and control equipment and components showing control and interconnection wiring, including connections to equipment components and electrical power feeders. Diagrams shall be drawn from the latest version of AUTOCAD. A disk containing these drawings shall be furnished to the Engineer for submittal review and record drawings. Differentiate between portions of wiring that are manufacturer-installed and portions that are field- installed. These drawings shall be coordinated with other specialty panels, motor control centers, and subsystems not included in this section but interconnected to form a finished operational system. When the job is completed, a fully documented record of this interconnected system shall be furnished to the Owner and shall be labeled as "Record Drawings".
- D. Maintenance Manuals: Furnish six (6) sets of installation, operations and maintenance manuals which contain equipment cuts, operating instructions, troubleshooting procedures, and spare parts list for equipment. Ensure manuals include operating instructions.
- E. Bill of Materials: Submit a complete "Bill of Materials" to provide adequate information by manufacturer and specifications to permit an exact duplicate maintenance replacement item to be obtained without additional data.

#### 1.4 QUALITY ASSURANCE:

- A. Manufacturer's Qualifications: The SCADA Control/RTU's shall be furnished by Evoqua Water Technologies (formerly Siemens Water Technologies of Vadnais Heights, MN and represented by The C. I. Thornburg Co. of Huntington, WV for compatibility with the Rattlesnake Ridge Water District's existing water treatment plant and distribution SCADA system.
- B. Installer's Qualifications: Firm with at least 5 years of successful installation experience on projects with instrumentation and controls equipment work similar to that required for this project.
- C. Agreement to Maintain: Engage Installer who is willing to execute with the Owner, at Owner's discretion, an agreement for continued maintenance of instrumentation and controls equipment upon expiration of warranty period.

#### 1.5 WIRING REQUIREMENTS

- A. The equipment shall be constructed in compliance with Underwriter's Laboratories Industrial Control Panels listing and following-up service, utilizing U.L. listed and recognized components where applicable. The panels shall be integrated from a UL508 Listed Control Panel manufacturing facility and document as such in the project submittals.



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### TELEMETRY

- B. All wiring shall be minimum 600 volt UL type MTW or AWM and have a current-carrying capacity of not less than 125% of the full load current. The conductors shall be in complete conformity with the national electric codes, state, local and NEMA electrical standards. For ease of servicing and maintenance, all wiring shall be color-coded. The wire color code shall be clearly shown on the drawings, with each wire's color indicated.
- C. All control wiring shall be contained within plastic/PVC wiring duct with covers. Where dimensional constraints prevent the use of wiring duct, wires shall be trained to panel components in groupings. The wire groupings shall be bundled and tied not less than every 3 inches with nylon self-locking cable ties as manufactured by Panduit or equal.
- D. Every other cable tie shall be fastened to the enclosure door or inner device panel with a cable tie mounting plate with pressure tape. Where wiring crosses hinged areas such as when trained from the inner device panel to the enclosure door, spiral wrap shall be used.

#### 1.6 INCOMING SERVICE

- A. The existing incoming service for each of the RTU's to be upgraded is listed below:
  - 1. All locations – 120 volt, 1 phase, 3 wire (Existing)
- B. The incoming power service to the new RTU panel will be fed from the existing distribution panel at either tank or booster locations.
- C. All metering shall be done ahead of the main disconnect and control panel. The meter shall be existing or installed by the Owner in accordance with company requirements.

#### 1.10 SYSTEM RESPONSIBILITY

- A. Basis of Design: The drawings and specifications have been developed based on a Controls and Instrumentations System supplied by The C.I. Thornburg, Inc., Huntington, West Virginia and manufactured by Evoqua Water Technologies (formerly Siemens Water Technologies) of Vadnais Heights, MN. Any costs resulting from changes made necessary by the approval of other systems shall be borne by the Contractor. This shall include all design work and drawing and specification revisions by the Engineer. Also, the Contractor shall submit drawings to the Engineer for approval showing all changes made necessary by the other equipment.
- B. Responsibility: To ensure that all equipment required for the installation of the Controls and Instrumentation System is properly coordinated and will function as a unit in accordance with the intent of these specifications, the Contractor shall obtain all the equipment specified under this Section from a single supplier in whom the responsibility for the proper function of all the equipment, regardless of manufacturer, as an integrated and coordinated system shall be vested. The intent of this paragraph is to establish unit responsibility for all equipment with the Controls and Instrumentation System supplier. The use of the word "responsibility" relating to the equipment supplier is in no way intended to relieve the Contractor's ultimate responsibility for equipment coordination, installation, operation, and guarantee.

#### 1.11 DELIVERY, STORAGE AND HANDLING:

### TELEMETRY EQUIPMENT

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### TELEMETRY

- A. Deliver instrumentation and controls equipment and components in factory- fabricated type containers or wrappings, which properly protect equipment from damage during transit, storage, and installation.
- B. Store instrumentation and controls equipment in original packaging and protect from weather and construction traffic. Store indoors and in accordance with manufacturer's recommendations.
- C. Handle instrumentation and controls equipment carefully to prevent physical damage to equipment and components. Do not install damaged equipment; remove from site and replace damaged equipment with new.

## PART 2 - PRODUCTS

### 2.1 SUPPLIERS:

- A. Available Suppliers: Subject to compliance with requirements, suppliers offering products which may be incorporated in the work include, but are not limited to the following:
  - 1. The C. I. Thornburg Co., Inc., Huntington, West Virginia representing Evoqua Water Technologies (formerly Siemens Water Technologies) of Vadnais Heights, MN
  - 2. Another manufacturer who can supply Instrumentation and Controls System that has equivalent qualities complying to specifications. The equivalent equipment and components must be compatible to the District's existing SCADA system communications protocol and integrated without changing the existing protocol or adding parallel system components. The Engineer shall evaluate this product to determine compliance to specifications.

### 2.2 PROJECT SCOPE

- A. The upgraded RTU's listed will control and monitor booster station status and alarms, plus monitor tank level and alarms at tank RTU's as listed in the Input/Output table shown at the end of this section. The status and alarms listed shall be transmitted to the existing RRWD Water Treatment Plant Master Transceiver Unit (MTU) and displayed on the existing HMI Computer for notification in the existing alarm notification software and logging in existing reporting software.
- B. The control and instrumentation equipment shall consist of the following:

***Unit A – Water Storage Tank RTU Upgrades (3 ea., Route 504 West and Route 504 East Tanks, and Diamond Ridge Tank)***

Three (3) new/upgraded Water Storage Tank RTU panels shall be furnished and installed at the referenced locations to monitor tank level status and alarms and transceive data to and from the RRWD WTP MTU via radio telemetry. The tank RTU panels shall be powered by 120 volts AC incoming service with battery backup and enclosed in Nema 4 enclosure. The RTU shall include VHF radio yagi antenna and coax cable.

***Unit B - Water Booster Station RTU Upgrades (1 ea., Diamond Ridge Booster Station RTU)***

## TELEMETRY EQUIPMENT

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### TELEMETRY

One (1) new/upgraded Water Booster Station RTU panel shall be furnished and installed at the referenced location to control the booster pumps, monitor status and alarms and transceive data to and from the RRWD WTP MTU via radio telemetry. The booster station RTU panel shall be powered by 120 volts AC incoming service with battery backup and enclosed in Nema 4 enclosure. The RTU shall include VHF radio yagi antenna and coax cable.

#### ***Unit C – Water Storage Tank Level Transmitter Panels (3 ea.)***

Three (3) new Water Storage Tank Level Transmitter Panels shall be furnished and installed at the upgraded tank RTU locations. The panels shall consist of a pressure gauge, shut off and bleed valves, terminals, tubing and stainless fittings, and 2-wire Dwyer 673 pressure transmitter with range to correspond to tank overflow height, plumbed and wired within a Nema 4X fiberglass enclosure.

## 2.3 PRODUCT SPECIFICATIONS

### A. NEW REMOTE TRANSCEIVER UNITS (RTUS)

1. The new Remote Transceiver Units (RTU) / Controllers shall be Model LC2000 as manufactured by Evoqua Water Technologies (formerly Siemens Water Technologies) as currently operating in the Rattlesnake Ridge Water District's SCADA system.
2. Expansion modules and output relays shall be furnished as required per the I/O tables shown herein.
3. The RTU controller shall be mounted within a Nema 4 enclosure.

### B. ENCLOSURES

1. The described RTU equipment shall be housed in U.L. listed enclosures properly sized to accommodate all control elements. Appropriate NEMA type enclosures shall be provided to meet the particular environmental requirements of each location as herein specified.
2. The described equipment shall be housed in a U.L. listed NEMA 4 wall mounted enclosure properly sized to accommodate all control elements. The enclosure shall be constructed of not less than 14 gauge galvanized steel. The enclosure shall have an ASA 49 dark gray enamel coating inside and out and shall include the following features:
  1. Protection for outdoor installation against rain, sleet and snow
  2. Drip shield top and seam free sides, front & back
  3. 16 gauge galvanized steel continuous hinge with stainless steel pin
  4. Cover fasteners with captive plated steel screws
  5. Hasp and staple for padlocking
  6. Oil-resistant door gasket attached with oil resistant adhesive
  7. Collar studs shall be provided for mounting inner panel

## SECTION 13300

### TELEMETRY

#### C. RADIO MODEMS AND ANTENNAS

1. Radios to be furnished with the new RTU/Control panels shall be Calamp Model Guardian 100 P/N 140-5016-500 VHF radio modem programmed for operating on the RRWD's existing sewage pump station licensed VHF frequency, and identical to the District's existing telemetry radios.
2. The radios are to be furnished with the proper cable and connected to a bulkhead lightning arrestor mounted in the enclosure back panel.
3. Yagi directional antennas shall be furnished and installed with each RTU. The yagi antennas shall be 3-element for VHF frequencies, 9.2 dbi gain minimum with "N" type female coax connection. The antenna shall be tuned to the District's existing VHF licensed frequency, and mounted on a vertical 1-1/4" aluminum conduit section secured to the side of the new panel backboard assembly. The antenna shall be a Maxrad Model MYA-1503 or equal.
4. The proposed communication path for the RTU's shall be configured by the supplier and programmed for a reliable data transfer to the RRWD WTP MTU.

#### D. RTU ACCESSORIES

1. The following components shall be furnished, mounted and wired within the new RTU panels, and tested prior to shipment:
  - a. Allen-Bradley Model 1606-XLP50B 120-15VDC Power Supply
  - b. Transtronics BVUP12PFA Battery Charging/Power Fail Relay and base
  - c. Powersonic PS1270 Battery
  - d. Phoenix 2856812 Surge Protector
  - e. Ingram MHS-15 Condensation Heater, 120 vac
  - f. Ingram HTS Heater Thermostat
  - g. Digital Input Fuse Holder and Fuse, 0.5 amp
  - h. Allen-Bradley 1489-M1C150 Circuit Breaker, 15 amp, 1 pole
  - i. Polyphaser IS-B50 LN-C1 Coax Bulkhead N female x N female
  - j. DIN-rail mounted wiring terminals
  - k. Evoqua ILK-ISOLINK-2 Analog Isolator (one for each analog input per the I/O Table)

#### **RTU INPUT-OUTPUT TABLES**

#### **LOCATION - WATER STORAGE TANK RTU'S (RT 504 EAST, RT 504 WEST AND DIAMOND RIDGE)**

<b><u>I/O DESCRIPTION</u></b>	<b><u>I/O TYPE</u></b>	<b><u>I/O SOURCE</u></b>
Power Fail	DI-1	Battery Charging / Power Fail Relay
Spares	DI-2 thru 12	Spares

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### TELEMETRY

Tank Level (ft.)	AI-1	New Tank Level Transmitter
Spares	DO-1 thru DO-6	Spares

#### **LOCATION – WATER BOOSTER STATION RTU (DIAMOND RIDGE BOOSTER)**

<b><u>I/O DESCRIPTION</u></b>	<b><u>I/O TYPE</u></b>	<b><u>I/O SOURCE</u></b>
Pump No. 1 Run	DI-1	Exist. MS Aux Contact
Pump No. 2 Run	DI-2	Exist. MS Aux Contact
Pump No. 1 in Auto	DI-3	New HOA Aux Contact
Pump No. 2 in Auto	DI-4	New HOA Aux Contact
Pump No. 1 Overload	DI-5	Exist. MS Overload Relay
Pump No. 2 Overload	DI-6	Exist. MS Overload Relay
Low Suction Pressure Alarm	DI-7	Exist. Pressure Switch
Power Fail	DI-8	New battery charger/power fail relay
Spares	DI-9 thru 12	Spares
Suction Pressure (psi)	AI-1	Future Pressure Transmitter
Discharge Pressure (psi)	AI-2	Future Pressure Transmitter
Station Flow (gpm)	AI-3	Existing Station flow meter
Pump No. 1 Required	DO-1	RTU Relay
Pump No. 2 Required	DO-2	RTU Relay
Spares	DO-3 thru DO-6	Spares

(Note: I/O type designations: AI = analog input, AO = analog output, DI = digital input, DO = digital output, SD = software/RTU derived)

#### 2.4 SPARE PARTS

A. The Contractor shall furnish the following spare parts:

1. One (1) radio modem
2. One (1) power supply

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### TELEMETRY

3. One (1) RTU controller

#### PART 3 - EXECUTION

##### 3.1 EXAMINATION

- C. Examine areas and conditions under which instrumentation and control equipment is to be installed and notify Contractor in writing of conditions detrimental to proper completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

##### 3.2 INSTALLATION OF INSTRUMENTATION AND CONTROL EQUIPMENT

- C. Install instrumentation and control system components and ancillary equipment as indicated, in accordance with equipment manufacturer's written instructions, and with recognized industry practices, to ensure that instrumentation and control equipment complies with requirements.
- D. Coordinate with electrical work, including raceways, conduits, electrical boxes and fittings, as necessary to interface installation of instrumentation and control system work with other work.
- E. Tighten electrical connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Standards 486A and 486B.

##### 3.3 GROUNDING

- A. Provide equipment grounding connections for lighting control equipment as indicated and/or required. Tighten connectors to comply with tightening torques specified in UL Standard 486A to assure permanent and effective grounding.

##### 3.4 FIELD QUALITY CONTROL

- A. Upon completion of installation and after system has been energized, demonstrate capability and compliance of system with requirements. Where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and proceed with retesting. Testing and retesting at no cost to Owner.

##### 3.5 PERSONNEL TRAINING

- A. Personnel Training: Train Owner's personnel in procedures for starting-up, testing and operating instrumentation and control system equipment as follows:

#### TELEMETRY EQUIPMENT

## **SECTION 13300**

### **TELEMETRY**

1. Furnish the services of an experienced engineer for a period of not less than two (2) eight (8) hour working days to inspect the installation of the equipment, provide start-up and calibration services, and instruct the operator on maintenance and operation procedures.

**SECTION 15000****BASIC MECHANICAL REQUIREMENTS****PART 1 - GENERAL****1.01 WORK INCLUDED**

The work in this section shall include all labor, materials, equipment and services required to construct and install the complete and operable mechanical systems. The omission of express reference to a complete installation shall not be construed as releasing the Contractor from providing such parts or work as may be required.

**1.02 REFERENCES**

The chemical and physical properties of all materials and the design, performance characteristics and methods of construction of all items of equipment shall be in accordance with the requirements of the latest issue of the various applicable Standard Specifications. These Standard Specifications have been prepared by authorities which are recognized by the Mechanical Trades. The names of these authorities are listed below together with the abbreviation of their names as they may appear in these Specifications.

- A. American National Standards Institute (ANSI)
- B. American Society for Testing and Materials (ASTM)
- C. National Fire Protection Association (NFPA)
- D. Air Movement and Control Association (AMCA)
- E. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE)
- F. American Society of Mechanical Engineers (ASME)
- G. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA)

**1.03 PERMITS AND INSPECTIONS**

- A. Contractor shall obtain all permits and inspections necessary for completion of work under this division and pay all legally authorized fees.
- B. Contractor shall furnish three copies of all required inspection certificates before requesting final payment.

**1.04 CODE COMPLIANCE**

- A. Contractor shall complete all work in accordance with applicable State and Local regulations including but not limited to the following:
  - City, State and County Building Inspector
  - National and Local Electrical Codes
  - National Fire Protection Association
  - State Department of Health
  - State Plumbing Code



Air Pollution Board  
 Kentucky Standards of Safety  
 Local Insuring Agency  
 National Sanitation Foundation

- B. Systems, equipment and materials furnished or provided by this Contractor shall be in accordance with applicable State and Local regulations.
- C. Systems, equipment or materials furnished or provided by this Contractor shall not be considered substantially complete if work is not in accordance with State and Local regulations.

#### **1.05 EXAMINATION OF SITE**

- A. Contractor shall visit the site and acquaint himself with the working conditions. Contractor shall accept conditions as they exist on bid date. Claims for labor and material required for difficulties encountered, which could have been foreseen had an examination been made, will not be recognized.
- B. Contractor shall notify the Architect/Engineer immediately of any existing field conditions not compensated for in the contract drawings and/or specifications. Any work not shown on Contract Drawings which is performed without proper authorization shall make Contractor responsible for correction, addition, and/or deletion as may be later called for by the Architect/Engineer.

#### **1.06 SUBMITTALS**

- A. General shop drawing submittals will be required for all plumbing fixtures and mechanical equipment as specified in the following specification sections.
- B. All shop drawings shall be checked and noted accordingly by the Contractor before submitting same to the Engineer for his review.
- C. No equipment shall be ordered or fabricated without formal approval of submitted shop drawings.

### **PART 2 - PRODUCTS**

#### **2.01 GENERAL**

- A. Products shall be as specified in Division 15 and in the following sections of these Specifications for specific mechanical products used in the Work.
- B. Products containing asbestos shall NOT be used.

### **PART 3 - EXECUTION**

#### **3.01 CONSTRUCTION SAFETY**

This Contractor assumes responsibility for the safety of his personnel. The Contract Documents do not include materials, procedures, components, etc., required to insure construction safety. Refer to the General Conditions and Supplementary General Conditions for additional information.

### **3.02 ASBESTOS**

This Contractor shall instruct all personnel, including those of any sub-contractors, that should any material suspected of containing asbestos be observed that all work shall stop immediately and all personnel shall vacate the premises. This Contractor shall then notify the Architect/Engineer and await further instructions. This Contractor assumes all liability for failure to notify personnel of potential hazards and procedures.

### **3.03 CONTRACT DRAWINGS**

- A. Scale of drawings is approximate. Exact locations, dimensions, and elevations shall be governed by field conditions. Make field measurements of building before fabricating equipment or materials.
- B. Drawings are based on physical dimensions of one or more manufacturer's equipment. Other approved equipment shall be of such dimensions that it can be readily installed in available space with ample clearance for proper maintenance and operation.
- C. Intent of drawings is to show systems and sizes. Drawings do not necessarily show all required offsets. Work shall be installed to conform with space limitations. Offset, transformation, fittings, etc. shall be provided where required to attain this objective.
- D. Refer to other drawings for construction of building, work in other sections and floor and ceiling elevations.
- E. Failure to notify the Architect/Engineer inconsistencies in the Contract Documents shall make the Contractor subject to either method as may be later called for the Architect/Engineer.

### **3.04 ORDER OF WORK**

Contractor shall organize work to cause least disturbance possible to operation of any building, service or system on site. When necessary to interrupt services, time of interruption shall be approved by Owner. Extras for differences between regular and overtime pay shall be allowed only when work is authorized to be accomplished at a time other than regular working hours. Work shall be scheduled to coincide with and cause the least possible disturbances to other Contractor's work and schedules.

### **3.05 COOPERATION**

- A. Cooperate with other trades to obtain the most practical arrangement of work. Become familiar with drawings before starting work.
- B. Make known to other trades intended positioning of materials and intended order of work. Coordinate work with other trades and proceed with the installation to assure no delays to other trades. Determine intended positions of work of other trades and intended order of installation.

### **3.06 WORKMANSHIP**

Work shall be performed only by mechanics and tradesmen skilled and working within their respective trades and shall present appearance typical of the best trade practices. Work not installed in this manner shall be repaired, removed or replaced, or otherwise remedied at Contractor's expense as directed by Architect/Engineer.

**3.07 GUARANTEE**

- A. Labor and materials entering into this contract shall be guaranteed for a period of one year from date of acceptance. Date of acceptance shall be date of voucher for final payment. Owner reserves right to use equipment installed prior to date of final acceptance. Use of equipment by Owner shall in no way invalidate guarantee except Owner shall be liable for damage to equipment during this period due to negligence of his operator or other employees.
- B. This guarantee shall further provide that in the event of a failure of any system or its component equipment items or the improper functioning thereof, during the period of this guarantee. This Contractor shall have available an "on call" competent service personnel for the restoration of all systems and equipment for complete operation. Should the nature of the failure be such as to present an emergency in the opinion of the Owner, such personnel shall be promptly available, regardless of the hour of the day or day of the week. Should the failure be such as to fall under the guarantee, the cost of the service shall be borne by this Contractor, otherwise the Owner will pay therefor at the prevailing rate for such service.
- C. Should this Contractor fail to make such service personnel promptly available "on call" the Owner may employ such personnel as are available to him at the expense of this Contractor.

**3.08 MANUFACTURER'S INSTALLATION INSTRUCTIONS**

All equipment shall be installed in strict accordance with the manufacturer's installation instructions.

**3.09 PROTECTION OF EQUIPMENT AND MATERIALS**

This Contractor shall continuously maintain adequate protection of all equipment and materials. Equipment and materials, located inside or outside, shall be tightly covered with sheet polyethylene or waterproof tarpaulin as protection against dirt, rust, moisture and abuse from other trades. Equipment and materials shall not be stored directly on the ground. Equipment, ductwork and piping shall not be used as supports for scaffolds or personnel. Repairs made necessary by damage shall be paid for by this Contractor.

**3.10 CUTTING AND PATCHING**

- A. Unless otherwise indicated do all cutting and patching required for installation of work. All openings not requiring lintels shall be cut and patched by mechanical contractor. Openings requiring lintels for ductwork, grilles, louvers, etc. in vertical walls both new and existing shall be provided by this Contractor. Patching of these openings shall be by this Contractor.
- B. Do no more cutting than necessary. Cutting of structural members or exposed surface of concrete block shall not be permitted without written approval of Engineer.
- C. Cut pipe openings in floor slabs with core drill. Scribe cut edges of trenches or openings in slabs with masonry saws.
- D. Where necessary to remove exterior walks, paving, or lawns, they shall be returned to their original surfaces.
- E. Only skilled mechanics and tradesmen shall do patching and finishing required to match surrounding surfaces.

**3.11 PAINTING**

- A. All painting except "touch-up" shall be provided under the painting section (Division 9) unless noted otherwise. All exposed piping, equipment, etc., shall be left clean and free from rust or grease and ready for the painter.
- B. Where equipment finishes are damaged, this Contractor shall obtain touch-up paint in matching colors from the equipment manufacturer and paint as required.

**3.12 LUBRICATION**

This Contractor shall provide all lubricants for the operation of all equipment until acceptance. The Contractor shall protect all bearings during installation of equipment and shall thoroughly grease steel shafts to prevent corrosion. All motors and other equipment shall be provided with covers as required for proper protection during construction. All equipment bearings requiring frequent or periodic lubrication shall be provided with proper fittings for this purpose. Where equipment requiring such lubrication is not readily accessible due to position or location, extensions shall be provided in addition to lubrication fittings.

**3.13 EQUIPMENT CONNECTIONS**

- A. This Contractor shall bring all required mechanical services to all equipment furnished under other sections of this Specification or by the Owner, make final connection, and leave equipment ready for operation.
- B. When the Contractor is uncertain about the method of installation, proper location, etc., he shall ask for further instructions or details. Failure to request such information will not excuse non-compliance.

**3.14 TESTS**

This Contractor shall conduct all specified tests until approved by the Engineer. All tests shall be repeated until approved by the Engineer. Piping systems shall not be covered or otherwise concealed until tests have been made and approvals obtained. This Contractor shall notify the Architect four days prior to testing to allow for scheduling. Tests shall be conducted as specified in applicable sections.

**3.15 CLEAN-UP**

- A. Before final acceptance of work, clean and restore all road surfaces, sidewalks, and other areas leaving them in a neat, clean and usable condition as originally found. Remove all machinery, tools, surplus materials, dirt, sand, temporary building, and other structure from the site. All manholes and other appurtenant structures shall be cleared of all scaffolding, rubbish and dirt. Existing road and walks cut or damaged shall be restored and repaired to the satisfaction of the Architect/Engineer.
- B. Equipment, fixtures, diffusers, grilles and exposed piping and supports shall be cleaned to the satisfaction of the Architect/Engineer before the project can be considered Substantially Complete.

**3.16 AS-BUILT DRAWINGS**

The Contractor will furnish one (1) set of prints which will be on file in the field office. These prints shall be kept and maintained in good condition at the site of the project and a qualified representative of the Contractor shall record on these prints from day to day as the work progresses, all changes, alterations and deviations from the contract drawings with special emphasis on the exact final location of all

underground utilities by offset distances to surface improvements such as building corners, curbs, etc. Entries and notations shall be neat, legible and permanent. Those prints shall be delivered to the Architect/Engineer upon completion of the project. Approval of final payment will be contingent upon compliance with these provisions.

### **3.17 OPERATING AND MAINTENANCE MANUALS**

Provide four (4) copies of operating and maintenance manuals. Manuals shall be bound in large ring loose-leaf binders and contain the following:

- A. Manufacturer's instructions and/or installation manual.
- B. Manufacturer's service manual.
- C. Manufacturer's lubrication chart listing types of lubricant to be used on each item of equipment and recommended frequency of lubrication.
- D. Electrical diagrams of each equipment "packaged" control system.
- E. Diagrams of automatic temperature control systems, identifying each by name, location and number showing sequence of operation. Each component of a control system shall be identified by model number, location, description of component, function, pressure or temperature range, voltage, special accessories, etc., or technical information necessary to fully describe the component. All diagrams shall be up-to-date, reflecting any on-the-job changes.
- F. Part lists and identifying part numbers with prices of each part. The name and address of the nearest distributor from which parts can be obtained.

### **3.18 OPERATING INSTRUCTIONS**

- A. Contractor shall organize and conduct a training session at the site to instruct the Owner in the proper operation of all systems.
- B. The Owner's operating personnel shall be instructed by the Contractor on how to start and operate each item of equipment.

- END OF SECTION -

**SECTION 15215****BOOSTER STATION IMPROVEMENTS****PART 1 - GENERAL****1.01 WORK INCLUDED**

- A. The contractor shall furnish, provide and install new pumps with all the necessary piping, controls and appurtenances as shown on the plans and as specified herein. The improvements are located at existing booster stations.
- B. Contractor shall install temporary/permanent piping, valves, controls, VFD and pumps to maintain service to existing customers.
- C. Contractor shall remove existing piping, valves, controls and/or pumps as shown on plans for a complete installation.
- D. All bidders must recognize that, if any alternate booster pumping system is used and does not meet or exceed the physical and dimensional standards nor perform as specified in the judgement of the project Engineer or Owner, the Contractor shall be required to modify or replace the alternate equipment with the original booster pumping equipment at no additional cost to the Owner or Engineer.

**1.02 RELATED WORK**

- A. Division 3 - Concrete
- B. Division 4 - Masonry
- C. Division 9 - Finishes
- C. Division 16 - Electrical

**1.03 QUALITY ASSURANCE**

- A. The equipment and materials covered by these specifications are intended to be standard equipment of proven reliability and as manufactured by reputable manufacturers having experience in the production of such equipment. The equipment furnished shall be designed, constructed, and installed in accordance with the best practices and methods and shall operate satisfactorily when installed as shown on the contract drawings and operated per manufacturer's recommendations.
- B. It is intended that the manufacturer of the specified equipment shall be a business regularly engaged in the manufacture, assembly, construction, start-up and maintenance of water distribution equipment of the type required for this project. The manufacturer shall have at least ten (10) years of successful experience in providing stations of the type, design, function and quality as required for this project.

**1.04 SUBMITTAL**

Equipment submittals shall be in accordance with Section 01300 and at a minimum shall be bound and a minimum of six (6) copies provided. The submittals shall contain a minimum of two (2) full size

drawings, size 24" x 36"; one (1) each covering the booster pump station and the electrical control schematic.

## PART 2 - PRODUCTS (UNUSED)

## PART 3 - EXECUTION

### 3.01 OPERATING CONDITIONS

The pump station shall be capable of delivering the fluid medium at the following capacities and heads when operating at (SEE CHART BELOW) minimum suction pressure. The flow and head indicated shall be the total flow and head as measured on the discharge main exiting the station.

Pump Station Location										
Pump Station Location	Model	Min. Suction Pressure	Design		Shut-off Head (ft)	RPM	HP	Voltage	Phase	Eff. @ Design
		PSI	GPM	TDH						
Diamond Ridge	CR15-5		90	254	330	3450	10		3	70%
Rattlesnake Ridge	CR32-4-2		150	250	330	3450	15		3	70%
KY RT 504	CR20-6		111	315	345	3450	15		3	70%

- A. The pump driver shall be a standard, A.C. induction motor, totally enclosed fan cooled (TEFC) construction, normal thrust type and shall be (SEE CHART ABOVE) nominal horsepower and suitable for (SEE CHART ABOVE) volt electrical service. The motor shall be inverter duty and/or premium efficiency for suitable use with variable frequency drive (VFD) unit.
- B. The pump motor shall be sized so that the nameplate horsepower rating, without consideration of the service factor, **shall not** be exceeded at any point along the pump performance profile. The pump motor shall be complete with a 1.15 service factor.

### 3.02 BOOSTER PUMPS - VERTICAL MULTI-STAGE CENTRIFUGAL TYPE

- A. The booster pumps employed within the booster pump station shall be of the vertical centrifugal multi-stage type, designed specifically for low flow - high head operation. The pumps shall conform to the detailed specifications as set forth below:

### 3.03 PUMP

- A. The pump suction/discharge chamber, pump head, motor stool and shaft coupling shall be constructed of ductile iron. The impellers shall be constructed of stainless steel, laser welded through the front and back shrouds to the impeller vanes for increased efficiency. The impellers shall be secured to the pump shaft by means of a split cone and nut design. The metallic rotating parts, chambers, and outer sleeve shall be stainless steel. Intermediate bearings shall be bronze or

Graflon. The lower bearing shall be tungsten carbide, mounted in the suction/discharge base and replaceable. The lower shaft journal shall be tungsten carbide and replaceable. The pumps shall be equipped with a cartridge seal of Tungsten Carbide/Tungsten Carbide. The seal shall be replaceable without disassembling the pump. The seal shall be replaceable without removing the motor. Sleeve sealing shall be on O-ring design, allowing sleeve expansion and contraction without leaking. A motor bearing plate option shall be available to allow use of a motor with standard bearings. Connections shall be plate flanges, locked to the suction/discharge base with a stainless steel split ring. The plate flanges shall rotate to allow alignment of the mating flange bolts.

- B. The pumps shall be supplied with ductile iron flange mounted discharge head with a suction flange with 125 pounds ANSI drilling and a discharge flange with 125 pounds ANSI drilling. If the shut-off head plus static pressure exceeds the 250 psi, then the discharge head shall have 250 pounds ANSI drilling or as indicated on the drawings.

### **3.04 MOTOR**

- A. The pump motor shall be sized to insure the pump is non-overloading when operating on the specified pump curve. The motor shall be of the horsepower, voltage, phase and cycle as shown on the drawings. Motor design shall be Totally Enclosed Fan Cooled (TEFC) with a NEMA C face design operating at a nominal 3450 rpm with a minimum service factor of 1.15. Lower motor bearings shall be adequately sized to insure long motor life. The motor shall be premium efficient for suitable use with variable frequency drive (VFD) unit.

### **BOOSTER PUMPS SHALL BE GRUNDFOS SERIES CR.**

### **3.05 INTERNAL PIPING**

- A. Piping shall be in accordance with Section 02610 and shall be flanged ductile iron, Class 350 unless noted otherwise on the drawings.
- B. Pipe Supports
  - 1. Pipe supports by minimum sizing for:
    - a. 4" and smaller piping shall be 2" x 2" x 3/16" wall rectangular tubing;
    - b. 6" through 12" piping shall be 3" x 3" x 1/4" wall rectangular tubing;
    - c. 14" through 24" piping shall be 4" x 4" x 1/4" wall rectangular tubing and, also;
    - d. 6" and larger piping shall be provided with "kick" bracing projecting fully from the underside of the pipe to the floor at an angle of no less than 15° from vertical out at a right angle to the run of the pipe being supported. These "kick" braces shall be in addition to the vertical pipe supports called out above.
  - 2. Pipe supports are to be fully anchored to the concrete floor slab, where required, with concrete anchor bolts..
  - 3. Simple pipe stands made of pipe and upholding a yoke or bracket with or without a threaded jack bolt or a U-bolt are not acceptable.
- C. Service Connections on Internal Piping: All plumbed devices within the station eventually requiring service, such as meters, control valves, pumps and like equipment, shall be easily removed from the piping by the presence of appropriately placed and sufficient quantity of



adaptors and couplings as shown on the drawings; no less than the quantity of couplings and adaptors shown shall be allowed.

### 3.06 SERVICE CONNECTIONS ON INTERNAL PIPING

- A. All plumbed devices within the station eventually requiring service, such as meters, control valves, pumps and like equipment, shall be easily removed from the piping by the presence of appropriately placed and sufficient quantity of adaptors and couplings as shown on the drawings; no less than the quantity of couplings and adaptors shown shall be allowed.

### 3.07 RESTRAINING POINTS

The main inlet and outlet piping to the station shall each be provided with two (2) or four (4) restraining points as welded on "eyes" or similar device welded to the framing to facilitate the attachment of joint restraint tie rods or other device to be used in retarding any pipe movement at the connections.

### 3.08 COMPRESSION COUPLINGS

- A. The booster station piping shall include a compression type, flexible coupling to prevent binding and facilitate removal of associated equipment where shown on the plans for this item. In lieu of a compression coupling, a restraint flange adapter of the wedge action type, or a restraint joint flanged coupling adapter (FCA) may be used.
- B. All compression couplings, Uni-Flanges, flanged coupling adapters (FCA), and flexible connectors/expansion joints shall include a minimum of two (2) control joint rods with appropriate restraining points.

### 3.09 COMBINATION PRESSURE GAUGES

- A. Combination pressure gauges shall have a built-in pressure snubber and 4-1/2 inch minimum diameter faces and be turret style, black phenolic case with clear glass face. The movement shall be rotary, of 400 Series stainless steel with teflon coated pinion gear and segment. The gauge shall be bottom connected & accept a 1/4" NPT female thread. Pressure gauge range and scale graduations shall be in feet of water and psi with the normal operating pressure for both suction and discharge pressures operating in the mid-range of the gauge. Combination pressure gauge range and scale graduations shall be in psi and feet of water as follows:
  - 0 to 60 psi, 5 psi figure intervals, with graduating marks every 1 psi (0-140 feet)
  - 0 to 100 psi, 10 psi figure intervals, with graduating marks every 1 psi (0-230 feet)
  - 0 to 160 psi, 10 psi figure intervals, with graduating marks every 1 psi (0-370 feet)
- B. SUCTION PRESSURE –
  - 0 to 200 psi, 20 psi figure intervals, with graduating marks every 2 psi (0-460 feet).
  - 0 to 300 psi, 25 psi figure intervals, with graduating marks every 5 psi (0-690 feet).
  - 0 to 400 psi, 50 psi figure intervals, with graduating marks every 5 psi (0-920 feet).
- C. DISCHARGE PRESSURE –
  - 0 to 200 psi, 20 psi figure intervals, with graduating marks every 2 psi (0-460 feet).
  - 0 to 300 psi, 25 psi figure intervals, with graduating marks every 5 psi (0-690 feet).
  - 0 to 400 psi, 50 psi figure intervals, with graduating marks every 5 psi (0-920 feet).
- D. All gauges will be panel mounted off the pipeline and be flexible connected to their respective sensing point. The gauge trim tubing shall be complete with both isolating and vent valves and the tubing shall be so arranged as to easily vent air and facilitate gauge removal. Gauges mounted directly to the pipeline or at the sensing point **will not** be accepted.

**GAUGES SHALL BE ASHCROFT DURAGAUGE PLUS MODEL 1279XLL.**

### 3.10 SAMPLE TAP

A single, right angle outlet, smooth nose, brass sample tap shall be affixed to the manual vent ball valve for the low suction lockout and suction pressure gauge assembly.

### 3.11 GATE VALVES

The isolating gate valves used throughout the building shall be as specified in Section 02640 of the specifications.

### 3.12 CUSHIONED SWING CHECK VALVES

#### A. Submittals:

1. Submit detailed product data and descriptive literature including dimensions, weights, headloss data, pressure rating and materials of construction.
2. Provide shop drawings which clearly illustrate the general arrangement of the equipment and cross-sectional views of the components.

#### B. Quality Assurance:

1. Supplier shall have been manufacturing air-cushioned swing check valves for a period of at least ten (10) years and shall, at the Engineer's request, provide a list of installations involving equipment of similar size and application.

#### C. The valve shall have a heavy duty body, shall be constructed of high-strength cast iron conforming to ASTM A126 Class B with integral flanges, faced and drilled per ANSI B16.1 Class 125 or 250 and be suitable for horizontal or vertical installation.

#### D. The valve body shall be the full waterway type, designed to provide a net flow area not less than the nominal inlet pipe size when swung open no more than 25 degrees. The valve shall have a replaceable stainless steel body seat.

#### E. Valve disc shall be cast iron and faced with a renewable resilient seat ring of rubber or other suitable material, held in place by a follower ring and stainless steel screws.

#### F. The disc arm shall be ductile iron or steel, suspended from and keyed to an austenitic stainless steel shaft which is completely above the waterway and supported at each end by heavy bronze bushings. The shaft shall rotate freely without the need for external lubrication. The shaft shall be sealed where it passes through the body by means of a stuffing box and adjustable packing. Simple O-ring shaft seals are not acceptable.

#### G. The valve shall be supplied with an outside lever and adjustable counterweight to initiate valve closure. Final closure shall be dampened by means of a single, side-mounted bronze oil-cushion assembly directly mounted to the valve body on machined pads. The amount of cushioning shall be easily adjustable without the need for pre-charged oil chambers. Commercial oil cylinders which pivot and/or are attached with fabricated brackets are not acceptable.

#### H. Function:

1. The valve shall swing open smoothly at pump start and close quickly and quietly upon pump shutdown to prevent flow reversal. When closed, the valve shall seat drop tight.

- I. Manufacturer
  - 1. The valve shall be GA Industries, Inc. Figure 25-DSH, or approved equal.
- J. Installation
  - 1. Install valve in accordance with manufacturer's written instructions and approved submittals.
- K. Manufacturer's Field Service
  - 1. Manufacturer's authorized representative shall be present at the jobsite for assistance during equipment start-up and to train owner's personnel in the operation, maintenance and troubleshooting of the equipment provided.

### **3.13 PRESSURE RELIEF & SURGE ANTICIPATOR VALVE**

- A. The valve shall be hydraulically operated, single diaphragm-actuated and globe or angle pattern. The valve shall consist of three major components: the body with seat installed, the cover with bearings installed and the diaphragm assembly. The diaphragm assembly shall be the only moving part and shall form a sealed chamber in the upper portion of the valve separating operating pressure from line pressure. Packing glands and/or stuffing boxes are not permitted and there shall be no pistons operating the main valve or pilot controls.
- B. No separate chambers shall be allowed between the main valve cover and body. Valve body and cover shall be of ductile iron material. No fabrication or welding shall be used in the manufacturing process. The valve shall contain a resilient, synthetic rubber disc, with a rectangular cross-section contained on three and one-half sides by a disc retainer, forming a tight seal against a single removable seat insert. No O-ring type disc (circular, square, or quad type) shall be permitted as the seating surface. The disc guide shall be of the contoured type to permit smooth transition of flow and shall hold the disc firmly in place. The disc retainer shall be of a sturdy one-piece design capable of withstanding opening and closing shocks. It must have straight edge sides and a radius at the top edge to prevent excessive diaphragm wear as the diaphragm flexes across this surface. No hourglass-shaped disc retainers shall be permitted and no V-type or slotted type disc guides shall be used. The diaphragm assembly containing a non-magnetic 303 stainless steel stem of sufficient diameter to withstand high hydraulic pressures shall be fully guided at both ends by a bearing in the valve cover and an integral bearing in the valve seat. The seat shall be a solid, one-piece design and shall have a minimum of a five-degree taper on the seating surface for a positive, drip-tight shut off. No center guides shall be permitted. The stem shall be drilled and tapped in the cover end to receive and affix such accessories as may be deemed necessary.
- C. The diaphragm assembly shall be the only moving part and shall form a sealed chamber in the upper portion of the valve separating operating pressure from line pressure. The diaphragm shall consist of nylon fabric bonded with synthetic rubber compatible with the operating fluid. The center hole for the main valve stem must be sealed by the vulcanized process or a rubber grommet sealing the center stem hole from the operating pressure. The diaphragm must withstand a Mullins Burst Test of a minimum of 600 psi per layer of nylon fabric and shall be cycle tested 100,000 times to insure longevity. The diaphragm shall not be used as the seating surface. The diaphragm shall be fully supported in the valve body and cover by machined surfaces which support no less than one-half of the total surface area of the diaphragm in either the fully open or fully closed position. The main valve seat and the stem bearing in the valve cover shall be removable. The cover bearing and seat in 6" and smaller size valves shall be threaded into the cover and body. The valve seat in 8" and larger size valves shall be retained by flat head machine screws for ease of maintenance. The lower bearing of the valve stem shall be contained

concentrically within the seat and shall be exposed to the flow on all sides to avoid deposits. To insure proper alignment of the valve stem, the valve body and cover shall be machined with a locating lip. No "pinned" covers to the valve body shall be permitted. Cover bearing, disc retainer, and seat shall be made of the same material.

- D. All necessary repairs and/or modifications other than replacement of the main valve body shall be possible without removing the valve from the pipeline. Packing glands and/or stuffing boxes shall not be permitted and components including cast material shall be of North American manufacture. The valve manufacturer shall warrant the valve to be free of defects in material and workmanship for a period of three years from date of shipment provided the valve is installed and used in accordance with all applicable instructions. Electrical components shall have a one-year warranty.
- E. The valve shall be sized as shown on the plan and be globe pattern, threaded and have a maximum pressure rating of 400 psi.

**THE RELIEF VALVE SHALL BE CLA-VAL MODEL 52-03.**

### **3.14 SUCTION LINE STRAINERS**

- A. Each pump suction pipe run shall include a semi-steel basket type flanged strainer of a size as shown on the plans. The flange pattern shall conform to 125 pound ANSI standards. The strainer body and cover material shall be hi-grade cast iron equal to ASTM specification A126-61T Class B.
- B. The strainer cover will be complete with strong-back clamp device for quick easy access to strainer basket. The strainer basket shall be stainless steel.

**STRAINERS SHALL BE METRAFLEX MODEL B-1-T.**

### **3.15 BALL VALVES**

- A. Isolating ball valves where shown and as sized on the plan sheet covering this item shall meet or exceed ASTM Spec B124 No. C37700. The ball valves will be 2-piece forged brass body, blow out proof stem, TFE seats, TFE packing with adjustable stem packing gland. The valves will be NPT threaded pattern complete with lever operators. Maximum working pressure shall be 600 psi.

**BALL VALVES SHALL BE HAMMOND MODEL 8901.**

### **3.16 PRESSURE TESTING**

- A. When the station plumbing is completed, the pressure piping within the station (including valves, pumps, control valves, and fittings), connections as make up the entire system shall be hydrostatically tested at a pressure of 150 psi or a pressure equal to the lowest test pressure rating of the equipment within the tested system, whichever is lesser pressure. The test pressure shall be applied for a minimum of 20 minutes, during which time all joints, connections and seams shall be checked for leaking. Any deficiencies found shall be repaired and the system shall be retested.
- B. The results of this testing shall be transmitted in writing to the Engineer prior to shipment of the station and shall note test pressure, time at full pressure and be signed by the Quality Control Manager or test technician.

### **3.17 ELECTRONIC CHLORINE METER PUMP**

- A. The chlorine pump shall be shown and sized on the plan sheet covering this item. The chlorine pump shall provide a maximum of 100 strokes per minute. Stroke length shall be adjustable by

readily accessible dial. The pump shall also provide a minimum of .200 gallons per hour with a maximum of 1.0 gallon per hour. The pump will work off a 4-20 milliamp and shall be controlled by telemetry to the station. The pump shall operate only when the pumps are in a run mode. A 50 gallon plastic tank shall also be provided.

- B. The chemical injector quill shall be a ¾-inch Sodium Hypochlorite Injection Assembly with flexible tubing installation, retractable injection quill, 150 psi rated and suited for liquid chlorine injection. All wetted parts shall be stainless steel. All chemically wetted parts shall be PVC. The injection quill shall be as manufactured by Saf-T-Flo, Inc., Anaheim, CA.

#### **CHLORINE METERING PUMP SHALL BE A LMI MILTON ROY SERIES AA96**

### **3.18 TURBO METER W/STRAINER**

- A. Turbo meter shall comply with ANSI/AWWA Standard C701 and the meter shall be performance tested to insure compliance. The operating range shall be a continuous flow from 35 to 3500 gpm. The maximum operating pressure shall be 150 psi. The meter shall have a bronze maincase with stainless steel straightening vanes, thermoplastic rotor and ceramic magnets and radial bearings. The meter shall come equipped with an AWWA type strainer and must be installed immediately upstream of the meter.

#### **TURBO METER AND STRAINER SHALL BE A SENSUS SERIES W 3500**

### **PART 4 – ELECTRICAL ALSO SEE DIVISION 16**

#### **4.01 ELECTRICAL APPARATUS - DESIGN, ASSEMBLY & TEST**

The electrical apparatus and control panel design, assembly, and installation, and the integration of component parts will be the responsibility of the manufacturer of record for this booster pumping equipment. That manufacturer shall maintain at his regular place of business a complete electrical design, assembly and test facility to assure continuity of electrical design with equipment application. Control panels designed, assembled or tested at other than the regular production facilities or by other than the regular production employees of the manufacturer of record for this booster pumping equipment **will not** be approved.

#### **4.02 CONFORMANCE TO BASIC ELECTRICAL STANDARDS**

The manufacturer of electrical control panels and their mounting and installation shall be done in strict accordance with the requirements of UL Standard 508 and the National Electrical Code (NEC) latest revision so as to afford a measure of security as to the ability of the eventual owner to safely operate the equipment. **No exceptions to the requirements of these codes and standards will be allowed; failure to meet these requirements will be cause to remove the equipment and correct the violation.**

#### **4.03 U.L. LISTING**

All service entrance, power distribution, control and starting equipment panels shall be constructed and installed in strict accordance with Underwriter's Laboratories (UL) Standard 508 "Industrial Control Equipment." The UL label shall also include an SE "Service Entrance" rating stating that the main distribution panel is suitable for use as service entrance equipment. The panels shall be shop inspected by UL, or constructed in a UL recognized facility. All panels shall bear a serialized UL label indicating acceptance under Standard 508 and under Enclosed Industrial Control Panel or Service Equipment Panel. In addition, a photocopy of the UL labels for this specific project shall be transmitted to both the project engineer and the contractor for installation within their permanent project files, prior to shipment of the equipment covered under these specifications.

**4.04 E.T.L. LISTING**

All control panels shall be E.T.L. Listed by Interek Testing Services (ITS) under Category 4 - Industrial Control Equipment. Each completed panel shall bear an E.T.L. listing label. The listing label shall include the station manufacturer's name, address and telephone number. The station manufacturer shall have quarterly inspections performed by ITS at the manufacturer's facilities to ensure that the products being listed comply with the report and procedural guide for that product.

**4.05 EQUIPMENT GROUNDING**

Each electrical equipment item in the station shall be properly grounded per Section 250 of the National Electrical Code. Items to be grounded include, but are not limited to, pump motor frames, control panel, transformer, convenience receptacles, dedicated receptacle for heater, air conditioner, dehumidifier, lights, light switch, exhaust fans and pressure switches.

All ground wires from installed equipment shall be in conduit and shall lead back to the control panel to a copper ground buss specific for grounding purposes and so labeled. The ground buss shall be complete with a lug large enough to accept the installing electrician's bare copper earth ground wire. The bus shall serve as a bond between the earth ground and the equipment ground wires.

**4.06 PANEL MOUNTING HARDWARE**

Metal framing channel shall be used exclusively for mounting of all electrical panels and electrical components except for those specifically designated otherwise.

**4.07 ELECTRICAL APPARATUS - CONTROL PANEL**

- A. All motor starters, time delay relays and control relays shall be incorporated into one (1) NEMA 4X control panel. The electrical service provided for this station will be (SEE CHART SECTION 3.01 OPERATING CONDITIONS)
- B. There shall be provided circuit breakers for each major equipment and at a minimum as follows and install in one (1) NEMA 4X Mini-power zone control panel:
  - 1. One (1) Main Breaker
  - 2. Two (2) Branch Breakers, one each per pump
  - 3. One (1) Phase Monitor Breaker
  - 4. Seven (7) Auxiliary Circuit Breakers, as follows:
    - 5. Controls
    - 6. Dehumidifier
    - 7. Lights
    - 8. Convenience Outlets
    - 9. Telemetry
    - 10. HVAC
    - 11. Four Spare Breakers

**4.08 VARIABLE FREQUENCY DRIVE**

- A. Acceptable Manufacturers – Refer to Section 16269, VARIABLE FREQUENCY CONTROLLERS.
- B. The VFD shall provide an adjustable carrier frequency and shall provide noiseless operation of the driving motor, short circuit and ground protection, and work with controlled sinusoidal current synthesis and dynamic over current limitations. The VFD controller shall be one complete integrated unit including the variable frequency drive, programmable pump control logic, and include a NEMA 1 (CPC). Additional control panels, PLC's or other external devices,



shall NOT be necessary to accomplish complete pump programming and variable speed control of pump and motor. Standard variable frequency drives that do not incorporate pump control logic as the primary control software; programming and features directly applicable to centrifugal pump applications shall not be considered equal. The pumping station controller shall provide a LCD two line display with 16 characters per line and programming keypad for data entry. Unit(s) shall utilize user friendly front panel programming in three languages that displays pump and motor language in clear text. Three colored LED's shall signal 'power on', 'pump running' and 'fault'. Program settings shall be changeable and stored in non-volatile memory. Program settings shall be retained in memory in the event of loss of power to the controller, without the use of a backup battery. System operating pressure shall be clearly displayed in PSI or feet of head for ease of use and to provide an operator friendly interface. Additional parameters, where applicable, shall be displayed in units consistent with pumping systems. Generic control systems adapted from other applications shall not be considered equal. The settings and program in whole or part may be locked out with the use of an operator selectable password. Standard system hydraulic settings shall include at a minimum the following functions: loss of suction, lack of NPSHa, pump run-out protection, "dead-head" protection, constant pressure setting with variable. Flow capability, constant flow with variable TDH (pressure) capability, quadratic differential flow calculation, system curve compensation, multiple pump operation with alternation, pump starting point with allowable, adjustable pressure drop, minimum speed with time delay, pressure of flow sensor error, overpressure shutdown, and low flow shutdown.

#### **4.09 ELECTRICAL APPARATUS - RUNNING TIME METER**

A running time meter shall be supplied for each pump to show the number of hours of operation. The meter shall be enclosed in a dust and moisture proof molded plastic case, suitable for flush mounting on the main control panel. The meter dial shall register in hours and tenths of hours up to 99999.9 hours before repeating. The meter shall be suitable for operation from a 115 volt, 60 cycle supply.

#### **4.10 ELECTRICAL APPARATUS - PHASE MONITOR**

A phase monitor shall be supplied to protect three-phase equipment against phase loss, undervoltage and phase reversal conditions. When a fault is sensed, the monitor output relay opens within two seconds or less to turn the equipment off and/or cause an audio or visual alarm. Both Delta and Wye systems may be monitored. The monitor shall have an automatic reset and shall also include an adjustable voltage delay. The monitor shall have an indicator LED (glows when all conditions are normal and shall monitor phase sequence: ABC operate (will not operate CBA). The phase monitor shall be UL approved and CSA certified.

#### **4.11 ELECTRICAL APPARATUS - SURGE ARRESTOR**

A secondary surge arrestor shall be provided. Housing shall be Noryl and be ultrasonically sealed. Valve blocks shall be metal oxide with an insulating ceramic collar. Gap design shall be annular. The lead wire shall be permanently crimped to the upper electrode forming part of the gap structure. Arrestors shall be UL and CSA listed Lightning Protective Devices.

#### **4.12 ELECTRICAL APPARATUS - SUCTION PRESSURE CONTROL**

A. Suction control of the pumping operation shall be provided by a bellows type, adjustable differential pressure switch. The switch shall be complete with a single pole, double throw contact block with 5 amp non-inductive rated contacts at 230 volts AC. The set points of the on/off cycle shall be independently adjustable through the full range of the switch rating.

1. Low Suction Cut-out, 4-150 psi.
- 1A. Adjustable Differential, 2-25 psi.

- B. A pressure gauge shall be sub-panel mounted adjacent to the low suction pressure switch. The gauge and switch shall be so plumbed with the suction header sensing line that a common blow-off valve can relieve pressure in both simultaneously for purposes of checking and calibrating the low suction lock-out.

#### 4.13 ELECTRICAL APPARATUS - TELEMETRY CONTROL - INTERFACE PANEL

It will be the responsibility of the booster station manufacturer to provide the following as an adjunct to the supplied telemetry equipment.

1. 3/4" telemetry entrance conduit complete to telemetry panel.
2. Size 12" x 12" NEMA 4X telemetry interface panel.
3. Separate 120 volt single phase power circuit in conduit to the telemetry interface panel.
4. Telemetry control circuits made up and in conduit from main control panel to telemetry interface panel terminal strip.
5. Metal framing channel to mount telemetry equipment.

#### 4.14 ELECTRICAL APPARATUS - DEVICES

One (1) solid state time delay relays shall be provided to perform the following functions:

1. Low Suction Timer

The solid state time delay relay shall have an adjustable time range of 10 seconds to 10 minutes. The relays shall be constructed to use a DIN rail mount socket so that the relays can be replaced without disturbing the wiring. The relay shall be complete with LED indicators for output and power.

Hand-Off-Automatic switches shall be oil tight, 3-position maintained and be located on the main control panel door.

1. Pump #1
2. Pump #2
3. Telemetry Test

Indicating lights shall be oil tight, with a full voltage pilot light and be provided:

1. Red - Low Suction Pressure
2. Green - Pump #1 in Operation
3. Green - Pump #2 in Operation

Nameplates shall be furnished on all panel front mounted switches and lights.

The control panel door shall be complete on the interior with a stick-on transparency containing an "as-built" reproduction of the electrical control panel schematic. The wiring diagram shall be a corrected "as-built" copy & contain individual wire numbers, circuit breaker numbers, switch designation & control function explanations.

#### 4.15 ELECTRICAL APPARATUS - CONDUIT AND WIRING

- A. The service entrance conduits shall be **rigid steel conduit**, individually sized to accept the inbound service conductors and telemetry/telephone/radio cables, and shall be installed from the main power or control panel through the equipment enclosure floor and terminate exterior to the equipment enclosure. The service entrance exterior conduit connection points shall be capped or plugged for shipment.



- B. All wiring within the equipment enclosure and outside of the control panel or panels shall be run in conduit except for the watertight flexible conduit and fittings properly used to connect pump drivers, fan motors, solenoid valves, limit switches, etc., where flexible connections are best utilized. Only the dehumidifier where furnished by the original manufacturer with a UL approved rubber cord and plug, may be plugged into a receptacle.

#### **4.16 EQUIPMENT ENCLOSURE CONDUIT**

Rigid, heavy wall, Schedule 40 PVC with solvent weld moisture-proof connections, in minimum size 3/4" or larger, sized to handle the type, number and size of equipment conductors to be carried - in compliance with Article 347 of the National Electrical Code and NEMA TC-2, Federal WC-1094A and UL-651 Underwriters Laboratory Specifications.

#### **4.17 FLEXIBLE CONNECTIONS**

Where flexible conduit connections are necessary, the conduit used shall be liquid-tight, flexible, totally nonmetallic, corrosion resistant, nonconductive, U.L. listed conduit sized to handle the type, number and size of equipment conductors to be carried - in compliance with Article 351 of the National Electrical Code.

#### **4.18 MOTOR CIRCUIT CONDUCTORS**

Sized for load. All branch circuit conductors supplying a single motor of one (1) horsepower or more shall have an ampacity of not less than 125 percent of the motor full load current rating, dual rated type THHN/THWN, as set forth in Article 310 and 430-B of the National Electrical Code, Schedule 310-13 for flame retardant, heat resistant thermoplastic, copper conductors in a nylon or equivalent outer covering.

#### **4.19 CONTROL AND ACCESSORY WIRING**

Sized for load, type MTW/AWM (Machine tool wire/appliance wiring material) as set forth in Article 310 and 670 of the National Electrical Code, Schedule 310-13 and NFPA Standard 79 for flame retardant, moisture, heat and oil resistant thermoplastic, copper conductors in compliance with NTMA and as listed by Underwriters Laboratories (AWM), except where accessories are furnished with a manufacturer supplied UL approved rubber cord and plug.

#### **4.20 ELECTRICAL APPARATUS - ALARMS**

- A. The following alarms/status points shall be included within the booster pump station:
  1. Water within station alarm
  2. Unauthorized entry alarms
  3. Pumps status off/run/standby alarms
  4. Phase fail alarm
  5. Smoke Alarm
  6. High Station Temperature alarm
- B. The water alarm shall be a 120 volt AC circuit driven by a float switch wall mounted within the equipment capsule. The float switch shall be of the magnetic float type with the float moving up and down a guide tube. One-half (1/2) inch of float movement shall actuate the SPST reed type switch inside the guide tube. The switch shall be so mounted that when water reaches a point one (1) inch above the sump the float switch will activate the alarm. The alarm will be sealed in through an auxiliary relay and will be manually reset via a push button station.

- C. The unauthorized entry alarm shall be a 120 volt AC circuit driven by a hatch mounted limit switch. The limit switch shall be the adjustable arm, roller contactor type which makes an internal SPST micro switch. The switch will be so mounted as to activate anytime the entrance hatch is opened. The unauthorized entry alarm circuit shall be complete with a time delay relay, 0-180 seconds minimum and manual alarm lock out key switch. The alarm circuitry will be set up to activate every time the entrance manway is opened after a time delay period has lapsed. The engagement of the key switch will lock out the alarm.
- D. The pump status shall be determined by differential pressure switches. The pressure switches shall be placed between the pump discharge and the check valve. The switches shall indicate the differential pressure across the pump. A motor starter auxiliary contact shall be wired in series with the pressure switch to indicate pump status.
- E. The phase fail alarm shall be provided by 120 volt AC relay.
- F. The fire/smoke alarm shall be provided by a 120 volt AC relay controlled by a fire/smoke detector in the station.
- G. The station high temperature alarm shall be provided by a 120 volt AC relay controlled by a thermostat in the station.

#### **4.21 ELECTRICAL APPARATUS - RECEPTACLES**

Two (2) duplex, ground fault circuit interrupter type receptacles shall be furnished about the periphery of the equipment enclosure, with one (1) receptacle adjacent to the main control panel.

#### **4.22 CONVENIENCE GROUP - LIGHTING**

There shall be one or more two-tube, 32 watt per tube, electronic start, enclosed and gasketed, forty-eight (48) inch minimum length fluorescent light fixtures installed within the equipment enclosure, as shown on the plan for this item. One (1) light fixture shall be located directly over the main control panel. The light switch shall be of the night glow type and be located conveniently adjacent to the door. Open fluorescent or incandescent fixtures will not be accepted.

#### **4.23 CONVENIENCE GROUP - HEATING/COOLING/EXHAUST UNIT**

The unit shall be one piece, wall mounted, factory assembled, precharged, prewired, tested and ready to operate. The unit shall have a limited warranty of five years on parts and five years on the compressor. The unit shall be approved and listed by Underwriters' Laboratories, Inc., and Canadian Underwriters' Laboratories (CUL). Unit performance shall be certified in accordance with Air Conditioning and Refrigeration Institute Standard 210/240-89 for Unitary Air-Source air conditioners or latest standard.

1. One (1) each exterior wall mounted, hard-wired as shown;
2. Enclosed weatherproof casing constructed of 20 gauge galvanized steel, finished with baked-on polyester enamel paint;
3. One (1) washable filter;
4. Remote adjustable thermostat;
5. Cooling capacity in tons: 1;
6. Cooling Capacity: 11,100 BTUH at 230 volts, single phase;
7. Amps: 30;
8. Twin indoor blowers, SCFM maximum/minimum: 325/300 at 0.2" static pressure;
9. Electrical supplemental heater: 5 kW;

**4.24 CONVENIENCE GROUP - DEHUMIDIFIER**

1. One (1) each, installed as shown.
2. Capacity 25 pints per 24 hours (AHAM Standard DH-1).
3. Compressor rated 1/5 HP, 4.1 amps, 400 watts.
4. Condensate piped direct to sump.
5. 120 volt A.C. operation by dial-controlled adjustable humidistat.
6. UL listed rubber cord.

**4.25 FACTORY START-UP SERVICE**

1. Start-up service technician shall be a **regular employee of booster station manufacturer**.
2. As part of the submittal covering this equipment, list the factory service manager, his employee number, his telephone number with extension and his number of years with the company. List also each start-up service technician, his employee number and years of service with the company.
3. Verify that one (1) or more of the service technicians listed above will perform the required start-up service on the equipment covered in the submittal.
4. One (1) full day at job site for start-up and training.
5. Start-up service to include two (2) bound O&M manuals.
6. Start-up service report attested to by start-up technician and representative of owner or engineer.
7. Service report distributed to:
  - A. Manufacturer's File
  - B. Engineer's File
  - C. Contractor's File
  - D. Owner's File

**PART 5-WARRANTY****5.01 CONTRACTOR'S WARRANTY**

Shall at a minimum cover:

1. A period of one (1) year commencing upon successful start-up.
3. The contractor's warranty shall cover all equipment, components and systems provided in or with the station, exclusive of those components supplied by and/or installed by others independent of the contractor of record for this station.
4. The warranty shall provide for the contractor to bear the full cost of labor and materials for replacement and/or repair of faulty or defective components so there shall be no cost incurred by the Owner for this work during the warranty period.
5. The contractor's warranty policy is amended only by the items considered consumables, i.e., light bulbs, pump seals, pump packing, lubricants and other maintenance items consumed by usage.
6. No assumption of contingent liabilities for any component failure during contractor's warranty is made.

It is the intent of this contractor's warranty to gain for the owner a single source responsible party for all components specified herein. "Second party" or "pass through" warranties will not be accepted.

- END OF SECTION -

**SECTION 15240****ABOVE GROUND PACKAGED BOOSTER PUMP STATION****PART 1 – GENERAL****1.01 WORK INCLUDED**

- A. The contractor shall furnish and install one (1) factory built, factory delivered, above ground water booster pump station, with all the necessary internal piping, pumps, motors, valves, and controls and other necessary appurtenances installed on a fabricated steel base and enclosed in a modular structure as shown on the plans and as specified herein. The booster station shall be complete when delivered and will not require internal contractor construction except to install the power service through the service conduit provided for that purpose.
- B. The manufacturer of this equipment shall be one recognized and established in the design and manufacturing of water booster pumping stations. The booster station manufacturer shall allow the facilities to be open for inspection by a representative of the owner at any time during construction and testing of the booster pump station equipment.
- C. Approved manufacturers, Engineered Fluid, Inc. (EFI), Centralia, Illinois or USEMCO, Inc., Tomah, Wisconsin or approved equal are eligible to offer equipment proposals for this work provided any exceptions or deviations taken to the plan design and product specifications shall be approved by the Engineer prior to bidding.
- D. All bidders must recognize that, if any alternate booster pumping system is used and does not meet or exceed the physical and dimensional standards nor perform as specified in the judgement of the project Engineer or Owner, the Contractor shall be required to modify or replace the alternate equipment with the original booster pumping equipment at no additional cost to the Owner or Engineer.
- E. In order for alternate equipment to be considered an "approved equal," prospective suppliers must make a pre-bid submittal as detailed in the following paragraphs and make it available to the design engineer fourteen (14) calendar days prior to the time of bidding. All differences shall be clearly marked between the specifications and proposed substitute equipment.
- F. The pre-bid submittals for qualification to bid must contain an installation list of ten (10) similar in size and capacity walk-in booster pump stations completed and in operation within the past five (5) years. The installation list will be complete with the date of installation, the name and telephone number of the equipment operator and the name and telephone number of the design engineer.

**1.02 QUALITY ASSURANCE**

The equipment and materials covered by these specifications are intended to be standard equipment of proven reliability and as manufactured by reputable manufacturers having experience in the production of such equipment. The equipment furnished shall be designed, constructed, and installed in accordance with the best practices and methods and shall operate satisfactorily when installed as shown on the contract drawings and operated per manufacturer's recommendations.

It is intended that the manufacturer of the selected equipment shall be a business regularly engaged in the manufacture, assembly, construction, start-up and maintenance of water distribution equipment of the type required for this project. The manufacturer shall have at least ten (10) years of successful

ABOVE GROUND PACKAGE BOOSTER STATION

experience in providing stations of the type, design, function and quality as required for this project. As such, the pump station manufacturer shall be required to affix an **UNDERWRITER'S LABORATORIES (UL) LABEL** attesting to the compliance of that assembled equipment under the **PACKAGED PUMPING SYSTEMS (QCZ)** UL Listing Category. This label shall be inclusive of the entire station with enclosure so as to demonstrate compliance with the National Electrical Code (NEC) requirements for working clearances and wiring procedures. **Equipment manufactured without this third party certification label or equipment manufactured by an outside source or "brokered equipment" defined as systems not assembled on the premises of the named manufacturer by that company's employees WILL NOT be allowed.**

By Kentucky Commonwealth Law, all Modular Buildings Manufactured in or imported into the state must have Model Plan Approved by the Kentucky office of Housing, Buildings and Construction (State Fire Marshal) as administered by the Kentucky Industrialized Building System (K.I.B.S.) Program. An authorized Manufacturer will have an assigned KIBS Factory number, and each unit will bear a serialized label certifying it is "In Compliance with the Standards adopted by the Authority of the 2002 Kentucky Residential Code or the 2002 Kentucky Building Code." The pump station manufacturer will be required to provide in the submittal the assigned KIBS Factory Number, and the Serial Number for each label which will be attached to the Modular Station. Submittals lacking this information will not be reviewed.

### 1.03 SUBMITTAL

Equipment submittals shall be bound and in a minimum of six (6) copies. The submittals shall contain a minimum of two (2) full size drawings, size 24" x 36"; one (1) each covering the booster pump station and the electrical control schematic. The booster pump station drawing shall be specific to this project, in at least three (3) different views, be to scale and illustrate the National Electrical Code (NEC) clearances per Section 110-26 of the Code. The submittal booklets will be complete with data sheets covering all individual components that make up the booster pump station, the Kentucky Modular Building Manufactured FIBS factor number, and the UL file number under which the manufacturer is listed, service department personnel statement as detailed in the specifications and be complete with the manufacturer's formal warranty policy. **The submittal booklets shall be complete with a full size photocopy of the manufacturer's combination UL/manufacturer logo Packaged Pumping Systems label.**

Two (2) submittal reviews of this item will be accomplished at no cost to the submitting contractor. However, all subsequent reviews will be charged to the submitting contractor at the design engineer's standard hourly billing rate.

## PART 2 - PRODUCTS

### 2.01 MODULAR STRUCTURES

- A. The booster pump station will be complete with a factory assembled modular building affixed to the steel deck structure supporting the booster pumps as shown on the plans. The completed booster station shall be one (1) piece when delivered and require only off loading, installation on the prescribed foundation slab, pipeline hookup and electrical service to complete the installation. Layout and dimensions shown are for illustrative purposes and are not intended to limit an innovative design.
  - 1. The polyurethane foam core shall be classified by Underwriters Laboratories as having flame spread of 25 or lower and smoke generation of less than 450 when tested in accordance with ASTM E-84-76.
  - 2. Insulation values for the walls and roof structure shall have a minimum coefficient of heat transfer ("U" factor) of R-21.

- B. Exterior Finish:
1. In addition to the standard exterior finish, the station manufacturer shall apply at the factory and prior to shipment fabricated veneer panels with an exterior face of textured ribs with exposed aggregate finish applied with polymer epoxy resin on mineral fiber reinforced cement board.
  2. Two samples of 3" x 5" panels and product data sheet shall be included with the submittal.
- C. Interior Finish: A minimum of .024" (24 gauge) galvanized steel panel shall be furnished, protected by a sprayed and baked interior finish. Color charts shall be provided to the Owner to determine the interior finish color.
- D. Hinged Entrance Doors
1. Insulation shall consist of a full 2" thick foam polyurethane insulation core. Matching metal jambs shall be furnished to fit prefab panels without adjustment or use of interior framing. Doors shall be supplied with weather stripping and a wiper gasket.  
  
Entrance opening shall be a double door with the following clear opening size: 72" x 84".
  2. Hardware for Doors: Hardware shall be Best 300H Series, "B" function mortise lockset with satin chrome finish and deadbolt type locking assembly. Two (2) keys will be provided, on a key ring complete with the manufacturer's identification.
  3. Door Hinges: Each door shall have three (3) SOSS 450 T tamper proof pinned butt hinges.
  4. Weatherproof Shields: All doors for outdoor structures shall be supplied with a metal shield above the door to divert rain and snow from the door opening.
  5. Sillplates: An extruded aluminum sillplate shall be provided on outdoor buildings with friction-type vinyl weatherseal.
  6. Weatherstrip: Jamb and head at door shall have factory-installed vinyl weatherstrip.
- E. Metal Roof System: A prefab standing rib sectional roof shall be furnished for the modular structure. The sectional roof shall be made minimum of .038" embossed aluminum and be complete with underlayment and standing rib gaskets. Color charts shall be provided to the Owner to determine the finish color of the metal roof system.
- F. Louvers: Louvers shall be gravity type with insect screen, factory installed. Exterior of louver shall be protected by a minimum 6 gauges, 1 inch, open wire mesh securely attached to the building exterior and painted for corrosion protection and aesthetic appearance.
- G. Floor Matting: The walkway areas (that space from the entrance to the control panel and the entire NEC clearance area) shall be covered with a Nyracord industrial safety matting. The mat shall be a heavy duty, 2 inch minimum thickness Nyracord compound (rubber blend with fiber reinforcement) of open slot design with a ribbed safety pattern (ribbed in two directions) to promote sure footing. The underside of the safety mat shall also be ribbed (in one direction only) to permit aeration and drainage. The safety mat shall not be glued to the floor surface.

## H. Corrosion Protection

1. All surfaces of the exposed steel structure, interior and exterior, shall be gritblasted equal to commercial blast cleaning (SSPC-SP6).
  2. The protective coating shall take place immediately after surface preparation. The protective coating shall be Tnemec Series 66 Hi-Build Epoxoline consisting of a two-component, high solids, amide-cured epoxy system formulated for high build application having excellent chemical and corrosion resistant properties. The epoxy system shall be self-priming and require no intermediate coatings. The protective coating shall provide in two (2) applications a total dry mil thickness of 8.0 mils.
- I. Building Size: The building shall be sized by the manufacturer to provide for the equipment specified and meet all clearances required by code. The floor plate shall be 1/4 inch steel with structural tubing supports as required. The station floor shall be provided with floor drains as shown. The angle clip for the pre-engineered wall panel at the floor plate shall be continuously welded to the floor.

## 2.07 OPERATING CONDITIONS

The pump station shall be capable of delivering the fluid medium at the following capacities and heads when operating at minimum suction pressure.

### BIG RUN BOOSTER STATION

#### PUMP #1, PUMP #2

Design 20 GPM @ 200 feet TDH;  
Shutoff Head 345 feet;  
Efficiency at design flow rate is 75 %.

1. The pump driver shall be a standard, A.C. induction motor, type totally enclosed fan cooled (TEFC), of the horizontal extended shaft, normal thrust type and shall be 2 h.p., 34500 rpm nominal and suitable for 1 phase, 240 volt electrical service. Motor shall be equipped with VFD's to varying flow/head conditions.
2. The pump motor shall be sized so that the nameplate horsepower rating, without consideration of the service factor, **shall not** be exceeded at any point along the pump performance profile. The pump motor shall be complete with a 1.15 service factor.

## 2.08 BOOSTER PUMPS – VERTICAL MULTISTAGE, CENTRIFUGAL TYPE

The pumps employed within the pump station shall be of the horizontal end suction, centrifugal type. The pumps shall be of close grain cast iron construction complete with bronze trim. The pumps shall conform to the detailed specifications as set forth below:

CASING - Volute type, bolted to adapter, with recessed lock fit to insure alignment. No stud or bolt holes are tapped through casing to liquid ways. Tapping openings provided for priming, venting, draining and suction and discharge gauge connections. Piping connection to be as shown per pump data sheets.

IMPELLER - Enclosed, single suction type, cast in one piece. All impellers are to be statically balanced to insure smooth operation, also hydraulically balanced except in some small sizes where end thrust is but a minor factor.



**WEARING RINGS** - Renewable type; maintain proper running clearance with impeller hubs to minimize leakage between suction and discharge.

**SHAFT SLEEVES** - To be shouldered on shaft near impeller and covers full length of shaft from impeller hub to motor end bracket. Seals by compression between shaft sleeve and impeller hub, also between sleeve and shoulder on shaft, protecting shaft from contact with liquid.

**STUFFING BOX** - The stuffing box shall be cast integral with the pump casing. The stuffing box shall contain a single face type mechanical seal. The seal shall have a carbon rotating head against a Ni-Resist stationary face and be complete with a Buna-N boot with stainless steel spring and spring retainer.

**ADAPTER** - Maintains rigid assembly between motor and casing. Machined lock between adapter and motor end bracket keeps adapter & casing in permanent alignment with motor and extended motor shaft.

## **2.09 MOTORS**

- A. Motor for the pump shall be of United States manufacture, C-face frame type totally enclosed fan cooled (TEFC) enclosure with 1.15 service factor, and class F insulation. Motors shall be three phase wound for full voltage starting. Design pump brake horsepower shall not exceed 100% of motor horsepower exclusive of motor efficiency and service factor. The motor shaft shall be high-strength steel. Motors shall be as manufactured by Baldor or approved equal. Motors shall be wound with ISR (Inverter Spike Resistant) wire for use with VFD's
- B. Motors shall have locked shaft end bearings for longer life and positive end play control. NEMA 56C and 182-4TC motors shall have pressure cast endplates. Bearing seat inserts shall be of machined steel and have ribs for added rigidity.

## **2.10 PUMP/MOTOR VIBRATION ISOLATION PADS**

The pump/motor assembly shall be mounted to a fabricated steel base built specifically for the pump/motor to be mounted. Each mounting or attachment point shall be complete with a vibration isolation pad. The pad will be in two (2) parts, a 1/4" base layer followed by a 5/8" upper layer and be a nominal 2" x 2" square size for pump/motor combinations weighing up to 1500 pounds.

## **2.11 ELASTOMER PIPE CONNECTOR**

The inlet side of each booster pump shall include an elastomer connector to help isolate vibration and noise in the piping system. The elastomer connector shall be of single sphere design, constructed of neoprene and nylon with biasply tire reinforcing cord to provide a 225 psi working pressure rating to a minimum of 120° F. The elastomer connector shall pass through the plate steel flanges designed to grip the connector so the connector seals without gaskets when the flange bolts are drawn up.

A control joint limiting pipe connector movement shall be supplied with each pipe connector.

## **2.12 PIPING**

Piping shall be steel and conform to material specification ASTM A-53(CW) for nominal pipe size four (4) inch and smaller and ASTM A-53(ERW) Grade B for nominal pipe size five (5) inches and larger. Steel butt-welding fittings shall conform to material specification ASTM A-234 Grade WPB and to the dimensions and tolerances of ANSI Standards B16.9 and B16.28 respectively.

Forged steel flanges shall conform to material specification ASTM A-105 Class 60 and/or ASTM A-181 for carbon steel forgings and to the dimensions and tolerances of ANSI Standards B16.5 as amended in 1992 for Class 150 and Class 300 flanges.



The piping sizes shall be as shown on the drawing.  
 Size 10 inch and below - Schedule 40  
 Size 12 inch and above - Standard weight (.375" wall)

All pipe welds shall be performed by certified welders employed by the pump station manufacturer. As part of the equipment submittal, the pump station manufacturer shall provide copies of the welding certificates of the employees who are to perform the pipe welds.

All piping surfaces shall be prepared by gritblasting, or other abrasive blasting, prior to any welds taking place. Piping of 5" diameter and smaller may be cut by saw. Piping of 6" diameter and larger shall be bevel cut, and Oxyfuel or Plasma-arc cutting techniques shall be used to assure and facilitate bevel pipe cuts. No saw cuts or other form of abrasive cut-offs are allowed on 6" and larger diameter pipe.

In all cases, short circuit transfer, spray transfer or pulse-arc transfer modes of the gas metal arc welding process shall be applied semi-automatically. When utilizing the short circuit mode, shielding gas consisting of 50% carbon dioxide and 50% argon gas shall be used. When utilizing the spray or pulse-arc transfer modes, a shielding gas consisting of 5% carbon dioxide and 95% argon shall be used. In all cases, welding wire with a minimum tensile strength of 70,000 psi shall be employed. All flange welds and butt welds of equal size pipe shall be a single continuous nonstop weld around the complete circumference of the pipe. Whenever possible, vertical up weld passes will be applied to all pipe welds. No vertical down weld passes will be allowed. Completed welding assemblies shall create no internal obstruction, restriction or create any unintended sources of water deflection.

Piping of six (6) inch diameter and larger shall require a minimum of two (2) weld passes to complete each weld. The first pass, or root pass, shall be applied at the bottom of the bevel cut using the short circuit transfer welding mode, and the second pass, or cap pass, shall be applied over the root pass using the spray or pulse arc transfer welding modes to insure that at a minimum the total weld thickness shall be equal to thinnest of the two pieces being welded together.

## 2.13 PIPE SUPPORTS

Pipe supports by minimum sizing for:

- 8" and smaller piping shall be 2" x 3" x 3/16" wall rectangular tubing;
- 10" and larger piping shall be 3" x 4" x 1/4" wall rectangular tubing;
- 6" and larger piping shall be provided with "kick" bracing projecting fully from the underside of the pipe to the floor at an angle of no less than 15° from vertical out at a right angle to the run of the pipe being supported. These "kick" braces shall be in addition to the vertical pipe supports called out above.

Pipe supports are to be fully welded at both end points to the pipe and steel floor where required.

**Simple pipe stands made of pipe welded only at the floor and upholding a bracket with or without a threaded jack bolt or a U-bolt are not acceptable, as no lateral or transverse support is provided.**

## 2.14 FUSION BONDED EPOXY COATING - STEEL PIPING

Steel piping shall have applied to it a Fusion Bonded Epoxy Coating on the interior pipe surface that conforms to AWWA C-213-91 for steel water pipelines. The powder coating product shall be National Sanitation Foundation (NSF) Standard 61 certified material. The final product shall be capable of meeting Salt Spray Resistance ASTM B117 (1000 hour) with no blistering, undercutting or rust bleed; Humidity Resistance ASTM D2247 (1000 hour) with no blistering, undercutting or rust bleed; and Impact Resistance of ASTM G14-72 (160 in. lbs.). The Fusion Bonded Epoxy Coating shall provide a minimum total dry mil thickness of 12-16 mils. The epoxy powder coating shall be Pipe Clad 1500 Red latest revision from Valspar, Inc.

Prior to shipment of the station, the station manufacturer shall provide in writing to the Engineer certification that the fusion bonded epoxy coating has been applied to all internal surfaces of the steel piping using the proper method. Said certification shall show under the station manufacturer's letterhead:

- Date of application;
- Material manufacturer and product designation including a product data sheet for the coating;
- Applier of the fusion bonded coating, name, address and phone number;
- Notarized signature of an officer of the station manufacturing company stating the fusion bonded epoxy coating was applied to AWWA Standard C213-91 or the latest revision.

## **2.15 SERVICE CONNECTIONS ON INTERNAL PIPING**

All plumbed devices within the station eventually requiring service, such as meters, control valves, pumps and like equipment, shall be easily removed from the piping by the presence of appropriately placed and sufficient quantity of adaptors and couplings as shown on the drawings; no less than the quantity of couplings and adaptors shown shall be allowed.

## **2.16 RESTRAINING POINTS**

The main inlet and outlet piping to the station shall each be provided with two (2) or four (4) restraining points as welded on "eyes" or similar device welded to the framing to facilitate the attachment of joint restraint tie rods or other device to be used in retarding any pipe movement at the connections.

## **2.17 COMPRESSION COUPLINGS**

The booster station piping shall include a compression type, flexible coupling to prevent binding and facilitate removal of associated equipment where shown on the plans for this item. In lieu of a compression coupling, a Uni-Flange or a flanged coupling adapter (FCA) may be used.

All compression couplings, Uni-Flanges, flanged coupling adapters (FCA), and flexible connectors/expansion joints shall include a minimum of two (2) control joint rods with appropriate restraining points.

## **2.18 COMBINATION PRESSURE GAUGES**

Combination pressure gauges shall be glycerine filled with a built-in pressure snubber and have 4-1/2 inch minimum diameter faces and be turret style, black phenolic case with clear glass face. The movement shall be rotary, of 400 Series stainless steel with teflon coated pinion gear and segment. The gauge shall be bottom connected & accept a 1/4" NPT female thread. Combination pressure gauge range and scale graduations shall be in psi and feet of water as follows:

SUCTION PRESSURE - 0 to 160 psi, 20 psi figure intervals, with graduating marks every 2 psi (0-370 feet).

DISCHARGE PRESSURE - 0 to 300 psi, 25 psi figure intervals, with graduating marks every 5 psi (0-690 feet).

**All gauges will be panel mounted** off the pipeline and be flexible connected to their respective sensing point. The gauge trim tubing shall be complete with both isolating and vent valves and the tubing shall be so arranged as to easily vent air and facilitate gauge removal. Gauges mounted directly to the pipeline or at the sensing point **will not** be accepted.

**2.19 SAMPLE TAP**

A single, right angle outlet, smooth nose, brass sample tap shall be affixed to the manual vent ball valve for the low suction lockout and suction pressure gauge assembly.

**2.20 BUTTERFLY VALVES**

Valve body shall be wafer style and meet ANSI Class 125/150 flange standards. Metal reinforced dovetail seat shall ensure drop tight, bi-directional shutoff. The stem shall be one piece. The disc and stem shall be connected by a stainless steel torque plug which shall provide positive engagement. The valve shall have upper and lower RTFE inboard stem bearings, isolated from the line media, and a heavy-duty upper stem bushing.

The valve body shall be cast iron; aluminum bronze disc; stainless steel stem; EPDM seat; acetal upper stem bushing; BUNA-N V-cup stem seal.

Valve sized six (6) inches and smaller shall be equipped with lever operator and 10 degree increment throttling plate. Valve sized eight (8) inches and larger shall be equipped with a weather-proof, heavy-duty, gear operator complete with a position indicator.

**2.21 CHECK VALVE**

The check valve shall be pilot controlled, hydraulically operated, single diaphragm-actuated, no-slam with dual speed controls. Each main valve shall be furnished with a resilient, synthetic rubber disc. The valves shall be sized as shown on the plan and be angle/globe pattern, flanged to meet ANSI Class 150 and have a maximum pressure rating of 250 psi.

The valve body and cover shall be ductile iron meeting ASTM A536 and ANSI B16.42 standards. The disc retainer and diaphragm washer shall be cast iron; the main valve stem, stem nut, cover bearing, disc guide and seat shall be stainless steel, Grade 303, AISI Grade 303 for bar stock products and ASTM A743-CF-16FA for cast products.

**2.22 PRESSURE REDUCING, SUSTAINING AND SOLENOID VALVE**

The water pressure reducing valve shall be a pilot-controlled, hydraulically operated, diaphragm or differential piston globe valve. The main valve shall be single-seated with a driptight resilient, replaceable seat. The valve shall be cast iron construction with full bronze internal trim, flanged end design with flanges conforming to 125 ANSI standards. The pilot control shall be a direct acting, adjustable, spring-loaded normally open diaphragm valve designed to permit main valve opening when the controlled pressure is less than the pilot set point. The pilot actuating spring shall be field adjustable a minimum of thirty (30) psi above and below the pilot set point. The water pressure reducing valve shall be equipped with a closing speed control. The complete water pressure reducing valve assembly shall be designed so as to maintain a constant downstream pressure regardless of inlet head fluctuations. The reducing valve shall be designed for a 175 psi maximum working pressure rating.

The pressure sustaining pilot control shall be a direct-acting adjustable, spring-loaded, normally closed diaphragm valve which opens when upstream pressure exceeds the spring setting.

A solenoid control pilot shall also be supplied. The solenoid pilot shall be furnished in a general purpose, NEMA I, enclosure with an epoxy encapsulated coil that operates on 120 volt, 60 Hz, AC power source. The main valve shall be trimmed so as to be normally open and be energized to close on a pump start signal.

## PART 3 – ELECTRICAL

### 3.01 EQUIPMENT GROUNDING

Each electrical equipment item in the station shall be properly grounded per Section 250 of the National Electrical Code. Items to be grounded include, but are not limited to, pump motor frames, control panel, transformer, convenience receptacles, dedicated receptacle for heater, air conditioner, dehumidifier, lights, light switch, exhaust fans and pressure switches.

All ground wires from installed equipment shall be in conduit and shall lead back to the control panel to a copper ground buss specific for grounding purposes and so labeled. The ground buss shall be complete with a lug large enough to accept the installing electrician's bare copper earth ground wire. The bus shall serve as a bond between the earth ground and the equipment ground wires.

### 3.02 PANEL MOUNTING HARDWARE

Metal framing channel shall be used exclusively for mounting of all electrical panels and electrical components except for those specifically designated otherwise.

### 3.03 ELECTRICAL APPARATUS - CONTROL PANEL

**All circuit breakers, motor starters, time delay relays and control relays shall be incorporated into one (1) NEMA 4/12 control panel.** The electrical service provided for this station will be 460 volt, 3 phase, 60 cycle, 3 wire.

There shall be provided, thermal-magnetic trip circuit breakers as follows:

One (1) Main Breaker, 100 amps;  
Two (2) Branch Breakers, one each per pump, 60 amps;  
One (1) Phase Monitor Breaker, 15 amps;  
Seven (7) Auxiliary Circuit Breakers, as follows:

- |                 |                        |
|-----------------|------------------------|
| 1. Controls     | 5. Telemetry           |
| 2. Lights       | 6. Convenience Outlets |
| 3. HVAC         | 7. Spare               |
| 4. Dehumidifier |                        |

### 3.04 ELECTRICAL APPARATUS - PUMP STARTING EQUIPMENT

**Pump starting equipment** shall be via the Variable Frequency Drives.

### 3.05 ELECTRICAL APPARATUS - RUNNING TIME METER

**A running time meter** shall be supplied for each pump to show the number of hours of operation. The meter shall be enclosed in a dust and moisture proof molded plastic case, suitable for flush mounting on the main control panel. The meter dial shall register in hours and tenths of hours up to 99999.9 hours before repeating. The meter shall be suitable for operation from a 115 volt, 60 cycle supply.

### 3.06 ELECTRICAL APPARATUS - PHASE MONITOR

**A phase monitor** shall be supplied to protect three-phase equipment against phase loss, undervoltage and phase reversal conditions. When a fault is sensed, the monitor output relay opens within two seconds or less to turn the equipment off and/or cause an audio or visual alarm. Both Delta and Wye systems may be monitored. The monitor shall have an automatic reset and shall also include an adjustable voltage delay. The monitor shall have an indicator LED (glows when all conditions are normal

and shall monitor phase sequence: ABC operate (will not operate CBA). The phase monitor shall be UL approved and CSA certified.

### **3.07 ELECTRICAL APPARATUS - SURGE ARRESTOR**

A secondary surge arrestor shall be provided. Housing shall be Noryl and be ultrasonically sealed. Valve blocks shall be metal oxide with an insulating ceramic collar. Gap design shall be annular. The lead wire shall be permanently crimped to the upper electrode forming part of the gap structure. Arrestors shall be UL and CSA listed Lightning Protective Devices.

### **3.08 ELECTRICAL APPARATUS - SUCTION PRESSURE CONTROL**

Suction control of the pumping operation shall be provided by a bellows type, adjustable differential pressure switch. The switch shall be complete with a single pole, double throw contact block with 5 amp non-inductive rated contacts at 230 volts AC. The set points of the on/off cycle shall be independently adjustable through the full range of the switch rating.

- 1. Low Suction Cut-out, 4-150 psi.
- 1A. Adjustable Differential, 2-25 psi.

A pressure gauge shall be sub-panel mounted adjacent to the low suction pressure switch. The gauge and switch shall be so plumbed with the suction header sensing line that a common blow-off valve can relieve pressure in both simultaneously for purposes of checking and calibrating the low suction lock-out.

### **3.09 ELECTRICAL APPARATUS - LOCAL PRESSURE CONTROL (BACK-UP TO TELEMETRY)**

Control of the pumps shall be provided by bellows type, adjustable differential pressure switches. Each switch assembly will be complete with a single pole, double throw contact block with 5 amp non-inductive rated contacts at 230 volts AC. The set points of the on/off cycle shall be independently adjustable through the full range of the switch rating.

- 1. Start Lead Pump, 4-150 psi control range.
- 1A. Adjustable Differential, 2-25 psi.
- 2. Start Back-up Pump, 4-150 psi control range.
- 2A. Adjustable Differential, 2-25 psi.

A pressure gauge shall be sub-panel mounted adjacent to the discharge pressure switches. The gauge and switches shall be so plumbed with the discharge header sensing line that a common blow-off valve can relieve pressure in all simultaneously for purposes of checking and calibrating the start-stop functions of the pumps.

### **3.10 VARIABLE FREQUENCY DRIVE**

- A. Acceptable Manufacturers shall include Goulds Pumps Aquavar, Danfoss VLT 8000 AQUA Series or approved equal. The Aquavar VFD is described in paragraph B and was used as a bases for design.
- B. The VFD shall provide an adjustable carrier frequency with IGBT power switching, and utilize PWM technology. The drive shall provide noiseless operation of the driving motor, short circuit and ground protection, and work with controlled sinusoidal current synthesis and dynamic over current limitations. The VFD controller shall be one complete integrated unit including the variable frequency drive, programmable pump control logic, and include a NEMA 1 (CPC). Additional control panels, PLC's or other external devices, shall NOT be necessary to accomplish complete pump programming and variable speed control of pump and motor. Standard variable frequency drives that do not incorporate pump control logic as

the primary control software; programming and features directly applicable to centrifugal pump applications shall not be considered equal. The pumping station controller shall provide a LCD two line display with 16 characters per line and programming keypad for data entry. Unit(s) shall utilize user friendly front panel programming in three languages that displays pump and motor language in clear text. Three colored LED's shall signal 'power on', 'pump running' and 'fault'. Program settings shall be changeable and stored in non-volatile memory. Program settings shall be retained in memory in the event of loss of power to the controller, without the use of a backup battery. System operating pressure shall be clearly displayed in PSI or feet of head for ease of use and to provide an operator friendly interface. Additional parameters, where applicable, shall be displayed in units consistent with pumping systems. Generic control systems adapted from other applications shall not be considered equal. The settings and program in whole or part may be locked out with the use of an operator selectable password. Standard system hydraulic settings shall include at a minimum the following functions: loss of suction, lack of NPSHa, pump run-out protection, "dead-head" protection, constant pressure setting with variable. Flow capability, constant flow with variable TDH (pressure) capability, quadratic differential flow calculation, system curve compensation, multiple pump operation with alternation, pump starting point with allowable, adjustable pressure drop, minimum speed with time delay, pressure of flow sensor error, overpressure shutdown, and low flow shutdown.

### **3.11 ELECTRICAL APPARATUS - TELEMETRY CONTROL - INTERFACE PANEL**

It will be the responsibility of the booster station manufacturer to provide the following as an adjunct to the supplied telemetry equipment.

1. 3/4" telemetry entrance conduit complete to telemetry panel.
2. Size 12" x 12" NEMA 1 telemetry interface panel.
3. Separate 120 volt single phase power circuit in conduit to the telemetry interface panel.
4. Telemetry control circuits made up and in conduit from main control panel to telemetry interface panel terminal strip.
5. Metal framing channel to mount telemetry equipment.

### **3.12 MANUAL TRANSFER SWITCH**

- A. Manual transfer switch shall be a 3 Phase, 100 amps rated at all locations shown on drawing. Switch shall be a double throw non-fused safety switch in NEMA 3R enclosure similar to Square D Class 3140, Series F, Part # DTU323RB. The switch shall have the following features:

- a. Load make/break rated
- b. Dual cover interlock
- c. May be padlocked ON or OFF
- d. Lock-off to accept up to three padlocks
- e. Side opening door
- f. Quick make/break mechanism
- g. Should meet NEMA requirements as heavy duty switch
- h. UL listed as suitable for use as service equipment

### **3.13 ELECTRICAL APPARATUS - DEVICES**

Five (5) solid state time delay relays shall be provided to perform the following functions:

1. Low Suction Timer
2. Start Control Timer Pump #1
3. Stop Control Timer Pump #1



4. Start Control Timer Pump #2
5. Stop Control Timer Pump #2

The solid state time delay relay shall have an adjustable time range of 10 seconds to 10 minutes. The relays shall be constructed to use a DIN rail mount socket so that the relays can be replaced without disturbing the wiring. The relay shall be complete with LED indicators for output and power.

Hand-Off-Automatic switches shall be oil tight, 3-position maintained and be located on the main control panel door.

1. Pump #1
2. Pump #2
3. Exhaust Fan
4. Telemetry Test

#### **A TWO POSITION SWITCH SHALL BE PROVIDED TO SELECT TELEMETRY OR PRESURE CONTROL.**

Indicating lights shall be oil tight, with a full voltage pilot light and be provided:

1. Red - Low Suction Pressure
2. Green - Pump #1 in Operation
3. Green - Pump #2 in Operation

Nameplates shall be furnished on all panel front mounted switches and lights.

The control panel door shall be complete on the interior with a stick-on transparency containing an "as-built" reproduction of the electrical control panel schematic. The wiring diagram shall be a corrected "as-built" copy & contain individual wire numbers, circuit breaker numbers, switch designation & control function explanations.

### **3.15 ELECTRICAL APPARATUS - CONDUIT AND WIRING**

The service entrance conduits shall be **rigid steel conduit**, individually sized to accept the inbound service conductors and telemetry/telephone/radio cables, and shall be installed from the main power or control panel through the equipment enclosure floor and terminate exterior to the equipment enclosure. The service entrance exterior conduit connection points shall be capped or plugged for shipment.

All wiring within the equipment enclosure and outside of the control panel or panels shall be run in conduit except for the watertight flexible conduit and fittings properly used to connect pump drivers, fan motors, solenoid valves, limit switches, etc., where flexible connections are best utilized. Only the dehumidifier where furnished by the original manufacturer with a UL approved rubber cord and plug, may be plugged into a receptacle.

**EQUIPMENT ENCLOSURE CONDUIT** - Rigid, heavy wall, Schedule 40 PVC with solvent weld moisture-proof connections, in minimum size 3/4" or larger, sized to handle the type, number and size of equipment conductors to be carried - in compliance with Article 347 of the National Electrical Code and NEMA TC-2, Federal WC-1094A and UL-651 Underwriters Laboratory Specifications.

**FLEXIBLE CONNECTIONS** - Where flexible conduit connections are necessary, the conduit used shall be liquid-tight, flexible, totally nonmetallic, corrosion resistant, nonconductive, U.L. listed conduit sized to handle the type, number and size of equipment conductors to be carried - in compliance with Article 351 of the National Electrical Code.

**MOTOR CIRCUIT CONDUCTORS** - Sized for load. All branch circuit conductors supplying a single motor of one (1) horsepower or more shall have an ampacity of not less than 125 percent of the motor full load

current rating, dual rated type THHN/THWN, as set forth in Article 310 and 430-B of the National Electrical Code, Schedule 310-13 for flame retardant, heat resistant thermoplastic, copper conductors in a nylon or equivalent outer covering.

CONTROL AND ACCESSORY WIRING - Sized for load, type MTW/AWM (Machine tool wire/appliance wiring material) as set forth in Article 310 and 670 of the National Electrical Code, Schedule 310-13 and NFPA Standard 79 for flame retardant, moisture, heat and oil resistant thermoplastic, copper conductors in compliance with NTMA and as listed by Underwriters Laboratories (AWM), except where accessories are furnished with a manufacturer supplied UL approved rubber cord and plug.

### **3.16 ELECTRICAL APPARATUS - RECEPTACLES**

**Two (2) duplex, ground fault circuit interrupter type receptacles** shall be furnished about the periphery of the equipment enclosure, with one (1) receptacle adjacent to the main control panel.

### **3.17 CONVENIENCE GROUP - LIGHTING**

There shall be one or more two-tube, 32 watt per tube, electronic start, enclosed and gasketed, forty-eight (48) inch minimum length fluorescent light fixtures installed within the equipment enclosure, as shown on the plan for this item. One (1) light fixture shall be located directly over the main control panel. The light switch shall be of the night glow type and be located conveniently adjacent to the door. Open fluorescent or incandescent fixtures **will not** be accepted.

### **3.18 CONVENIENCE GROUP - HEATING/COOLING/EXHAUST UNIT**

The unit shall be one piece, wall mounted, factory assembled, precharged, prewired, tested and ready to operate. The unit shall have a limited warranty of five years on parts and five years on the compressor. The unit shall be approved and listed by Underwriters' Laboratories, Inc., and Canadian Underwriters' Laboratories (CUL). Unit performance shall be certified in accordance with Air Conditioning and Refrigeration Institute Standard 210/240-89 for Unitary Air-Source air conditioners or latest standard.

1. One (1) each exterior wall mounted, hard-wired as shown;
2. Enclosed weatherproof casing constructed of 20 gauge galvanized steel, finished with baked-on polyester enamel paint;
3. One (1) washable filter;
4. Remote adjustable thermostat;
5. Cooling capacity in tons: 1;
6. Cooling Capacity: 11,100 BTUH at 230 volts, single phase;
7. Amps: 30;
8. Twin indoor blowers, SCFM maximum/minimum: 325/300 at 0.2" static pressure;
9. Electrical supplemental heater: 3 kW;

### **3.19 CONVENIENCE GROUP - DEHUMIDIFIER**

1. One (1) each, installed as shown.
2. Capacity 25 pints per 24 hours (AHAM Standard DH-1).
3. Compressor rated 1/5 HP, 4.1 amps, 400 watts.
4. Condensate piped direct to sump.
5. 120 volt A.C. operation by dial-controlled adjustable humidistat.
6. UL listed rubber cord.



## PART 4 – EXECUTION

### 4.01 PRESSURE TESTING

When the station plumbing is completed, the pressure piping within the station (including valves, pumps, control valves, and fittings), connections as make up the entire system shall be hydrostatically tested at a pressure of 150 psi or a pressure equal to the lowest test pressure rating of the equipment within the tested system, whichever is lesser pressure. The test pressure shall be applied for a minimum of 20 minutes, during which time all joints, connections and seams shall be checked for leaking. Any deficiencies found shall be repaired and the system shall be retested.

**The results of this testing shall be transmitted in writing to the Engineer prior to shipment of the station and shall note test pressure, time at full pressure and be signed by the Quality Control Manager or test technician.**

### 4.02 ELECTRICAL APPARATUS - DESIGN, ASSEMBLY & TEST

The electrical apparatus and control panel design, assembly, and installation, and the integration of component parts will be the responsibility of the manufacturer of record for this booster pumping equipment. That manufacturer shall maintain at his regular place of business a complete electrical design, assembly and test facility to assure continuity of electrical design with equipment application. Control panels designed, assembled or tested at other than the regular production facilities or by other than the regular production employees of the manufacturer of record for this booster pumping equipment **will not** be approved.

### 4.03 CONFORMANCE TO BASIC ELECTRICAL STANDARDS

The manufacturer of electrical control panels and their mounting and installation shall be done in strict accordance with the requirements of UL Standard 508 and the National Electrical Code (NEC) latest revision so as to afford a measure of security as to the ability of the eventual owner to safely operate the equipment. **No exceptions to the requirements of these codes and standards will be allowed; failure to meet these requirements will be cause to remove the equipment and correct the violation.**

### 4.04 U.L. LISTING

All service entrance, power distribution, control and starting equipment panels shall be constructed and installed in strict accordance with **Underwriter's Laboratories (UL) Standard 508 "Industrial Control Equipment."** The UL label shall also include an **SE "Service Entrance"** rating stating that the main distribution panel is suitable for use as service entrance equipment. The panels shall be shop inspected by UL, or constructed in a UL recognized facility. All panels shall bear a serialized UL label indicating acceptance under Standard 508 and under Enclosed Industrial Control Panel or Service Equipment Panel. In addition, a photocopy of the UL labels for this specific project shall be transmitted to both the project engineer and the contractor for installation within their permanent project files, **prior to shipment of the equipment covered under these specifications.**

### 4.05 E.T.L. LISTING

All control panels shall be E.T.L. Listed by Interek Testing Services (ITS) under Category 4 - Industrial Control Equipment. Each completed panel shall bear an E.T.L. listing label. The listing label shall include the station manufacturer's name, address and telephone number. The station manufacturer shall have quarterly inspections performed by ITS at the manufacturer's facilities to ensure that the products being listed comply with the report and procedural guide for that product.

#### 4.06 FACTORY START-UP SERVICE

1. Start-up service technician shall be a **regular employee of booster station manufacturer**.
2. As part of the submittal covering this equipment, list the factory service manager, his employee number, his telephone number with extension and his number of years with the company. List also each start-up service technician, his employee number and years of service with the company.
3. Verify that one (1) or more of the service technicians listed above will perform the required start-up service on the equipment covered in the submittal.
4. One (1) full day at job site for start-up and training.
5. Start-up service to include two (2) bound O&M manuals.
6. Start-up service report attested to by start-up technician and representative of owner or engineer.
7. Service report distributed to:
  - A. Manufacturer's File
  - B. Engineer's File
  - C. Contractor's File
  - D. Owner's File

#### 4.07 MANUFACTURER'S WARRANTY

The warranty is the sole responsibility of the station manufacturer and that manufacturer's warranty shall be provided in written form for inclusion with both the submittal covering the specified equipment and the O&M manuals provided with that equipment.

Said manufacturer's warranty shall at a minimum cover:

1. A period of one (1) year commencing upon **successful start-up**, after authorized manufacturer's start-up, not to exceed eighteen (18) months from the date of shipment.
2. The one (1) year period shall be inviolate regardless of any component manufacturer's warranty for equipment and components within the station.
3. The manufacturer's warranty shall cover all equipment, components and systems provided in or with the station by the manufacturer of the station, exclusive of those components supplied by and/or installed by others independent of the manufacturer of record for this station.
4. The warranty shall provide for the station manufacturer to bear the full cost of labor and materials for replacement and/or repair of faulty or defective components so there shall be **no cost** incurred by the Owner for this work during the warranty period.
5. The manufacturer's warranty policy is amended only by the items considered consumables, i.e., light bulbs, pump seals, pump packing, lubricants and other maintenance items consumed by usage.
6. No assumption of contingent liabilities for any component failure during manufacturer's warranty is made.

It is the intent of this manufacturer's warranty to gain for the owner a **single source** responsible party for all components specified herein. "Second party" or "pass through" warranties **will not** be accepted.

If the submitted written manufacturer's warranty **does not** meet the minimum requirements set forth above, that submittal will forthrightly be rejected.

**4.08 GENERAL LIABILITY INSURANCE**

The booster pump station manufacturer shall furnish premises/ operations and products/completed operations general liability insurance from an insurance company with a rating of A-V according to the most recent Best's Key Rating Guide, in an amount equal to \$5,000,000 per occurrence. The insurance certificate must be included with the manufacturer's submittal. The coverage must be provided by an insurance carrier licensed and admitted in the state of manufacture.

- END OF SECTION -

**DIVISION 16**

**ELECTRICAL**



**SECTION 16010****ELECTRICAL – GENERAL****PART 1 - GENERAL****1.1 SUMMARY**

- A.** Provide complete, tested and fully functional electrical systems as shown on the Drawings and as specified herein.
- B.** Electrical equipment and installed systems shall be suitable for the intended application, shall be safe for the intended use, shall be rated for the available fault current, and shall conform to local building codes and statutory requirements.
- C.** All pump stations shall be provided with transient voltage surge suppressors (TVSS).

**1.2 RELATED DOCUMENTS**

- A.** Electrical requirements specified in this Section apply to all electrical equipment and materials described in other Sections of Division 16.

**1.3 SCOPE OF WORK**

- A.** The work includes, but is not limited to, the following:
  - 1. Secondary electrical service
  - 2. Grounding and bonding
  - 3. Electrical identification
  - 4. Wire and cable
  - 5. Raceways, boxes, and fittings
  - 6. Transient voltage surge suppressors
  - 7. Enclosed switches and circuit breakers
  - 8. Panelboards
  - 9. Dry type transformers (600V and less)
  - 10. Interior lighting
  - 11. Exterior lighting
  - 12. Field wiring for equipment provided under other Sections of the Specification
  - 13. Thorough cleaning of all equipment prior to energization
  - 14. Protection of all equipment under this Division until the final acceptance of the job
- B.** Coordinate Division 16 requirements with work in other Divisions.
- C.** Submit preconstruction submittals, shop drawings, product data, samples, design data, test reports, certificates, manufacturer's instructions, manufacturer's field reports, operation and maintenance data, closeout submittals and other specified documents to the Engineer for review and approval as described in the Special Provisions, in this Section, and in other Sections of Division 16.
- D.** Perform Electrical Acceptance Testing as described in other Division 16 Sections.

## 1.4 PROJECT CONDITIONS

- A. Ambient temperature, humidity, and elevation ranges: Equipment other than transformers shall be rated for continuous operation at full rated load without derating, under the following conditions:
  - 1. Ambient Temperature: 0 to 40 deg C.
  - 2. Humidity: Less than 90 percent (non-condensing).
  - 3. Altitude: Not exceeding 3300 feet (1000 m).
- B. Transformer output ratings shall be as specified in Division 16 Section "Dry Type Transformers (600V and Less)".
- C. Product Selection for Restricted Space: Drawings show allowable space to scale for anticipated equipment sizes. Comply with NEC requirements for working clearances and with manufacturer's recommendations for access for maintenance. Notify the Engineer if insufficient space is available for available products.

## 1.5 DEFINITIONS

- A. The following definitions apply to work specified in Division 16:
  - 1. AHJ: The statutory Authority Having Jurisdiction as defined in NEC Article 100 for enforcement of legally required compliance to local codes, standards, and ordinances.
  - 2. ANSI: American National Standards Institute
  - 3. AEIC: Association of Edison Illuminating Companies
  - 4. ASQ: American Society for Quality
  - 5. AWG: American Wire Gauge
  - 6. CFR: Code of Federal Regulations
  - 7. Cable: an assembly of insulated conductors
  - 8. Control panel: an electrical enclosure housing control logic devices and an operator control interface
  - 9. Commissioning: the process of testing system performance after the sequential steps of installation, testing, energization, startup (including initial adjustment and de-bugging) and functional testing of individual pieces of equipment have all been completed
  - 10. Contract: as used in the Electrical Specification, includes all Contract documents including Specifications and Appendices, Drawings, Addenda, and Change Orders
  - 11. ICEA: Insulated Cable Engineers Association
  - 12. Equipment: a general term including materials, fittings, devices, appliances, fixtures, apparatus, and the like, used as part of, or in connection with, an electrical installation (OSHA Section 29 CFR 1910.399(46) definition)
  - 13. FM: Factory Mutual, Inc.
  - 14. Field wiring: on-site installation of raceways & conductors to connect equipment in accordance with approved drawings
  - 15. Field test: electrical test carried out on-site
  - 16. Fail-safe: selection of control devices and contacts in a manner, which results in safe shutdown of the equipment whenever one of the following events occurs:
    - a. Loss of remote control RUN command (normal configuration: contacts close to run equipment)
    - b. Intentional and unintentional disconnection of device (normal configuration: contacts open to shut down equipment)

- c. High contact resistance or high resistance connection
  - d. Loss of 4-20mA DC signal
  - e. Definite-time sequence takes too long, e.g., reduced voltage motor starter fails to make transition from START mode to RUN mode after a reasonable time
  - f. Defined sequence does not occur, e.g., there is no flow from a motor driven pump within a reasonable time after the motor starter contactor is energized.
17. Furnish and install: same as "Provide" below.
  18. Functional testing: verification of the satisfactory performance of control logic, with due attention to equipment protective devices, for example, overload relays, temperature switches, pressure switches, flow switches, and similar devices, under actual operating conditions
  19. HV: high voltage, operating voltage over 600V (NEC definition)
  20. IEEE: Institute of Electrical and Electronics Engineers, Inc.
  21. ISO: International Standards Organization
  22. Lineup: with respect to switchgear, switchboards, and motor control centers, a contiguous group of vertical sections with common main busbars, and including bus tie breaker sections and control sections
  23. LV: low voltage, operating voltage under 600V (NEC definition)
  24. Megger: insulation tester with megohm scale
  25. NEC: NFPA 70, the National Electrical Code
  26. NETA: InterNational Electrical Testing Association, Inc.
  27. NICET: National Institute for Certification in Engineering Technologies
  28. NFPA: National Fire Protection Association
  29. NRTL: Nationally recognized testing laboratory as defined in 29 CFR 1910.7 as it applies to testing and inspecting for safety in the workplace (OSHA definition)
  30. Nonconformity: The nonfulfillment of a specified requirement (ASQ definition)
  31. "Or approved equal": proposed "equal" product shall be in conformance with all specified requirements, shall be equivalent in materials of construction to specified manufacturers' products, shall have equal or superior performance in the conditions anticipated for use of the product in this project, and shall be approved by the Engineer
  32. OSHA: Occupational Safety and Health Act
  33. Panel: with respect to circuit breaker and fuse power distribution centers, panel is equivalent to "panelboard", e.g., lighting panel; with respect to control panels, refers either to the entire control panel itself or to a steel plate used for mounting devices inside the control panel
  34. Provide: Throughout the Specification, use of this term includes project administration, quality assurance, human resources, tools & equipment, logistics and scheduling, submittals of shop drawings & samples for approval, managing suppliers, purchasing, manufacturing, factory testing, release for shipment, packing, delivery, storage, submittal of coordinated & dimensioned installation drawings for approval, installation, surface preparation & finishes, site testing, startup & commissioning, on-site supervision by equipment manufacturers' representatives, spare parts & tools, Operations and Maintenance (O&M) Manuals, training, guarantees and warranties, other work described in individual Sections of the Specification, and the Contractor's duties, responsibilities, risks, and liabilities under the Contract.
  35. Punch list: document containing detailed descriptions of non-conformities
  36. Quality: conformance to specified requirements.
  37. RMS: root mean square
  38. Raceways: cable ladder and tray, conduit, duct, wireway, and associated boxes and fittings, which enclose, support, and protect wires and cables
  39. Shop drawings: a complete package of manufacturer's equipment drawings, bill of materials, catalog data sheets, performance curves, calculations, and other data



- provided to demonstrate conformance to the equipment specification
- 40. Substitution: an alternative, nonconforming product proposed by the Contractor in lieu of a specified, conforming product
  - 41. Substantial Completion: an electrical system may be considered substantially complete when the equipment has passed the specified tests required prior to energization, has been energized, has passed the Electrical Acceptance Tests, and all related Specification requirements have been met except for well-defined minor items which, in the opinion of the Engineer, may be repaired or replaced prior to Final Acceptance without adversely affecting process performance.
  - 42. Terminal box: an electrical enclosure containing labeled terminal blocks for connection of wiring
  - 43. UL: Underwriters Laboratories, Inc.
  - 44. VFC: variable frequency controller
  - 45. VFD: variable frequency drive, the combination of VFC and inverter-duty motor that drive mechanical loads using the principle of variable frequency motor control
  - 46. Wiring: conductors and connections to equipment terminals. 'Wiring' and 'cabling' shall be considered equivalent terms. Fiber optic cables shall be included in the scope of electrical wiring.

## **1.6 REFERENCE STANDARDS**

- A. Notwithstanding revision dates shown in this and other Sections of Division 16, the codes and standards applicable to this project shall be those in effect at the time of bid opening, except for NFPA 70 (NEC), which shall be the version acceptable to the AHJ.

## **1.7 QUALITY ASSURANCE**

- A. In consultation with the equipment and materials Suppliers, the Contractor shall prepare and submit a Compliance Statement as described in "SUBMITTALS" below with each submittal requiring approval.
- B. The Engineer's approval of a submittal shall not relieve the Contractor of any Contractor responsibilities under the Contract. Approval of a submittal that is incomplete, or one that has nonconformities that are not described in the Compliance Statement that is specified to be included with each submittal, followed by the discovery of unapproved nonconformities, will result in replacement of the non-conforming items at no additional cost to the Owner. Substitutions require the approval of the Engineer.
- C. Manufacturers of electrical equipment shall have quality certification to ISO 9000:2000 or an equivalent Quality Management System acceptable to the Engineer.
- D. Equipment, materials, and installation shall conform to NEC requirements and shall be NRTL-listed and labeled under the relevant UL standard.
- E. On-site testing prior to energization and electrical acceptance testing shall be performed as specified in other Sections.
- F. Manufacturers, manufacturer's representatives, subcontractors, supervisors, installers, and testing agencies shall have qualifications and experience as described in other Sections of the Specification. Qualifications and experience submittals for firms and individuals shall be submitted, re-submitted, or updated whenever requested by the Owner's Representative.

## **1.8 SAFETY IN THE WORKPLACE**

- A.** Electrical equipment and materials, and the Contractor's installation practices, shall conform to the following:
  - 1. Current edition of OSHA sections of the Code of Federal Regulations (CFR): Part 29 CFR 1910 for General Industry and Part 19 CFR 1926 for Construction Activities
  - 2. NFPA 70, the National Electrical Code
  - 3. Current edition of NFPA 70E, Standard for Electrical Safety Requirements for Employee Workplaces
- B.** These regulations and standards impose obligations on equipment manufacturers to obtain NRTL certification, listing, and labeling to comply with OSHA (Occupational Safety and Health Act) and Department of Labor regulations.
- C.** All electrical equipment for which NRTL test procedures have been established shall be certified, listed, and labeled, or otherwise determined to be safe for its intended use, by a NRTL. The absence of a specific reference to NRTL-listing in other Sections shall not relieve the Contractor of the requirement to provide NRTL-listed equipment, and to obtain certification as required by the AHJ in cases where NRTL listing and labeling is not a manufacturer's standard offering for a particular product.
- D.** Equipment shall not be modified in any manner adversely affecting safety for the intended use, nor shall any equipment be modified on-site without the approval of the manufacturer.
- E.** Equipment sound levels shall not exceed limits established by reference standards and local regulations. In the absence of reference standards and local regulatory requirements, sound pressure levels shall not exceed 85-dB (A) measured three feet from the equipment.
- F.** Equipment with moving parts shall be fully guarded in compliance with OSHA rules and regulations.

## **1.9 INSPECTIONS BY THE AHJ**

- A.** The Contractor shall make arrangements for electrical inspection of the project by the AHJ. Upon completion of the work, final certificate of approval documents shall be submitted to the Engineer for forwarding to the Owner. This certificate shall be submitted prior to request for final payment. The Contractor shall pay all fees required for inspection.

## **1.10 WORKMANSHIP AND MATERIALS**

- A.** Materials and equipment shall be new and undamaged, shall be marked by the manufacturer, and shall be delivered to the construction site in the original factory packaging.
- B.** Materials and equipment shall be installed in accordance with the Drawings, the Specification, and the manufacturer's installation, operation, and maintenance instructions. In the event of apparent conflicts or discrepancies, the Engineer shall be informed of the apparent conflict or discrepancy in writing, and will instruct the Contractor how to proceed.

**1.11 CONTRACT DRAWINGS**

- A.** The Electrical Drawings provide scaled layouts of representative equipment and key building dimensions, for example, structural gridlines, but do not include “approved for construction” dimensions for equipment.

**1.12 COORDINATION OF WORK**

- A.** Work under this Division shall be performed in conjunction with the work of other trades. Coordinate electrical installation work with the overall construction schedule. Examine the plans and specifications prior to commencement of work and become familiar with all phases of work involved prior to commencing installation work.
- B.** The Contractor shall be responsible for coordinating dimensions of equipment and working clearances in accordance with NEC, and in all cases bring to the attention of the Engineer any discrepancies on the plans and in the specifications prior to installation. Any work that installed without proper coordination shall be removed and reinstalled at the Contractor's expense. The layout for sleeves chases, openings, etc., must be arranged prior to construction in order to prevent unnecessary cutting. Examine Architectural drawings for doors swings, countertop heights, built-in furniture and casework, and other factors affecting electrical outlet locations prior to roughing-in raceways, boxes, fittings, and outlets.
- C.** Control and signal wiring requirements shall be coordinated with Division 17.

**1.13 CODES AND STANDARDS**

- A.** All equipment and materials shall be manufactured, tested, and installed in accordance with the National Electrical Code (NEC) and all applicable portions of local codes, in accordance with the requirements of the AHJ.
- B.** In addition, work shall be in accordance with the versions of the following referenced standards in effect at the time of bid opening:
  1. American Association for Laboratory Accreditation (A2LA)
  2. American Society for Testing and Materials (ASTM)
  3. American National Standards Institute (ANSI)
  4. Americans with Disabilities Act (ADA)
  5. Code of Federal Regulations (29 CFR 1903, 1910, and 1926)
  6. Factory Mutual Engineering & Research (FME&R)
  7. Illuminating Engineering Society of North America (IESNA)
  8. Insulated Cable Engineers Association (ICEA)
  9. International Organization for Standardization (ISO)
  10. National Electrical Manufacturers Associates (NEMA)
  11. Institute of Electrical and Electronic Engineers (IEEE)
  12. National Fire Protection Association (NFPA)
  13. Occupational Safety and Health Act (OSHA)
  14. Underwriters Laboratory, Inc. (UL) and other NRTL standards and test procedures

**1.14 HAZARDOUS AREAS**

- A.** Electrical equipment for use in hazardous areas shall be NRTL listed and labeled for the application. Equipment and installation shall be in accordance with NEC requirements for the hazardous area classification indicated on the Drawings.

**1.15 SUBMITTALS**

- A.** Submittals shall conform to the General Provisions and Special Provisions.
- B.** Compliance Statement: with each submittal, include a Compliance Statement listing each Specification Section, and Part 1, 2, and 3 Sub-Sections, stating, paragraph-by-paragraph, compliance with the Specification, each minor nonconformity that is within the intent of the Specification, and proposed nonconformities. Provide short description of minor nonconformities, and detailed explanation of other nonconformities.
- C.** Record Drawings: Maintain a full size paper set of "black-line" working drawings throughout the project, and shall carefully record in red ink the actual locations including dimensions to locate each piece of electrical equipment, raceways, boxes, & fittings, and electrical outlets. Upon Substantial Completion of the work, deliver the marked-up set of prints to the Engineer. The Engineer reserves the right to withhold final payment until "As-Built" drawings are received.
- D.** Operation and Maintenance Manuals: Prior to acceptance of the finished project, provide copies of electrical Operation and Maintenance Manuals in conformance with the Special Provisions. O&M Manuals shall be organized according to Division 16 Section numbers. Each copy shall be bound in a durable, 3-ring hardback binder, with data sheets individually punched and reinforced to prevent tearout. Data sheets shall be grouped, and binder dividers shall be provided to match the Table of Contents. Each Manual shall have an identifying label on the spine and front cover and shall include the following:
- E.** Spare Parts and Special Tools List: 90 days prior to the scheduled Substantial Completion date, submit a complete list of Spare Parts and Special Tools included in other Sections of Division 16 to the Owner, and request a time and location for delivery of the Spare Parts and Special Tools to the Owner.

**1.16 OUTAGES**

- A.** Electrical outages: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service if required by the Specification.
  - 1. Notify the Owner a minimum of 30 days in advance of proposed interruption of electrical service.
  - 2. Submit step-by-step sequence and schedule for proposed interruption, and if required, proposed method of providing temporary electrical service, to the Owner for approval.
  - 3. Confirm approved interruption of electrical service one week in advance of Owner-approved date.

4. Do not proceed with interruption of electrical service without written permission from the Owner.

### **1.17 TEMPORARY LIGHTING AND POWER**

- A. Conform to the General Provisions.
- B. Provide all temporary electric service for power and lighting including panels, feeders, lighting, outlets, branch circuits, etc.
- C. The Owner's electrical power shall not be used without permission.
- D. All temporary work shall be in accordance with the NEC, OSHA, and NFPA safety requirements and shall be completely removed upon completion of the project.

## **PART 2 - PRODUCTS**

### **2.1 EQUIPMENT AND MATERIALS**

- A. Provide equipment and materials in compliance with other Sections of Division 16. The requirements in this Section apply to all Sections in Division 16.

### **2.2 ELECTRICAL IDENTIFICATION**

- A. Electrical equipment, raceways, boxes, wires and cables shall be marked in the field in accordance with Division 16 Section "Electrical Identification"

### **2.3 ELECTRICAL ENCLOSURES**

- A. In the absence of other specified NEMA enclosure ratings in other Sections of the Specification, and where cross-referenced in other Sections of the Specification, electrical enclosures shall have degree of protection ratings suitable for the intended application (e.g., watertight, dust-tight, explosion-proof) and environmental conditions. Electrical equipment enclosures shall have the following NEMA 250 ratings and materials of construction:
  1. NEMA 1 or 1A: Enclosures located in clean, dry, indoor Control Rooms and Electrical Rooms shall be NEMA 1 painted steel, except that motor control centers in dedicated electrical rooms shall have foam gaskets on covers and doors (NEMA 1A) to reduce dust intrusion.
  2. NEMA 4X:
    - a. Outdoor enclosures containing electrical equipment: NEMA 4X stainless steel.
    - b. Outdoor pull and terminal boxes: NEMA 4X stainless steel.
    - c. Indoor enclosures in process areas that are not in Hazardous (Classified) locations.
  3. NEMA 4X: Outdoor enclosures containing heat producing electrical equipment such as VFC's shall be provided with individual side mounted air conditioner units and shielded to maintain the NEMA 4X rating.

4. Enclosures located in hazardous areas shall be epoxy powder-coated cast aluminum NEMA 7 and/or 9 with NRTL listing for the hazardous area classification. Outdoor explosion-proof enclosures shall also be rated NEMA 4.
5. Where different enclosure ratings and enclosure materials are specified in other Sections of the Specification, the Contractor shall submit a written request for clarification of the intent of the Specification to the Engineer.
6. For outlet box and junction box requirements, refer to Division 16 Section "Raceways, Boxes, and Fittings".

## **2.4 ELECTROMAGNETIC INTERFERENCE**

- A. Power conversion equipment, including variable frequency controllers, battery-powered inverters, computer power supplies, frequency converters, and Uninterruptible Power Supplies, shall be fitted with EMI (electromagnetic interference), RFI (radio frequency interference) and telephone interference filters to limit interference effects on other equipment in the area in accordance with IEEE standards and recommendations applicable to the equipment.

## **2.5 DISSIMILAR METALS**

- A. Dissimilar metals shall not be connected, spliced, or joined except where specifically approved in writing by the Engineer. Copper busbars, aluminum busbars, and copper-to-aluminum busbar connections shall be tin-plated at joints and at cable lugs. Bolted electrical conductor connections shall be made with silicone-bronze bolts, nuts, and washers. Belleville washers & tin-plated flat washers shall be used at aluminum-to-copper and aluminum-to-aluminum busbar joints.

## **2.6 WARRANTIES**

- A. Warranties for equipment and materials shall conform to the General Provisions.
- B. Provide an on-site parts and labor warranty for a minimum period of one year after Substantial Completion for all equipment and materials. In cases where the manufacturer offers a longer warranty period, the longer warranty period shall apply as described by the manufacturer.
- C. All components of electrical systems that are not fully functional at the time of Substantial Completion shall have warranties extended to provide minimum one year coverage of fully operational equipment unless otherwise approved by the Owner's Representative.

# **PART 3 - EXECUTION**

## **3.1 DELIVERY AND HANDLING**

- A. Equipment delivered to site shall be handled in accordance with manufacturer's recommendations by experienced riggers, crane operators, and fork lift truck operators.

### **3.2 STORAGE AND PROTECTION OF EQUIPMENT**

- A.** All electrical equipment to be used in construction shall be properly stored and protected against the elements. General construction materials shall be stored in covered trailers. Switchgear, unit substations, motor controllers, panelboards, emergency lighting, solid state equipment, engine generator shall be stored in a clean, dry, indoor location, under cover, until the building is weathertight and the area where the equipment is to be installed has been completed to the satisfaction of the Engineer, including completion of overhead work by other trades.

### **3.3 INSPECTIONS PRIOR TO COVERING-UP**

- A.** Raceways embedded in concrete or otherwise concealed shall be inspected in the presence of the Engineer's Representative prior to placement of concrete. Sufficient time shall be allowed to make corrections if required.

### **3.4 ON-SITE INSPECTIONS AND NONCONFORMITIES**

- A.** Equipment shall be inspected on delivery to site for physical damage and for compliance with the Specification and approved equipment shop drawings.
- B.** Installed equipment, raceways, and wiring shall be inspected on completion of installation for compliance with the Specification and approved installation drawings.
- C.** A Punch List will be prepared by the Owner's Representative during inspections and testing, and issued to the Contractor for corrective action.
- D.** Repairs, replacement, and other corrective action that requires de-energizing any part of the Electrical Power Distribution and Control System shall be completed prior to the scheduled date for substantial completion of the project.

### **3.5 PENETRATIONS AND SEALING**

- A.** Sleeves and rectangular openings shall be provided for raceways provided under this Contract, and for raceways for future equipment where future equipment is shown on the Drawings. Sleeves and rectangular openings for the passage of raceways and conductors shall be sealed after the raceways and conductors have been installed. Spare sleeves and rectangular openings shall also be sealed.
- B.** Penetration of Waterproof Construction: Coordinate the work to minimize penetration of waterproof construction, including roofs and exterior walls. Where penetrations are necessary, provide sleeves and sealing fittings to make each penetration watertight. Conduit sleeves and openings shall be sealed watertight with mechanical seals. Watertightness shall not rely on caulking.

### **3.6 ALTERATIONS AND REMOVAL OF EXISTING WORK**

- A.** Where the work specified under this Division connects to the existing electrical systems, the Contractor shall perform alterations to the existing work as described in the Contract Documents.

- B.** All work performed on the existing electrical systems shall be in accordance with the applicable provisions of the Specification. Visit the project site prior to submitting bids and examine the conditions in which work will be performed. Carefully document all existing conditions pertaining to removal and demolition work.
- C.** While performing connections and alterations to existing electrical work, the Contractor shall take special care to protect all existing equipment from dirt, debris and damage. Damaged equipment shall be replaced at no additional cost to the Owner.
- D.** All removal work shall be performed in a neat and workmanlike manner and shall be executed with the least possible disturbance to the building and tenants. The scheduling of all removal work shall be coordinated with other trades and with the Owner's schedule and operation of the building.

### **3.7 ELECTRICAL SAFETY AND TEST EQUIPMENT**

- A.** Provide electrical safety equipment, including personal protective equipment, gloves, electrical blankets, test instruments, lighting, ventilation, and instructions in the use of safety equipment, and perform the work under this Contract in accordance with applicable safety rules and regulations. The Contractor's attention is directed to safety issues related to confine spaces as defined in OSHA regulations.

### **3.8 CLEANING AND PAINTING**

- A.** After installation and wiring work is completed, all dust and debris shall be removed from the interior and exterior of each electrical equipment enclosure and motor by vacuum-cleaning with circuits de-energized. Do not use compressed air for cleaning. Vacuum cleaner wands and brushes shall be non-conducting. Anti-static protection shall be provided for static-sensitive devices.
- B.** Clean and remove all rust, scale, oil, grease, and dirt from panelboard enclosures, conduits, pull, junction and terminal boxes, fittings and hangers, leaving surfaces in condition for final surface preparation and painting under Division 9.
- C.** All ferrous materials that are concealed, or exposed in unfinished areas, including fittings, hangers, junction, pull and terminal boxes, that are not plated or painted with a factory-applied finish, shall be painted under this Section with one coat of zinc-chromate primer and one finish coat of enamel paint approved by the Engineer. Nonferrous materials shall be cleaned only and left unpainted.
- D.** Equipment furnished with a factory finish coat shall have finish carefully touched-up where it is scratched or otherwise damaged. Touch-up work shall be match the color and type of the original finish.

### **3.9 INSPECTION AND TESTING ON-SITE**

- A.** Perform Electrical Acceptance Tests in accordance with NETA Acceptance Testing Standards as described in individual Division 16 Sections, Part 3.
- B.** Submit manufacturer-endorsed field test data sheets & procedures for approval, test equipment and materials on-site prior to site visit by manufacturer's factory-trained representa-



tive, test equipment on-site under the supervision of the Engineer and the equipment manufacturer's factory-trained representative(s), and submit manufacturer's statement of acceptance of installation prior to energization of equipment. Invite the Engineer's and Owner's representatives to witness field testing.

- C. A complete certified electrical test report shall be compiled by the electrical testing firm, checked for completeness, and submitted for the record.
- D. The Contractor shall notify all parties whose presence is necessary for the test; and in all cases, the Engineer shall be notified at least one week prior to the actual test.

### **3.10 LOAD BALANCING**

- A. Single phase circuits in single and three-phase fuse and circuit breaker distribution boards and lighting panels shall be balanced initially based on the load calculations. Load currents shall be measured under actual operating conditions, and under conditions described by the Engineer. Circuiting shall be re-arranged as necessary to obtain current balancing within 10% on each busbar.

### **3.11 DEMONSTRATION AND TRAINING**

- A. Conform to the General and Special Provisions.
- B. Upon completion of all work furnished and installed under Division 16, instruct and train the Owner's representatives in the operation and maintenance of all the various apparatus and equipment to the complete satisfaction of the Engineer.
- C. Additional requirements for training are described in other Sections of the Specification.

-- END OF SECTION --

**SECTION 16060****GROUNDING AND BONDING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Provide a complete system of grounding electrodes, grounding electrode conductors, main bonding jumpers, equipment grounding conductors, and bonding in accordance with NEC requirements, in conformance with this Section and Division 16 Section "Electrical - General", and as shown on the Drawings.
- B. This Section includes requirements for grounding electrical systems and equipment. Grounding requirements specified in this Section may be supplemented by special requirements of systems described in other Sections.

**1.2 RELATED DOCUMENTS**

- A. Related Sections include the following:
  - 1. Division 2 Section "Trenching, Backfilling, and Compacting".
  - 2. Division 16 Section "Wire and Cable" for wire connector and equipment grounding conductor requirements.
  - 3. Division 16 Section "Raceways, Boxes, and Fittings" for grounding bushing requirements.
  - 4. Division 16 Section "Lightning Protection" for lightning protection system grounding and bonding materials.

**1.3 DEFINITIONS**

- A. Refer to NEC for definitions of grounding terms used in this Section.

**1.4 QUALIFICATIONS**

- A. Manufacturer's Factory Qualifications: Manufacturing facilities shall have accreditation to ISO 9000:2000 or an equivalent quality management system acceptable to the Engineer. The manufacturing company shall be listed in a published NRTL directory of companies offering NRTL-listed and labeled products.
- B. Testing Firm Qualifications: An independent firm, with experience and capability to conduct specified tests, and is a member company of NETA or is an NRTL as defined by OSHA in 19 CFR 1910.7, acceptable to the AHJ.
- C. Testing Firm's Field Supervisor Qualifications: person currently certified by NETA or NICET to supervise on-site testing specified in Part 3.

## 1.5 REFERENCE STANDARDS

- A. Comply with the following standards:
  - 1. IEEE 81-1983 Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System (Part 1)
  - 2. IEEE 118-1978 (R1992) Standard Test Code for Resistance Measurements
  - 3. IEEE 142-1991 Recommended Practice for Grounding of Industrial and Commercial Power Systems (IEEE Green Book)
  - 4. IEEE 665-1995 (R2001) Guide for Generating Station Grounding
  - 5. IEEE 837-1989(R1996) Standard for Qualifying Permanent Connections Used in Substation Grounding
  - 6. IEEE 1100-1999 IEEE Recommended Practice for Powering and Grounding Electronic Equipment. (IEEE Emerald Book)
  - 7. NFPA 70 The National Electrical Code

## 1.6 SUBMITTALS

- A. Product Catalog Data Sheets: For each type of product indicated.
- B. Product Data: For the following:
  - 1. Ground rods
  - 2. Grounding electrode conductors
  - 3. Exothermic weld grounding connection products
  - 4. Ground test wells
- C. Qualification Data: For firms and persons specified in "Qualifications" in Part 1 of this Section.
- D. Acceptance Test Reports: Submit written test reports to include the following:
  - 1. Test procedures used.
  - 2. Test results that comply with requirements.
  - 3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with the requirements described in this Section, provide products by one of the listed manufacturers in the Sub-Sections below.
  - 1. Ground Rods:
    - a. Copperweld Corp.
    - b. Eritech / Erico International Corporation
    - c. Galvan Industries, Inc.
    - d. Harger Lightning and Grounding, Inc.

- e. Robbins Lightning, Inc.
- 2. Grounding electrode connectors:
  - a. Exothermic type:
    - 1) Cadweld / Erico International Corporation
    - 2) Furseweld
    - 3) Harger Lightning and Grounding, Inc. (Ultraweld)
    - 4) ThermOweld, a division of Continental Industries
- 3. Ground test (access) wells
  - a. Eritech / Erico International Corporation
  - b. Harger Lightning and Grounding
  - c. Robbins Lightning, Inc.

## 2.2 GROUNDING ELECTRODES

- A. Ground Rods: 3/4 in. x 10-ft. Copper-clad steel, sectional type, with silicone bronze threaded connectors.

## 2.3 GROUNDING ELECTRODE CONDUCTORS

- A. Grounding Electrode Conductors: Solid for #6 AWG and smaller, Class A stranded for #4 AWG and larger, bare copper conductor, size(s) as indicated on the Drawings. Class B stranding is not acceptable for conductors in contact with earth.
- B. Comply with the following:
  - 1. Solid Conductors: ASTM B 3.
  - 2. Assembly of Stranded Conductors: ASTM B 8.
  - 3. Tinned Conductors: ASTM B 33.

## 2.4 BONDING JUMPERS

- A. Main Bonding Jumpers: copper or tin-plated copper, furnished with the service equipment by the equipment manufacturer. Panelboards up to 225 amps may use a bonding screw.
- B. Equipment Bonding Jumpers: insulated copper building wire, sized to match the largest equipment-grounding conductor in the associated conduits.
- C. Bonding Jumper: insulated copper wire, protected by conduit where exposed to physical damage
- D. Electrical and telephone room ground bus: Bare, annealed copper bars of rectangular cross section, with insulators.

## 2.5 EQUIPMENT GROUNDING CONDUCTORS

- A. Equipment Grounding Conductors: Insulated building wire in accordance with Division 16 Section "Wire and Cable". #6 AWG and smaller shall have green insulation, #4 AWG and larger shall have green insulation or shall be marked with green tape at each end.

## 2.6 CONNECTOR PRODUCTS

- A. Comply with IEEE 837 and UL 467. Products shall be NRTL-listed and shall be suitable for use for specific types, sizes, and combinations of conductors and connected items.
- B. Bolted Connectors: Bolted-pressure type silicone bronze connectors for test joints at ground rods with test (access) wells, and two-hole long barrel tin-plated copper compression type at equipment busbars and bonding connections to structural steel.
- C. Grounding clamps for metal water pipe connections: all cast bronze parts with silicone bronze bolts.
- D. Welded Connectors: Exothermic-welded type, in kit form, and selected per manufacturer's written instructions.
- E. Wirenuts: for use only for branch circuit wiring in switch and receptacle outlet and junction boxes containing #10 AWG and smaller wires.

## PART 3 - EXECUTION

### 3.1 INSTALLATION – GENERAL

- A. Install grounding electrodes, grounding electrode conductors, main bonding jumpers, equipment grounding conductors, equipment bonding jumpers, and bonding, in accordance with NEC requirements and as shown on the Drawings.
- B. Provide only copper and bronze grounding materials in direct contact with earth, concrete, masonry, crushed stone, and similar materials.
- C. Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
  - 1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
  - 2. Make connections with clean, bare metal at points of contact.
  - 3. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
- D. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or those show convex surfaces indicating improper cleaning are not acceptable.

### **3.2 INSTALLATION: GROUNDING ELECTRODES**

- A. Ground Rods: Install ground rods as shown on the Drawings.
  - 1. Drive ground rods until tops are 12 inches minimum below finished floor or final grade, unless otherwise indicated.
  - 2. Interconnect ground rods with grounding electrode conductors. Use exothermic welds, except at test wells and as otherwise indicated. Make connections without exposing steel or damaging copper coating.

### **3.3 INSTALLATION: GROUNDING ELECTRODE CONDUCTORS**

- A. Grounding Electrode Conductors: Route along shortest and straightest paths possible, unless otherwise indicated on the Drawings. Avoid obstructing access or placing conductors where subject to strain, impact, or damage.
- B. Connect grounding electrode conductor(s) to the service equipment as shown on the Drawings.
- C. For connections to structural steel and for underground connections, provide exothermic-welded connections except at test (access) wells, where bolted mechanical connections are required.
- D. Bond grounding electrode conductors in conduit to each end of each conduit run using a bronze conduit-to-wire grounding fitting.

### **3.4 INSTALLATION: EQUIPMENT GROUNDING CONDUCTORS**

- A. Provide separate insulated equipment grounding conductors in raceways, boxes, and fittings, as shown on the Drawings and specified herein.
- B. Equipment Grounding Conductor Terminations:
  - 1. At dry-type transformers, provide two-hole long-barrel tin-plated compression connector bolted to ground busbars with tin-plated or silicone bronze bolts.

### **3.5 INSTALLATION: EQUIPMENT BONDING JUMPERS**

- A. At sheet metal junction, pull and outlet boxes, and electrical enclosures, use conduit hubs bolted to enclosure or double locknuts to bond enclosure to conduit, and connect grounding bushings to equipment grounding conductors. Install equipment-bonding jumpers between conduit bushings entering and leaving boxes, using the lugs provided with the grounding bushings.
- B. At cast enclosures, connect equipment-grounding conductors together with a mechanical connector. Use mechanical connectors in conformance with Division 16 Section "Wire and Cable". Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.

### **3.6 INSTALLATION: MAIN BONDING JUMPERS**

- A. Install main bonding jumpers at service equipment in accordance with service equipment manufacturer's written instructions.

### **3.7 INSTALLATION: BONDING JUMPERS**

- A. Bonding Straps and Jumpers: Install so equipment vibration is not transmitted to rigidly mounted equipment support structure. Use long-barrel tin-plated compression connectors and galvanized steel or silicone bronze hex head cap screws in drilled and tapped holes to bond miscellaneous equipment to equipment grounding conductors.

### **3.8 CONNECTIONS**

- A. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.
- B. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.
- C. From grade level up to and through communication service and transformer spaces.

### **3.9 ACCEPTANCE TESTING**

- A. Testing: Engage a qualified testing agency to perform the following field quality-control testing:
  - 1. After installing grounding system but before permanent electrical circuitry has been energized, test ground resistance.
  - 2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells. Measure ground resistance not less than two full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests using the fall-of-potential method according to IEEE 81.
  - 3. Provide sketch of test setup with dimensions, locating each ground rod and ground rod assembly and other grounding electrodes. Identify each electrode by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results.
  - 4. Grounding resistance shall be 5 ohms or less. If resistance to ground measured at the service equipment with all grounding electrodes connected together is more than 5 ohms, proceed as described in the paragraph below.

5. Excessive Ground Resistance: If resistance to ground exceeds specified value(s), drive rods deeper with a connecting rod. If driving the rods to twice the original depth does not yield specified values, notify the Engineer and include recommendations to reduce ground resistance.

-- END OF SECTION --





**SECTION 16095****ELECTRICAL IDENTIFICATION****PART 1 - GENERAL****1.1 SUMMARY**

- A. Provide electrical equipment nameplates, junction, pull and outlet box labels, raceway identification, wiremarkers, receptacle circuit identification, and warning signs for electrical equipment and field wiring included in this Contract, as specified herein.
- B. This Section includes products and installation requirements for identification of electrical equipment, raceways, and conductors, wiring devices, warning signs.

**1.2 CODES AND STANDARDS**

- A. Materials and installation shall be in accordance with the latest revisions of the following codes, standards and specifications, except where more stringent requirements have been specified herein:
  - 1. National Electrical Code - NEC
  - 2. NFPA 70E Standard for Electrical Safety in the Workplace
  - 3. Underwriter's Laboratories, Inc. UL

**1.3 QUALITY ASSURANCE**

- A. Manufacturers: Manufacturers shall have accreditation to ISO 9000:2000 or an equivalent quality management system acceptable to the Engineer, and shall offer NRTL-listed and labeled products.
- B. Comply with NFPA 70.

**1.4 SUBMITTALS**

- A. Make submittals in accordance with the General Provisions.
- B. Submittals shall include the following:
  - 1. Complete list of all engraved nameplates.
  - 2. Sample of each size of engraved nameplate, punched tape labels, wiremarkers, and laminated instrument tags.

**PART 2 - PRODUCTS****2.1 EQUIPMENT NAMEPLATES**

- A. Provide custom nameplates for all equipment listed in Part 3 of this Section.

- B. Nameplates shall have white letters engraved on black field, and shall be fabricated from 3-layer (black-white-black) thermoset plastic.
- C. Drill holes in nameplates to be fastened with tie-wraps as described in Part 3 of this Section.
- D. Nameplate lettering to be uppercase Roman block letters, minimum height as follows:
  - 1. Switchboards, Generators, MCCs, VFCs, panelboards, and transformers: 3/4 inch.
  - 2. Process Control Panels (unless factory-labeled): 1/2 inch.
  - 3. Valve actuators: 3/8 inch.
  - 4. Other equipment: 1/4-inch minimum.

## 2.2 PUNCHED TAPE LABELS (RECEPTACLE IDENTIFICATION)

- A. Punched Tape Labels for identification of receptacle circuits shall be 1/2 -inch clear tape with black lettering.
- B. Manufacturer: Dymo or approved equal

## 2.3 WIREMARKERS

- A. Wiremarkers shall be computer-printed on white wrap-around paper with clear plastic protective "tail" and pressure-sensitive adhesive.
- B. Manufacturer: Brady, T&B, Panduit, or approved equal.

## 2.4 WIRE COLOR CODING

- A. Comply with NEC requirements for applying color-coding.
- B. Color Coding for service, feeder, and branch circuit wiring shall be as follows:
 

1.	208 / 120 VOLTS	A-B-C-N-G	Black	Red	Blue	White	Green
2.	240 / 120 VOLTS	A-B-C-N-G	Black	Red	Blue	White	Green
3.	480 / 277 VOLTS	A-B-C-N-G	Brown	Orange	Yellow	Gray	Green
- C. Color coding for 120 VAC control wiring shall be as follows:
  - 1. Line - Black
  - 2. Neutral - White
  - 3. Ground - Green
  - 4. Switched - any color except black, white, and green.
- D. Color coding for 4-20 mA DC signal wiring shall be the manufacturer's standard insulation color.
- E. Color coding for DC power and control circuits:
  - 1. Negative polarity - Black

2. Positive polarity - Red
3. Switched - any color except black, red, white, and green.

## **2.5 WARNING SIGNS**

- A. Provide warning signs on electrical equipment, electrical room doors, and automatically started mechanical equipment in accordance with NEC, NFPA 70E, and OSHA requirements.
- B. Apply arc flash hazard warning labels to electrical power distribution equipment using the data from Division 16 Section "Coordination Study".

## **PART 3 - INSTALLATION**

### **3.1 NAMEPLATES**

- A. Fabricate equipment nameplates using the description and tag number nomenclature shown on the Drawings.
- B. Provide equipment nameplates for transfer switches, panelboards, enclosed motor controllers and contactors, enclosed circuit breakers, transformers, disconnect switches, motor control centers, valve actuators, and major fire alarm system components.
- C. Fasten nameplates to flat sheet metal with pressure-sensitive two-sided adhesive tape.
- D. Fasten nameplates to valve actuators with nylon tie-wraps.

### **3.2 WIRE COLOR CODING AND MARKING**

- A. Color code phase, neutral, and ground wires for service conductors, feeders, and branch circuits, at points of origin and termination of wires.
- B. Provide wiremarkers on all control and signal wires, as shown on the approved Loop Diagrams, Motor Control Wiring diagrams, and Control Panel field wiring diagrams.

### **3.3 CONDUIT IDENTIFICATION**

- A. Clean conduit surfaces with mineral spirits. Write conduit number shown on the Conduit & Wire Schedules on each conduit at each exposed conduit termination point.

### **3.4 SPECIAL PANELBOARD REQUIREMENTS**

- A. Nameplates
  1. Identify in accordance with the Panelboard Schedule shown on the Drawings.
- B. Directory
  1. Provide complete typewritten directory for each panel, with all load information and room name and/or numbers, functions, etc., positively identified for each individual branch circuit.

2. Handwritten directory shall be provided until all circuits are connected and balanced. Then, install permanent directory.
3. Lighting branch circuits shall be identified in the panel directory as to location.
4. Electrical subfeed circuits from panels shall also be identified in the panel directories.
5. When branch circuits are relocated, the panel directory shall be updated to indicate functions, and locations.
6. When branch circuits are removed the panel directory shall be updated to indicate a spare.

-- END OF SECTION --

**SECTION 16110****RACEWAYS, BOXES, AND FITTINGS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Provide a complete system of raceways, including conduit, fittings, terminal boxes, hangers, supports, and accessories, as shown on the Drawings and in conformance with the requirements in this Section.

**1.2 RELATED DOCUMENTS**

- A. Rigid metal conduits for duct bank installation are specified in this Section.

**1.3 REFERENCE STANDARDS**

- A. Comply with the following standards:
  - 1. NEMA Standards applicable to raceways, boxes, and fittings.
  - 2. UL Standards applicable to raceways, boxes, and fittings. Each raceway, box, and fitting shall be NRTL-listed and labeled.
  - 3. ANSI and ASTM standards mentioned in this Section and included in the UL and NEMA Standards applicable to raceways, boxes, and fittings.

**1.4 ENVIRONMENTAL CONDITIONS**

- A. Provide raceways, boxes, and fittings fabricated from materials resistant to corrosion and suitable for the application in the locations where installed, including NEC requirements for installation in "Damp", "Wet", and Hazardous (Classified) Areas.

**1.5 SUBMITTALS**

- A. Submittals shall conform to the General Provisions and Special Provisions.
- B. Compliance Statement: With each submittal, include a Compliance Statement listing each Specification Section, and Part 1, 2, and 3 Sub-Sections, stating, paragraph-by-paragraph, compliance with the Specification, each minor nonconformity that is within the intent of the Specification, and proposed nonconformities. Provide short description of minor nonconformities, and detailed explanation of other nonconformities.
- C. Submit Manufacturer's Catalog Data for all raceways, boxes, and fittings proposed to be installed for this project. Include technical specifications sheets. Mark out inapplicable data.

**1.6 QUALITY ASSURANCE**

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

- B. Comply with NFPA 70 and NEMA standards.
- C. PVC-coated conduit, boxes, and fittings that are connected together shall be from the same manufacturer.

## **PART 2 - PRODUCTS**

### **2.1 CONDUIT, BOX, AND FITTING MANUFACTURERS**

- A. Provide products by the following manufacturers:
  1. Adalet / A Scott Fetzer Company
  2. AFC Cable Systems, Inc.
  3. Alfex Inc.
  4. Allied Tube & Conduit Corporation
  5. Allied Tube and Conduit Div. / A TYCO International Ltd. Company
  6. Anamet Electrical, Inc.; Anaconda Metal Hose.
  7. Appleton
  8. Bell
  9. Cooper / B-Line
  10. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
  11. Electri-Flex Co.
  12. Emerson/General Signal; Appleton Electric Company.
  13. Erickson Electrical Equipment Co.
  14. Hoffman.
  15. Hubbell, Inc. / RACO
  16. Hubbell, Inc./ Killark Electric Manufacturing Co.
  17. Lew Electric Fittings Co.
  18. LTV Steel Tubular Products Company
  19. Myers
  20. O-Z Gedney
  21. Perma-Cote
  22. Pittsburgh Standard Conduit Co.,
  23. RACO; Division of Hubbell, Inc.
  24. Robroy Industries
  25. Robroy Industries, Inc.; Enclosure Division.
  26. Scott Fetzer Co.; Adalet-PLM Division.
  27. Spring City Electrical Manufacturing Co.
  28. Thomas & Betts Corporation.
  29. Triangle PWC Co.
  30. Wheatland Tube Co.
  31. Or approved equal.

### **2.2 RIGID METAL CONDUIT (RMC)**

- A. Rigid Galvanized Steel Conduit (RGS): hot dip galvanized exterior and interior to ANSI C80.1, threads hot dip galvanized after fabrication, for use in accordance with NEC Article "Rigid Metal Conduit: Type RMC", NRTL-listed and labeled under UL 6. Threads shall be hot dip galvanized after fabrication.
- B. PVC-Coated Rigid Galvanized Steel Conduit: RGS with .040 inch PVC exterior coating, and .002 urethane or epoxy interior coating. Threads shall be protected with urethane coating over galvanizing.

- C. Provide RMC locknuts, bushings, fittings, conduit bodies, junction boxes, pull boxes, and outlet boxes as follows:
1. NEMA ratings: in accordance with Part 3 of this Section
  2. Locknuts: galvanized steel. Locknuts on outside of NEMA 12 sheet metal enclosures shall be sealing O-ring type.
  3. Bushings: galvanized steel or malleable iron, insulated throat grounding type, with thermoset plastic insulation insert, complete with mechanical ground lug for connection to ground wire.
  4. Fittings: ANSI 80.4, hot-dip galvanized cast steel or malleable iron. Conduit hubs or similar approved fittings shall be provided for conduit entry to water and dust-resistant enclosures.
  5. Conduit bodies: galvanized cast steel or malleable iron Form 8 with oil-resistant gasket and galvanized cast steel or malleable iron cover
  6. Junction boxes: galvanized cast steel or malleable iron with oil-resistant gasket and galvanized cast steel or malleable iron cover in non-hazardous areas, cast or malleable iron external screw cover type in hazardous (classified) areas
  7. Pull boxes: painted or stainless steel fabricated sheet metal type with hinged screw cover in non-hazardous areas, cast aluminum with hinged bolted cover in hazardous (classified) areas.
  8. Outlet boxes: Type FS or FD for exposed locations in non-hazardous areas, cast or malleable iron external screw cover type in hazardous (classified) areas
  9. PVC-coated fittings, conduit bodies, junction boxes, pull boxes, and outlet boxes: Same as RGS described above, with exterior and interior coatings similar and equal to PVC-coated RGS conduits, and shall have PVC sleeves extending approximately one conduit diameter beyond threaded hub for conduit overlap. Provide stainless steel cover screws.
  10. Explosion-proof flexible couplings: UL listed and labeled for the hazardous (classified) area location, with stainless steel outer braid. Non-stainless steel parts shall be PVC-coated when used with PVC-coated RGS conduit.
  11. Explosion-proof sealoffs: : UL listed and labeled for hazardous (classified) area location, cast metal, combination horizontal and vertical type, with 40% wire fill capacity to match allowable wire fill in conduit, with breather and drain. Non-stainless steel parts shall be PVC-coated when used with PVC-coated RGS conduit.

## 2.3 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

- A. Liquidtight flexible metal conduit (LFMC): Flexible steel type UA conduit with PVC jacket, for use in accordance with NEC Article "Liquidtight Flexible Metal Conduit: Type LFMC", NRTL-listed and labeled under UL 360. Non-UL listed LFMC is not acceptable.
- B. Fittings: Insulated-throat screw-in connectors, NEMA FB 1, UL 514B, galvanized malleable iron or steel. Connectors shall be suitable for use as grounding fittings. Provide fittings with



bonding jumper connections for exterior bonding jumpers at motors. Non-stainless steel parts shall be PVC-coated when used with PVC-coated RGS conduit.

## 2.4 CONDUIT SLEEVES AND SEALING FITTINGS

### A. Manufacturers:

1. Appleton
2. Crouse-Hinds
3. Spring City Electric
4. Thomas & Betts
5. O.Z. Gedney
6. Or approved equal

### B. Wall and Floor Sleeves:

1. Hot-dip galvanized steel or stainless steel pre-fabricated conduit sleeves with welded water-stop ring.
2. Galvanized steel, PVC, and polyethylene sleeves that are part of a manufacturer's standard wall seal assembly are also acceptable, subject to compliance with the fire resistant rating of the related walls and floors.

### C. Conduit-to-Sleeve Sealing Fittings:

1. Synthetic elastomeric gland with galvanized steel or stainless steel compression plates sized for the conduit OD and sleeve ID, or a manufactured assembly of hot-dip galvanized or stainless steel pressure plates, neoprene sealing grommets, and cast or malleable iron sealing bodies with zinc-rich epoxy coating, with factory-assembled galvanized steel, PVC, or polyethylene pipe sleeve. Segmented seals are also acceptable for conduit 4-inch trade size and larger.
2. Sealing fittings for wall penetrations with water or soil on one side shall have seals installed at both ends of the conduit sleeve or core-drilled hole.
3. Where single conductors pass through a single sleeve, select materials to mitigate the effects of inductive heating.
4. Provide ground wire attachment bolts for manufactured sleeve assemblies.
5. Seals shall have fire ratings equal to the fire-resistant rating of the wall.

## 2.5 FACTORY FINISHES

- A. Finish: For painted steel enclosures, provide manufacturer's standard commercial and industrial coating in ANSI 61 light grey color, or different color when required by the NEC.
- B. Field painting will be required for uncoated cast iron, steel, galvanized, zinc-coated, and factory primed surfaces. Products shall be degreased and made suitable for field painting prior to packaging for shipment.

## **PART 3 - EXECUTION**

### **3.1 RACEWAY APPLICATIONS**

- A. Outdoor raceways, boxes, and fittings:
  - 1. Exposed: Rigid galvanized steel conduit.
  - 2. Underground concealed in concrete: Schedule 40 PVC conduit.
  - 3. Exposed conduits containing shielded cables: PVC-coated rigid galvanized steel.
  - 4. Hazardous Classified Locations: PVC-coated rigid galvanized steel conduit with fittings and boxes UL listed and labeled for the hazardous area classification shown on the Drawings.
  - 5. Connections to transformers, motor-driven equipment, vibrating equipment, and equipment requiring position adjustment, e.g., rail-mounted motors: liquidtight flexible metal conduit in non-hazardous areas, explosion-proof flexible couplings in hazardous areas.
  - 6. Boxes and fittings: as described in each raceway sub-section, and recommended as suitable for the particular application by the manufacturer.
- B. Indoor raceways, boxes, and fittings:
  - 1. Below floor slab in slab-on-grade construction: PVC-coated rigid galvanized steel conduit.
  - 2. Exposed: rigid galvanized steel conduit.
  - 3. Conduits containing shielded cables: rigid galvanized steel.
  - 4. Connections to transformers, motor-driven equipment, vibrating equipment, and equipment requiring position adjustment, e.g., rail-mounted motors: liquidtight flexible metal conduit in non-hazardous areas, explosion-proof flexible couplings in hazardous areas
  - 5. NEC Damp and Wet Locations: PVC-coated rigid galvanized steel conduit.
  - 6. Hazardous Classified Locations: PVC-coated rigid galvanized steel conduit with fittings and boxes UL listed as suitable for the hazardous area classification shown on the Drawings.
  - 7. Boxes and fittings: as described in each raceway sub-section, and recommended as suitable for the particular application by the manufacturer.
- C. Minimum Raceway Size: 3/4-inch trade size.

### **3.2 INSTALLATION – GENERAL**

- A. Deliver raceways, boxes, and fittings to jobsite in factory packaging. Store in clean, dry, weatherproof locations. Handle in accordance with manufacturer's recommendations.

- B. Install raceways, boxes, and fittings in accordance with manufacturer's installation instructions and NEC requirements as a minimum, and comply with the additional requirements described in this Section.
- C. Conduits shall be electrically and mechanically continuous, and suitable for use as an equipment-grounding conductor. Make up threaded joints wrench tight.
- D. Fasten boxes in wet and damp areas using external mounting feet. Do not drill through boxes.
- E. Comply with NEC Article 314 requirements for sizing outlet, pull, and junction boxes to accommodate wires, splices, and devices.
- F. Bends and offsets between pull points shall not exceed a cumulative total of 270 degrees unless otherwise approved by the Engineer. Maximum distance between pull points in conduit systems inside buildings shall be 100 feet unless otherwise approved by the Engineer.
- G. Raceways shall be routed in accordance with the following guidelines:
  - 1. Run conduits exposed, concealed, and underground as indicated on the Drawings.
  - 2. Maintain eight feet minimum clearance above finished floor wherever it is physically possible to do so. Comply with OSHA requirements for minimum headroom.
  - 3. Comply with raceway, boxes, and fitting details shown on the Drawings.
  - 4. Provide seals and flashings at roof penetrations in accordance with the recommendations of the roofing system supplier, or as shown on the Drawings.
  - 5. Where conduits enter the top of electrical equipment enclosures and control panels, install conduit interior sealing fittings to prevent entry of water and condensation from conduit.
- H. Cut conduits square with roller-wheel pipe cutter. Hacksaw cuts are acceptable only if the entire conduit is swabbed clean after cutting and threading is completed. Conduits cut in the field shall be threaded with sharp, standard NPT dies to achieve a fully cut tapered thread with a minimum of five full tapered threads at the end of the conduit. Running threads are not acceptable. Over- and under-threading are not acceptable. After threading, ream conduit ends, remove cuttings and debris from inside and outside of conduit, degrease, and apply cold spray-on zinc-rich paint.
- I. Conduit bends shall be made with conduit bending tools manufactured for the purpose. Comply with conduit and bending tool manufacturers' instructions. Use specially sized shoes in bending tools for PVC-coated rigid galvanized steel conduits.
- J. Join raceways with fittings designed and approved for that purpose and make joints wrench tight. Comply with NEC requirements for minimum thread engagement in Hazardous Classified areas.
- K. Provide expansion, deflection, or expansion & deflection couplings at building expansion joints. Expansion and deflection fittings shall comply with UL 467 and UL 514B, and shall be suitable for the anticipated amount of movement and direction(s) of movement.

- L. Three-piece (Erickson) couplings shall be used where it is not possible to turn conduits to make up threaded joints. Threadless fittings are not generally acceptable. Application for permission to use threadless fittings at particular locations shall be made in writing to the Engineer, and threadless fittings shall not be used unless approved.
- M. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and keep straight legs of offsets parallel, unless otherwise indicated.
- N. Terminations:
  - 1. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box. Install bushings wrench-tight.
  - 2. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.
  - 3. Install temporary closures to prevent foreign matter from entering raceways.
- O. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.
- P. Install explosion-proof and moisture seal-off fittings at NEC-required accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:
  - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
  - 2. At hazardous classified locations and where otherwise required by the NEC.
- Q. Flexible Connections:
  - 1. Recessed and semi-recessed lighting fixtures: maximum of 72 inches of flexible metal conduit with UL-listed grounding fittings
  - 2. Motors and equipment subject to vibration or movement: maximum 36 inches of LFMC up to 2 inch trade size, up to 72 inches in larger sizes, and explosion-proof couplings of adequate length for the installed conditions in hazardous (classified) locations.
  - 3. Install separate equipment bonding jumper across flexible connections where required by the NEC.
- R. PVC Coated Rigid Galvanized Steel Conduits: Use only fittings approved for use with that material. Patch all nicks and scrapes in PVC coating after installing conduits.

### **3.3 INSTALLATION – EXPOSED RACEWAYS, BOXES AND FITTINGS**

- A. Install raceways, boxes, and fittings exposed as indicated on the Drawings.
- B. Make concentric bends in parallel exposed conduit runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.
- C. Install electrical enclosures and cabinets plumb. Support at each corner.

### **3.4 PROTECTION DURING CONSTRUCTION**

- A. Provide final protection and maintain conditions that ensure coatings and finishes without damage or deterioration at time of Substantial Completion.
  - 1. Repair damage to galvanize finishes with zinc-rich paint recommended by manufacturer.
  - 2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

### **3.5 CLEANING & PAINTING**

- A. Swab conduits clean after installation and plug ends until conductors are installed.
- B. Remove dust, construction debris, plaster and paint spatters from raceways, boxes, and fittings after all trades have completed their work, and prior to painting.
- C. After completing installation of exposed, factory-finished raceways and boxes, inspect exposed finishes, touch up damage, and prepare for finish painting in accordance with Division 9 Section "Painting and Finishing".

### **3.6 IDENTIFICATION**

- A. Identify raceways, boxes, and fittings as described in Division 16 Section "Electrical Identification".

-- END OF SECTION --

**SECTION 16120****WIRE AND CABLE****PART 1 - GENERAL****1.1 SUMMARY**

- A. Provide a complete system of wiring and cabling, including wire and cable pulling, splicing, and termination accessories, as shown on the Drawings and in conformance with the requirements in this Section.
- B. This Section includes building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

**1.2 RELATED DOCUMENTS**

- A. Related requirements are also specified in the following Sections:
  - 1. Division 16 Section "Electrical Identification" for identification requirements.
  - 2. Division 16 Section "Wiring Devices" for wiring devices installed in boxes.
  - 3. Division 16 Section "Grounding" for grounding and bonding.

**1.3 DEFINITIONS**

- A. In addition to the definitions in Division 16 Section "Electrical - General" the following definitions apply to this Section:
  - 1. NMC: non-metallic jacketed cable
  - 2. RTD: resistance temperature detector
  - 3. SE: service entrance cable
  - 4. THHN: NEC and UL designation for flame-retardant and heat resistant thermoplastic insulation, gas and oil resistant nylon jacketed, suitable for dry locations only, 90 deg. C. max in dry locations
  - 5. THW: NEC and UL designation for flame-retardant, moisture resistant thermoplastic insulation suitable for dry and wet locations, 75 deg. C. max
  - 6. THWN: NEC and UL designation for flame retardant and moisture-resistant thermoplastic insulation, gas and oil resistant nylon jacketed, suitable for dry and wet locations, 75 deg. C. max in wet locations
  - 7. XHHW: NEC and UL designation for (thermoset) cross-linked synthetic polymer-insulation suitable for dry and wet locations, 90 deg. C. max in dry locations, 75 deg. C max in wet locations
  - 8. XHHW-2: NEC designation for (thermoset) cross-linked synthetic polymer-insulation suitable for dry and wet locations, 90 deg. C. max in wet and dry locations

## 1.4 REFERENCE STANDARDS

- A. Comply with the following standards in effect at the time of bid submittal:
1. Underground Extruded Power Cable Pulling Guide
  2. ICEA P-51-432-1970 Copper Conductors, Bare & Weather Resistant
  3. ICEA P-56-520-1984 Cable Tray Fire Test Report (Round Robin Project)
  4. ICEA S-58-679-1996 Standard for Control Cable Conductor Identification
  5. ICEA S-95-658 / NEMA WC70 Non-Shielded Power Cables Rated 2000 V or Less
  6. IEEE 576-2000 Recommended Practice for Installation, Termination, and Test-ing of Insulated Power Cable as Used in Industrial and Commercial Applications
  7. UL 44 Thermoset-insulated Wires and Cables
  8. UL 62 Flexible Cord and Fixture Wire
  9. UL 83 Thermoplastic-insulated Wires and Cables
  10. UL 486A Wire Connectors and Soldering Lugs for Use with Copper Conductors
  11. UL 486C Splicing Wire Connectors
  12. UL 486D Insulated Wire Connector Systems for Underground Use in Damp or Wet Locations
  13. UL 493 Thermoplastic-insulated Underground Feeder and Branch-Circuit Cables

## 1.5 SUBMITTALS

- A. Submittals shall conform to the General and Special Provisions.
- B. Compliance Statement: With each submittal, include a Compliance Statement listing each Specification Section, and Part 1, 2, and 3 Sub-Sections, stating, paragraph-by-paragraph, compliance with the Specification, each minor nonconformity that is within the intent of the Specification, and proposed non-conformities. Provide short description of minor non-conformities, and detailed explanation of other non-conformities.
- C. Submit Manufacturer's Catalog Data for each type of product specified herein, including technical catalog data sheets, technical specifications, evidence of UL listing, and evidence of manufacturer's certification to ISO 9000:2000 or an equivalent quality management system certification acceptable to the Engineer.
- D. Qualifications and experience proposal for the electrical testing firm.
- E. Samples: 16-inch (400-mm) lengths of each size and type of approved wire and cable, mounted on a sample board of 1/2 inch AC exterior plywood painted white.
- F. Electrical Acceptance Test reports.
- G. Operation and maintenance data is not required, however, approved shop drawing submittals are required to be included for the record in the Operation and Maintenance Manuals, as described in Division 16 Section "Electrical - General".

## 1.6 QUALITY ASSURANCE

- A. Source Limitations: Obtain all wire and cable of a particular type through one source from a single qualified manufacturer.

- B. To be a qualified manufacturer, wire, cable, splice and termination components manufacturers shall have accreditation to ISO 9000:2000 or an equivalent quality management system acceptable to the Engineer, and shall offer NRTL-listed and labeled products.
- C. Testing firm shall be qualified as defined by OSHA in 29 CFR 1910.7, shall be a member of the InterNational Electrical Testing Association, shall be acceptable to the AHJ, and shall have supervision as follows:
  - 1. Testing Firm's Field Supervisor: Qualifications and experience for the person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.
- D. Wire and cable and accessories: Listed and labeled as defined in NEC Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

## **PART 2 - PRODUCTS**

### **2.1 APPLICATIONS**

- A. Refer to Part 3 for wire and cable applications.

### **2.2 MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

### **2.3 BUILDING WIRE AND MULTI-CONDUCTOR POWER CABLES**

- A. Manufacturers:
  - 1. Alcan Cable, Div. of Alcan Aluminum Corp.
  - 2. American Insulated Wire Corp.
  - 3. Belden Wire and Cable Co.
  - 4. Cerro Wire and Cable Co., Inc.
  - 5. General Cable Industries Inc.
  - 6. Okonite Co.
  - 7. Pirelli Cable Corp.
  - 8. Rome Cable Corp.
  - 9. Southwire Co.
- B. Conductor Material: Copper, solid conductor for No. 10 AWG and smaller, stranded for No. 8 AWG and larger.
- C. Building Wire and Multi-conductor Cable Insulation Types: Type THHN -THWN and XHHW.
- D. Portable appliance cords: 600V type SO and 300V SJO.



## 2.4 CONTROL AND INSTRUMENTATION WIRE AND CABLE

### A. Manufacturers:

1. Belden Wire and Cable Co.
2. Clifford of Vermont / TVC
3. General Cable Co., Inc.
4. Okonite Co.
5. Rome Cable Corp.
6. Southwire Co.

### B. Control wire: 600V type THWN insulated stranded copper conductors in conduit, mini-mum size #14 AWG, UL listed and suitable for installation in conduit.

### C. Instrumentation cable for 4-20 mA DC circuits: Polyethylene insulated #16 AWG stranded tinned copper twisted pair, with #18 AWG or larger stranded tinned copper drain wire, overall aluminum-on-mylar shield, with chrome PVC outer jacket. UL listed and suitable for installation in conduit and cable tray.

### D. Instrumentation cable for RTDs: UL listed polyethylene insulated #16 AWG stranded tinned copper twisted triple, with #18 AWG or larger stranded tinned copper drain wire, overall aluminum-on-mylar shield, with chrome PVC outer jacket. UL listed and suitable for installation in conduit and cable tray.

## 2.5 WIRE AND CABLE CONNECTORS AND SPLICES

### A. Manufacturers:

1. 3M Company, Electrical Products Division
2. AMP Incorporated / Tyco International
3. Burndy
4. Square D
5. Thomas and Betts

### B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

### C. Wirenuts: Spring type rated for copper wire, sized for the actual number of wires connected.

### D. Splices: Tin-plated copper compression type. Pre-insulated crimp-on connectors may be used for #14 AWG control wires. Long barrel splices shall be used for #1/0 AWG and larger.

### E. Connections at molded case circuit breakers, disconnect switches, and other equipment provided with wire termination lugs: NRTL-listed, suitable for use with the copper wire size to be connected.

### F. Connection lugs: Tin-plated copper compression type with NEMA drilling. Long-barrel lugs shall be used for #1/0 AWG and larger wire.

## **PART 3 - EXECUTION**

### **3.1 INSPECTION**

- A. Ensure that conduits, duct banks, manholes, handholes, and pullboxes are clean and clear of construction debris prior to installation of wire and cable.

### **3.2 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver wire and cables to construction site and unload in accordance with manufacturer's recommendations.
- B. Store and transport reels in compliance with manufacturer's printed instructions.
- C. Wire and cable ends shall be taped watertight until terminations and splices are completed.

### **3.3 WIRE AND CABLE APPLICATIONS**

- A. Service Entrance: Type XHHW, single conductors in raceway Type THHN-THWN, single conductors in raceway SE or USE multiconductor cable.
- B. Feeders: Type XHHW, single conductors in raceway
- C. Branch Circuits: Indoor branch circuit wiring shall be type THHN-THWN, single conductors in raceway. Branch circuit wiring outdoors, including duct banks and outdoor concrete slabs, shall be type XHHW.
- D. Cord Drops and Portable Appliance Connections: Type SO, 600V hard service cord, for applications over 150V to ground, and type SJO, 300V hard service cord, for applications less than 150 V to ground.
- E. NEC Class 1 Control Circuits: Type THHN-THWN, in raceway.
- F. NEC Class 2 and 3 Control Circuits: Type THHN-THWN, in raceway

### **3.4 CABLE LAYING AND PULLING**

- A. Install cables in accordance with manufacturer's installation instructions, IEEE 576 and AEIC CG5-90.
- B. Run wires and cables in raceways as shown on the Drawings and as specified in Division 16 Section "Raceways, Boxes, and Fittings".
- C. Use cable manufacturer approved wire pulling lubricant for pulling in wire and cables in conduit. Lubricant shall be UL-listed and shall be suitable for the conductor insulation. Use water-based products.
- D. Pull wire and cables in accordance with the manufacturer's installation recommendations and requirements, with emphasis on the following:

1. Do not exceed manufacturer's recommended maximum pulling tensions and side-wall pressure values
  2. Lubricate cables with water-base pulling compound or lubricant that is approved by the cable manufacturer and will not deteriorate conductor or insulation materials of construction.
  3. Follow cable manufacturer's recommendations for attaching pulling means to cables, including fish tape, cable, rope, and basket-weave cable grips. Do not attach to cable jacket alone for pulling.
  4. Rig pulleys and use pull ropes for pulling cables into raceways.
  5. Use tension indicators and electric-motor driven capstan rollers for pulling cables that are too large for pulling by hand.
  6. Observe manufacturer's recommendations for the minimum wire and cable-bending radius for each type and size of wire and cable provided for this project.
- E. In handholes, pull boxes, and junction boxes, train cables around perimeter from entry to exit, and support cables at intervals adequate to prevent sagging.
- F. Seal around cables penetrating fire-rated elements according to Division 7 Section "Through-Penetration Firestop Systems."
- G. Identify and color-code conductors and cables according to Division 16 Section

### **3.5 WIRE AND CABLE CONNECTIONS AND TERMINATIONS**

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- B. For compression lugs and splices, use the lug manufacturer's compression tools and comply with the manufacturer's written instructions.
- C. Control wires shall be run from terminal to terminal without splices, and no more than two wires under a terminal screw.
- D. Splices and terminations shall be insulated with boots, heat shrink tubing, or tape to 600 volts in accordance with the insulation product manufacturer's written instructions.
- E. Feeder taps shall be made with cast bronze 2-bolt or 4-bolt connectors with built-in conductor spacer, suitable for the run and tap conductor sizes. Split bolt connectors shall not be used unless approved by the Engineer.
- F. Wiring at Device Outlets: Install conductor at each outlet, leaving 8 inches (200 mm) of wire coiled in the box for connection to wiring devices. Wiring devices that are suitable for solid wire only shall be pigtailed to stranded wire with solid wire 6 inches long using wirenuts.
- G. Install a green insulated NEC-sized grounding jumper from a green ground screw in the outlet box to the receptacle or switch green ground screw.
- H. Wiring to terminals at transformers and busbars shall be connected with tin-plated copper compression connectors and insulated for 600 volts with tape, boots, or heat-shrink tubing rated for the temperature specified by the equipment manufacturer. Two hole lugs shall be

used for power cable terminations # 1/0 AWG and larger.

- I. Building wire connections to flexible motor leads shall be made with compression connectors bolted back-to-back with silicone-bronze bolts and insulated for 600 volts. For motors with busbar connections, connections shall be made with tin-plated copper lugs and silicone bronze bolts.
- J. Multi-conductor cables shall be installed and terminated in accordance with the cable manufacturer's installation instructions. Armored and metal clad cables shall be terminated with fittings suitable for grounding.
- K. Shielded cable conductors shall be terminated with insulated crimp-on connectors suitable for the terminals provided with the equipment, or tinned for connection to terminals, which are not suitable for crimp-on connectors. A minimum two inch length of heat shrink tubing shall be applied over each insulated conductor and the insulated portion of the crimp-on connector, and a separate piece of larger diameter heat shrink tubing shall cover the end of the cable jacket and cut shield, and overlap the individual conductor heat shrink tubing. Connect drain wire to the ground bus.

### **3.6 ELECTRICAL ACCEPTANCE TESTING**

- A. Testing: Engage a qualified testing agency to perform the following field quality-control testing:
  - 1. After installing conductors and cables and before electrical circuitry has been energized, test for compliance with requirements.
  - 2. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.3.1. Certify compliance with test parameters.
- B. Test Reports: Prepare a written report to record the following:
  - 1. Test procedures used.
  - 2. Test results that comply with requirements.
  - 3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.



**SECTION 16141****WIRING DEVICES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Provide switches, receptacles, and accessories required for a complete wiring device installation, as shown on the Drawings and specified herein.

**1.2 REFERENCES**

- A. Material and installation shall be in accordance with latest revisions of the following codes, standards and specifications, except where more stringent requirements have been specified herein:
  - 1. American National Standard Institute (ANSI)
  - 2. National Electrical Code (NEC)
  - 3. National Electrical Manufacturers Association (NEMA)
  - 4. Underwriters Laboratories, Inc. (UL)

**1.3 QUALITY ASSURANCE**

- A. Qualifications of Manufacturer
  - 1. All equipment furnished under this Section shall be furnished by manufacturers who meet the quality, workman-ship, and experience requirements as specified in the General Provisions section of this Contract.

**1.4 SUBMITTALS**

- A. Submittals shall be in accordance with the General and special Provisions.
- B. Compliance Statement: With each submittal, include a Compliance Statement listing each Specification Section, and Part 1, 2, and 3 Sub-Sections, stating, paragraph-by-paragraph, compliance with the Specification, each minor nonconformity that is within the intent of the Specification, and proposed non-conformities. Provide short description of minor non-conformities, and detailed explanation of other non-conformities.
- C. Manufacturer's Catalog Data
  - 1. Submit manufacturers catalog data describing each item and demonstrating conformance to the Specification.
- D. Other Submittals
  - 1. Samples are not required for specified manufacturers and part numbers. If "equal" products are proposed, samples of both the "equal" and the specified product shall

be submitted for comparison purposes.

- E. Equal products will not be considered unless samples are submitted.

## **PART 2 - PRODUCTS**

### **2.1 GENERAL**

- A. Provide industrial grade heavy-duty wiring devices, in types, characteristics, grades, colors, and electrical ratings for applications indicated which are UL listed and which comply with NEMA WD 1 and other applicable UL, and NEMA standards.
- B. Provide ivory color devices unless otherwise indicated.
- C. Model or series numbers, where indicated, refer only to the specified manufacturer. Identical numbers by other manufacturers are not considered equal.

### **2.2 RECEPTACLES**

- A. Receptacles
  - 1. Duplex convenience and appliance receptacles shall be NEMA 5-20R rated 20 amperes at 120 VAC.
  - 2. Duplex receptacles shall be:
    - a. Hubbell 5362 Series heavy-duty industrial grade.
    - b. Leviton 5362 Series heavy-duty industrial grade
    - c. Arrow Hart 5362 Series heavy-duty industrial grade.
    - d. Daniel Woodhead 5362 Series heavy-duty industrial grade.
    - e. Equal (samples of any proposed equal products shall be submitted as noted above).
  - 3. Simplex receptacles shall be NEMA standard straight-blade type, industrial grade with plastic body and plated contacts, suitable for the voltage and current application shown on the Drawings.
- B. GFI Receptacles
  - 1. Receptacles shown as GFI shall be of the ground fault interrupter type. They shall be UL rated Class A, Group 1.
    - a. Hubbell Series GF5262
    - b. Or approved equal.
  - 2. Single GFI Receptacles providing "downstream" protections are not acceptable. Each GFI receptacle shall be GFI type with test and reset buttons.
  - 3. GFI breakers used with conventional receptacles shall not be acceptable where GFI receptacles are shown.
- C. Other Receptacles
  - 1. Other receptacles shall be industrial grade heavy-duty, of the type shown on the

Drawings.

- F. Device Boxes for receptacles shall be of the type appropriate for each location as specified under Division 16 Section "Raceways, Boxes, and Fittings".

## **2.3 SWITCHES**

- A. Switches
  - 1. Light switches shall be rated 20 amperes at 277 VAC, toggle operated, thermoset plastic enclosed, single pole, three-way or four-way as shown on the Drawings.
    - a. Hubbell 1221 Series heavy-duty industrial grade
    - b. Leviton 1221 Series heavy-duty industrial grade
    - c. Arrow Hart 1221 Series heavy-duty industrial grade
    - d. Equal (samples of any proposed equal products shall be submitted as noted above)
  - 2. Switches shall have silver alloy contacts and provisions for side and back wiring.
  - 3. Device boxes for switches shall be of the type appropriate for each location as specified under Division 16 Section "Raceways, Boxes and Fittings".

## **2.4 DEVICE PLATES**

- A. Flush-mounted device plates located indoors shall be brushed stainless steel type 304.
- B. Surface-mounted device plates shall be galvanized steel for stamped steel boxes, and painted malleable iron for type FS and FD boxes.

# **PART 3 - EXECUTION**

## **3.1 INSTALLATION**

- A. Wall receptacles shall be mounted at 18 inches to the centerline of the device box above finished floor, unless otherwise noted or required by the National Electric Code or the Americans with Disabilities Act (ADA).
- B. Switches shall be mounted 44 inches to the centerline of device box above finished floor on knob side of doors unless otherwise noted or required by the National Electric Code or the Americans with Disabilities Act (ADA). Coordinate switch locations with cabinets, temperature controls, etc. to avoid conflicts.
- C. Install wiring devices and accessories as indicated, in accordance with manufacturer's written instructions, applicable requirements of NEC and in accordance with recognized industry practices to fulfill project requirements.
- D. Coordinate with other Work, including painting, electrical boxes and wiring installations, as necessary to interface installation of wiring devices with other Work.



- E. Install wiring devices only in electrical boxes, which are clean and free from building materials, dirt, and debris.
- F. Install wiring devices after wiring work is completed.
- G. Install wall plates after painting work is completed.

-- END OF SECTION --

**SECTION 16269****VARIABLE FREQUENCY CONTROLLERS****PART 1 – GENERAL****1.1 SUMMARY**

- A. Provide Variable Frequency Controllers (VFCs) in compliance with this Section for motors that drive mechanical equipment specified in other Divisions of the specifications.

**1.2 RELATED DOCUMENTS**

- A. Drawings and General and Special Provisions apply to this Section.

**1.3 QUALIFICATIONS**

- A. The variable frequency drive controller shall be designed, assembled, factory-tested, setup and commissioned by the AC converter – DC link – variable frequency AC inverter manufacturer.

**1.4 DEFINITIONS**

- A. In addition to the definitions in Division 16 Section “General Provisions,” the following definitions apply to this Section:
  - 1. AC: Alternating Current
  - 2. BMS: Building Management Systems
  - 3. Converter: Converts AC to DC
  - 4. DC: Direct Current
  - 5. HP: Horsepower
  - 6. I/O: Input / Output
  - 7. IGBT: Insulated gate bipolar transistor.
  - 8. Inverter: Converts DC to AC
  - 9. MCC: Motor Control Center
  - 10. PWM: Pulse-Width Modulated.
  - 11. Point of Analysis: with reference to IEEE 519, the point of common coupling selected by the Engineer
  - 12. TDD: Total Demand Distortion as defined in IEEE 519
  - 13. THD: Total Harmonic Distortion as defined in IEEE 519

**1.5 REFERENCE STANDARDS**

- A. Comply with the following standards in effect at the time of bid submittal unless otherwise noted in Division 1:
  - 1. IEEE 519 IEEE Recommended Practices & Requirements for Harmonic Controls in Electrical Power Systems
  - 2. NEMA FU 1 Low Voltage Cartridge Fuses
  - 3. NEMA ICS 6 Industrial Control and Systems Enclosures

4. NEMA KS 1 Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum)
5. NEMA MG 1 Motors and Generators
6. NEMA MG 10 Energy Management Guide for Selection and Use of Fixed Frequency Medium AC Squirrel-Cage Polyphase Induction Motors.
7. NFPA 70 National Electrical Code
8. UL 198C High-Interrupting-Capacity Fuses, Current-Limiting Types
9. UL 50 Safety Enclosures for Electrical Equipment
10. UL 508 Industrial Control Equipment

## 1.6 SUBMITTALS

- A. Submittals shall be in conformance with the General and Special Provisions.
- B. Compliance Statement: With each submittal, include a Compliance Statement listing each Specification Section, and Part 1, 2, and 3 Sub-Sections, stating, paragraph-by-paragraph, compliance with the Specification, each minor nonconformity that is within the intent of the Specification, and proposed non-conformities. Provide short description of minor non-conformities, and detailed explanation of other non-conformities.
- C. Shop Drawings
  1. Specially prepared shop drawings including the following:
    - a. Equipment nameplate data and electrical ratings
    - b. Weights and overall dimensions
    - c. General arrangement, plan view, section view, elevation, and sub-assembly drawings cross-indexed to a complete bill of materials listing all components and part numbers. Include layout of door-mounted components. Show conduit entry areas and field wiring termination points.
    - d. Three-line AC power schematic diagrams.
    - e. Control schematic showing all control devices.
    - f. Field wiring diagrams showing each external device connected.
    - g. Installation instruction including details, required clearances for access, operation and maintenance, and special instructions for unloading and hoisting, short term and long term storage, and unpacking.
- C. Product Data Sheets
  1. Technical data sheets for manufactured equipment and sub-assemblies, marked to show equipment selected for this project. Include product data sheets in Shop Drawing submittal.
- D. Test Reports
  1. Factory test reports
  2. Acceptance test reports

- E. Manufacturer's Field Reports
  - 1. Inspection of equipment installation (prior to energization and startup) report
  - 2. Complete tabulation of equipment settings and adjustments, and functional testing report
- F. Operation and Maintenance Data
  - 1. Operation and Maintenance Instructions: For equipment and accessories, including pre-energization tests and checks, initial startup procedure, manufacturer's written instructions for testing and adjusting overcurrent protective devices, exploded views of major assemblies and sub-assemblies indexed to parts lists, maintenance instructions and recommended maintenance intervals, troubleshooting procedures, and contact details for spare parts purchase and technical support.
- G. Closeout Submittals
  - 1. Follow up service reports
  - 2. Warranty

## **1.7 QUALITY ASSURANCE**

- A. All VFCs for this project shall be supplied by the same manufacturer.
- B. VFC sizing shall be based on the nameplate data for the motor selected by the mechanical equipment supplier to operate at variable frequency over the specified speed range. Where shown on the drawings VFC's being used as single to three phase conversion drives shall be increased in size as to provide the required output to serve the motor utilized.
- C. Quality Certification: The variable frequency drive motor controllers manufacturer shall have quality certification to ISO 9000:2000. Evidence of certification shall be submitted with equipment shop drawings.
- D. Compliance with the Specification: Clearly list Specification non-conformances on the shop drawing transmittal letter. Furnish controllers as approved on shop drawing submittals.
- E. Technical Support: The manufacturer shall maintain a service center capable of providing training, parts, and emergency maintenance and repairs within 200 miles of Project site.
- F. Safety in the Workplace: Provide NRTL-listed and labeled electrical components as defined in NEC Article 100, by an NRTL acceptable to the AHJ.

## **1.8 PROJECT CONDITIONS**

- A. Ambient temperature, humidity, and elevation: Equipment shall be rated for continuous operation, capable of driving full load without de-rating, within the ambient temperature, humidity, and elevation ranges specified in Division 16 Section "Electrical General Provisions."
- B. Equipment shall be suitable for operation under the service conditions listed in Division 16 Section "Electrical - General" and long-term exposure to low levels of hydrogen sulfide typical of wastewater facilities.

## 1.9 COORDINATION

- A. The Contractor is required to coordinate selection of variable frequency controller and motor to match equipment provided under other Sections in order to meet the Specification requirements for a complete and fully functional system.
- B. For freestanding enclosures, coordinate size and location of concrete equipment pads with the work of other trades in the area. Use afterset epoxy anchors to anchor equipment to concrete pads unless otherwise instructed by the equipment manufacturer. Concrete, reinforcement, and formwork requirements are specified in Division 3 Section "Cast-in-Place Concrete."
- C. Coordinate output current and motor full load current ratings with equipment provided under other Sections of the Specification.
- D. Provide VFC-to-motor wire size and length data to the VFC manufacturer prior to shop drawing submittal so that the VFC manufacturer can include accessory devices, such as output line reactors and motor termination DV/DT reduction devices that may be necessary to limit the impulse voltage at the motor to values within the inverter-duty motor insulation impulse voltage rating specified in Division 15 Section "Electric Motors".
- E. Coordinate controller interfaces with pilot devices and control and signal circuits furnished under Division 17. Follow the VFC manufacturer's recommendations for power, control, and signal cable separation and related installation details.

## PART 2 – PRODUCTS

### 2.1 EQUIPMENT AND COMPONENTS

- A. Materials, equipment, and devices shall be NRTL-listed, and shall comply with NFPA 70 National Electrical Code requirements.
- B. Indoor enclosures shall be NEMA 1 painted steel. Outdoor enclosures shall be NEMA 4 stainless steel painted white with sun shields and with air conditioning for heat dissipation.

### 2.2 MANUFACTURERS

- A. Available variable frequency motor controllers manufacturers: Subject to compliance with harmonic distortion limits, manufacturers include the following:
  - 1. Rockwell Automation Inc. / Allen Bradley
  - 2. Eaton Corporation / Cutler Hammer
  - 3. Square D Company
  - 4. Or Approved Equal as determined by the Owner/Engineer.

### 2.3 GENERAL DESCRIPTION:

- A. Solid-state constant-torque VFC and accessories with full-wave diode bridge AC-to-DC converter, and PWM-type IGBT output, with accessories as specified herein, listed and labeled as a complete unit and arranged to provide variable speed control of a NEMA Design B, 3-phase squirrel-cage induction motor by adjusting output voltage and frequency while maintaining a constant volts/hertz ratio.
- B. 6-pulse Controller: Controllers shall be six-pulse type (six pulses during a single cycle of the three-phase current).

- C. 18 Pulse Controller: Controllers shall be solid state constant torque 18 pulse type (number pulses during a single cycle of the three phase voltage) The motor controllers shall be phase-shifting type meeting the allowable current distortion limits for the 5th, 7th, 11th, and 13th harmonics in accordance with IEEE Standard 519 Table 10.3 without any additional harmonic filters. All components including phase shifting transformers, filters, etc. shall be mounted in the variable frequency motor controller enclosure, and shall be factory wired and tested as a complete system.

## **2.4 DRIVE PERFORMANCE REQUIREMENTS**

- A. The VFC shall control the motor speed over the range of 25 percent to 100 percent of base speed without motor forced-cooling accessories.
- B. Provide VFC output line voltage conditioning devices such as output reactors, output filters, and motor termination filters, to reduce impulse voltage at the motor terminals to values acceptable for operation of inverter-duty motors having 1500 volt 1 microsecond impulse voltage as defined by NEMA MG 1.

## **2.5 CONTROLLER PERFORMANCE REQUIREMENTS:**

- A. Controllers shall be designed for operation with the following performance:
  - 1. Minimum Efficiency: 95 percent at 60 Hz, full load.
  - 2. Minimum Displacement Power Factor: 95 percent.
  - 3. Overload Capability: 110% of continuous current output for 60 seconds; 150% of continuous current output for 3 seconds.
  - 4. Starting Torque: Provide starting boost up to 150%
  - 5. Speed Regulation: Plus or minus 1 percent without tachometer feedback.
- B. Controllers shall be equipped with the following internal adjustable functions:
  - 1. Minimum Speed: 5 to 25 percent of maximum rpm.
  - 2. Maximum Speed: 80 to 100 percent of maximum rpm.
  - 3. Acceleration Ramp: 2 to 22 seconds.
  - 4. Deceleration Ramp: 2 to 22 seconds.
  - 5. Current Limit: 50 to a minimum of 110 percent of maximum rating.
  - 6. Slip Compensation: adjustable
  - 7. Skip frequency bands: minimum of three to avoid mechanical equipment critical frequencies
  - 8. Carrier frequency: adjustable
- C. Controllers shall have the following self-protection and reliability features:

1. Input transient voltage protection by means of NRTL-listed transient voltage surge suppressors designed to limit transient over-voltages to acceptable limits for controller reliability. Provide metal enclosure for TVSS and minimize length of wire lead connections to incoming line terminals.
2. Under- and over-voltage trips; inverter over-temperature, overload, and over-current trips.
3. Motor Overload Relay: Adjustable and capable of NEMA 250, Class 10 performance for submersible pump motors and Class 20 performance for standard NEMA frame motors.
4. Notch filter to prevent operation of the controller-motor-load combination at a natural frequency of the combination.
5. Instantaneous line-to-line and line-to-ground over-current trips.
6. Loss-of-phase protection.
7. Short-circuit protection.
8. Motor over-temperature fault (for motors specified with over-temperature protection).
9. Historical Logging Information and Displays:
  - a. Real-time clock with current time and date.
  - b. Running log of total power versus time.
  - c. Total run time.
  - d. Fault log, maintaining last four faults with time and date stamp for each.

## 2.6 CONTROLLER ACCESSORIES

A. The following accessories shall be provided:

1. Integral fused disconnect:
  - a. Motor-rated fused disconnect switch with external flange-mounted operating handle, padlockable in the OFF position
  - b. Current limiting fuses rated 200,000 AIC, specifically for applications requiring protection of solid-state electronic power components.
2. Five percent incoming line reactor
3. VFC Output Filtering: Provide output line reactors and filtering devices (at motors) for limiting voltage at motor terminal at VFC carrier frequencies to less than the motor impulse voltage rating, if required for the drive application.

## 2.7 SPECIAL APPLICATIONS

- A. Reduced Frequency Output: Reduce motor speed without shutting down VFC during voltage sags and brownouts when VFC input voltage is below normal operating range of VFC.
- B. Automatic Reset/Restart: Attempts three restarts after controller fault or on return of power after an interruption and before shutting down for manual reset or fault correction.

## 2.8 FRONT-OF-ENCLOSURE MOUNTED DEVICES:

- A. Provide the following devices mounted on the door of the controller enclosure:
  - 1. Status Lights: Door-mounted LED indicators shall indicate the following conditions:
    - a. Power on
    - b. Motor Running
    - c. Fault
  - 2. Operator Control Station:
    - a. LOCAL-OFF-REMOTE selector switch for start-stop commands
    - b. LOCAL-REMOTE selector switch for speed reference signals
    - c. Red START and green STOP pushbuttons
    - d. Red RUNNING and green STOPPED indicator lights
    - e. Black RESET pushbutton with shroud for variable frequency fault reset.
    - f. Black RESET pushbutton for motor overload relay reset (if constant speed bypass is provided).
    - g. Local speed control potentiometer or keypad RAISE – LOWER speed control.
  - 3. Indicating Devices: Flush-mounted panel meters or digital readout devices to indicate the following controller parameters:
    - a. Output frequency (Hz).
    - b. Motor speed (rpm).
    - c. Motor status (running, stop, and fault).
    - d. Motor current (amperes).
    - e. Motor torque (percent).
    - f. Fault or alarm status (code).
    - g. Speed feedback signal (percent).
    - h. DC-link voltage (VDC).
    - i. Set-point frequency (Hz).
    - j. Output voltage (V).

## 2.9 CONTROLS INTERFACE:

- A. Remote START and STOP commands shall be Form C (SPDT) dry contacts that close to start the VFD and open to stop it.
- B. Remote Signal Inputs: Accept any of the following speed input commands from remote control systems specified in other Divisions:
  - 1. 0 to 10 V dc.
  - 2. 4-20 milliamp DC.
  - 3. Potentiometer
  - 4. Raise-Lower speed digital inputs.
  - 5. RS485.
- D. Output Signal Interface:
  - 1. A minimum of one isolated analog output signal (4-20 milliamp DC), which can be programmed to any of the following:



- a. Output frequency (Hz).
  - b. Output current (load).
  - c. Motor torque (percent).
  - d. Motor speed (rpm).
  - e. Set-point frequency (Hz).
- E. Remote Status and Alarm Indication Interface: A minimum of one Form C 10 amp 120 V AC dry circuit relay outputs for remote indication of each of the following:
  - 1. RUNNING status (forward and reverse)
  - 2. Controller READY (controller LOCAL-OFF-REMOTE selector switch is in REMOTE, and control power is on, and controller is available for normal operation)
  - 3. SHUTDOWN on fault condition
  - 4. FAULT
- F. Digital Communications Interface: Provide an RS485 interface allowing VFC to be used with an external system within a multi-drop LAN configuration. Interface shall allow all parameter settings of VFC to be programmed via BMS control. Provide capability for VFC to retain these settings within the nonvolatile memory.

## **2.10 FACTORY TEST**

- A. Each controller shall be factory tested at rated full load current and an ambient temperature of 40 degrees C for a period of not less than 24 hours. If a component fails, it shall be replaced and the test shall be repeated for the full time period.
- B. A certified copy of the factory Test Report shall be furnished to the Engineer prior to shipping the controller to the job site.

## **2.11 WARRANTY**

- A. Provide parts and labor warranty in accordance with Division 1. In the absence of more stringent warranty requirements, equipment furnished under this Section shall have a minimum 1 year on-site parts and labor warranty.
- B. Include contact details (names, addresses, telephone and fax numbers, and email if available) for warranty callbacks with the manufacturer's installation, operation, and maintenance instruction submittal.
- C. The manufacturer's standard warranty shall apply in cases where the standard warranty is more favorable to the Owner than the minimum warranty described in Division 1.

## **PART 3 – EXECUTION**

### **3.1 EXAMINATION PRIOR TO INSTALLATION**

- A. Inspect areas prepared for VFC installation for compliance with manufacturer's installation instructions, installation tolerances, NEC working clearances, and other conditions affecting performance.

- B. Examine roughing-in for conduit systems to verify actual locations of conduit connections before VFC installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 INSTALLATION**

- A. For freestanding enclosures, anchor each VFC assembly to a concrete equipment pad in accordance with the VFC manufacturer's installation instructions. Attach with stainless steel bolts.

### **3.3 CONCRETE BASES**

- A. Coordinate size and location of concrete equipment pad with manufacturer's installation instructions for approved equipment.
- B. Concrete materials and installation requirements are specified in Division 3.

### **3.4 IDENTIFICATION**

- A. Identify VFCs, components, and control wiring according to Division 16 Section "Electrical Identification".
- B. Operating Instructions: Mount engraved plastic sign with simplified normal and emergency operating instructions, including constant speed operation, on front of VFC enclosure five feet above finished floor. Sign shall have white letters on black field. Lettering shall be 1/4-inch minimum height.

### **3.5 ACCEPTANCE TESTING**

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to assist in acceptance testing.
- B. Testing Agency: Engage a qualified testing and inspecting agency to perform the following field tests and inspections and prepare test reports.
  - 1. Perform electrical test and visual and mechanical inspection stated in NETA Acceptance Testing Specifications, Section 7.17 Adjustable Speed Drive Systems. Certify compliance with test parameters.
  - 2. Replace damaged and malfunctioning controls and equipment.
- C. Remove malfunctioning units, replace with new units, and retest as specified above.
- D. Test Reports: Prepare written reports to record the following:
  - 1. Test procedures used.
  - 2. Test results that comply with requirements.
  - 3. Test results that do not comply with requirements and corrective actions taken to achieve compliance with requirements.

### 3.6 DEMONSTRATION AND TRAINING

- A. Engage the services of a factory-authorized service representative to train Owner's maintenance personnel.
- B. Upon completion of the work and at a time designated by the Owner, the equipment manufacturer's authorized representative shall instruct the Owner's personnel in the programming, operation, and maintenance of each type of variable frequency motor controller.
- C. A proposed training course schedule and a complete description of each day's training syllabus, hour-by-hour, shall be submitted to the Owner and the Engineer at least 30 days in advance of the proposed training date. All pages of the manufacturer's instructions and recommendations for maintenance, troubleshooting, and parts replacement shall be reviewed during the training course.

-- END OF SECTION --

**SECTION 16442****PANELBOARDS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Provide panelboards as shown on the Drawings and specified herein.

**1.2 RELATED DOCUMENTS**

- A. Drawings and the General and Special Provisions of the Contract apply to this Section.
- B. Transient voltage surge suppressors for panelboards are specified in Division 16 Section "Transient Voltage Surge Suppression".

**1.3 GENERAL**

- A. This Section describes requirements for the following:
  - 1. Distribution panelboards.
  - 2. Lighting and appliances branch-circuit panelboards.

**1.4 DEFINITIONS**

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. RFI: Radio-frequency interference.
- D. RMS: Root mean square.
- E. SPDT: Single pole, double throw.

**1.5 SUBMITTALS**

- A. Conform to the General and Special Provisions.
- B. Compliance Statement: With each submittal, include a Compliance Statement listing each Specification Section, and Part 1, 2, and 3 Sub-Sections, stating, paragraph-by-paragraph, compliance with the Specification, each minor nonconformity that is within the intent of the Specification, and proposed non-conformities. Provide short description of minor non-conformities, and detailed explanation of other non-conformities.
- C. Product Data: For each type of panelboard, overcurrent protective device, transient voltage surges suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings,

and finishes.

D. Shop Drawings: For each panelboard and related equipment.

1. Dimensions plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings. Include the following:
  - a. Enclosure types and details for types other than NEMA 250, Type 1.
  - b. Bus configuration, current, and voltage ratings.
  - c. Short-circuit current rating of panelboards and overcurrent protective devices.
  - d. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
2. Wiring Diagrams: Power and control wiring.

E. Panelboard Schedules: For installation in panelboards.

F. Operation and Maintenance Manuals: Conform to the Special Provisions. Include the following:

1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
2. Time-current curves, including selectable ranges for each type of overcurrent protective device.

## 1.7 PROJECT CONDITIONS

- A. Conform to the requirements in Division 16 section "Electrical - General".

## 1.8 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Keys: Two spares for each type of panelboard cabinet lock.
  2. Key all panelboards alike.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton Corporation; Cutler-Hammer Products.
  2. General Electric Co.
  3. Siemens Energy & Automation, Inc.
  4. Square D.

## 2.2 MANUFACTURED UNITS

- A. Enclosures: Flush- and surface-mounted cabinets, as shown on the drawings NEMA PB 1, enclosure type in conformance with Division 16 section "Electrical - General".
  - 1. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, matchbox dimensions; for flush-mounted fronts, overlap box.
  - 2. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Provide full height piano hinge.
  - 3. Finish: Manufacturer's standard enamel finish over corrosion-resistant treatment or primer coat.
  - 4. Directory Card: With transparent protective cover, mounted in metal frame, inside panelboard door.
  - 5. The manufacturer's nameplate shall be of corrosion resistant metal such as stainless steel and have the pertinent ratings embossed in raised letters and numerals. The pertinent ratings shall include at least the following; amperage, voltage, phase, wires, AIC, manufacturer and model number.
- B. Phase and Ground Buses:
  - 1. Material: Tin-plated hard-drawn copper, 98% conductivity.
  - 2. All busing shall be constructed of the same material.
  - 3. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment ground conductors; bonded to box.
  - 4. Split Bus: Vertical buses divided into individual vertical sections.
- C. Conductor Connectors: Suitable for use with conductor material.
  - 1. Main and Neutral Lugs: Mechanical type.
  - 2. Ground Lugs and Bus Configured Terminators: Mechanical type.
  - 3. Feed-Through Lugs: Mechanical type suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
- D. Service Equipment Label: UL labeled for use as service equipment for panelboards with main disconnecting means.
- E. Future Devices: Mounting brackets, bus connections, and necessary appurtenances required for future installation of devices.

## 2.3 PANELBOARD SHORT-CIRCUIT RATING

- A. Fully rated to interrupt symmetrical short-circuit current available at terminals.

## 2.4 DISTRIBUTION PANELBOARDS

- A. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
- B. Main Device: Main lugs (MLO) or main circuit breaker (MCB), as indicated on the drawings.
- C. Branch Overcurrent Protective Devices: Bolt-on circuit breakers.

## 2.5 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Main and Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- B. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

## 2.7 OVERCURRENT PROTECTIVE DEVICES

- A. Molded-Case Circuit Breaker: UL 489, with interrupting capacity to meet available fault currents.
  - 1. 150 amp frame and smaller: Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits.
  - 2. 225 amp frame and larger: Electronic trip-unit circuit breakers shall have RMS sensing; field-replaceable rating plug with the following field-adjustable settings:
    - a. Instantaneous trip.
    - b. Long- and short-time pickup levels.
    - c. Long- and short-time time adjustments.
    - d. Ground-fault pickup level, time delay, and I<sup>2</sup>t response. Provide only where indicated on the drawings.
  - 3. GFCI Circuit Breakers: Single- and two-pole configurations with 5 or 30 -mA trip sensitivity as shown on the Drawings.
- B. Molded-Case Circuit-Breaker Features and Accessories: Standard frame sizes, trip ratings, and number of poles.
  - 1. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
  - 2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
  - 3. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.

## 2.8 ACCESSORY COMPONENTS AND FEATURES

- A. Furnish accessory set including tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

- B. Fungus Proofing: Permanent fungicidal treatment for panelboard interior, including overcurrent protective devices and other components.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Install panelboards and accessories according to NEMA PB 1.
- B. Mount plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish.
- C. Install overcurrent protective devices and controllers.
  - 1. Set field-adjustable circuit-breaker trip ranges.
- D. Install filler plates in unused spaces.
- E. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

### **3.2 CONNECTIONS**

- A. Ground equipment according to Division 16 Section "Grounding and Bonding."
- B. Connect wiring according to Division 16 Section "Wire and Cable."

### **3.4 FIELD QUALITY CONTROL**

- A. Prepare for acceptance tests as follows:
  - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
  - 2. Test continuity of each circuit.
- B. Infrared Scanning: After occupancy, but not more than 90 days after Final Acceptance, perform an infrared scanning of each panelboard. Remove panel fronts so joints and connections are accessible to portable scanner.
  - 1. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each panelboard 11 months after date of Substantial Completion.
  - 2. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
  - 3. Record of Infrared Scanning: Prepare a certified report that identifies panelboards checked and describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action. Provide a color photo along side an infrared photo of each panelboard in the report.



### 3.5 CLEANING

- A. On completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

-- END OF SECTION --

**SECTION 16461****DRY TYPE TRANSFORMERS (600V AND LESS)****PART 1 - GENERAL****1.1 SUMMARY**

- A. Provide energy-efficient dry type transformers (600V and less) as shown on the Drawings and specified herein.

**1.2 RELATED DOCUMENTS**

- A. Drawings and General and Special Provisions of the Contract apply to this Section.
- B. Related requirements are specified in the following Sections:
  - 1. Division 16 Section "Grounding and Bonding" for transformer grounding.

**1.3 GENERAL**

- A. This Section describes requirements for dry type distribution and power transformers with primary and secondary windings under 600V.

**1.4 DEFINITIONS**

- A. In addition to the definitions in Division 16 Section "Electrical General Provisions", the following definitions apply to this Section:
  - 1. AA: air-to-air (dry type, ventilated, self-cooled)
  - 2. AC: alternating current
  - 3. Energy efficient transformer: transformer kVA rating is at lower than maximum temperature rise for a particular insulation class
  - 4. FA: forced-air (cooled)
  - 5. FFA: future forced air (cooled)
  - 6. FCAN: full capacity above normal
  - 7. FCBN: full capacity below normal
  - 8. MOV: metal oxide varistor
  - 9. Standard transformer: transformer kVA rating is at maximum temperature rise for a particular insulation class

**1.5 QUALIFICATIONS**

- A. The manufacturer of the core and coil shall procure all other transformer components, and shall assemble, factory test, and prepare the transformer for shipping.
- B. The transformer manufacturer shall have quality certification to ISO 9000:2000 or equivalent.

## REFERENCE STANDARDS

A. Comply with the following standards in effect at the time of bid submittal:

1. IEEE C2 National Electrical Safety Code.
2. IEEE 259-1999 IEEE Standard Test Procedure for Evaluation of Systems of Insulation for Dry-Type Specialty and General Purpose Transformers
3. IEEE C57 Family of Guides and Standards for Distribution, Power, and Regulating Transformers, with emphasis on the following:
  - a. IEEE C57.12.01-1998 IEEE Standard General Requirements for Dry-Type Distribution and Power Transformers Including Those with Solid Cast and/or Resin Encapsulated Windings
  - b. IEEE C57.12.70 IEEE Standard Terminal Markings and Connections for Distribution and Power Transformers
  - c. IEEE C57.12.80 IEEE Standard Terminology for Power and Distribution Transformers
  - d. IEEE C57.12.91 IEEE Standard Test Code for Dry-Type Distribution and Power Transformers
  - e. IEEE C57.96-1999 IEEE Guide for Loading Dry-Type Distribution and Power Transformers
  - f. IEEE C57.105-1978 (R1999) IEEE Guide for Application of Transformer Connections in Three-Phase Distribution Systems
  - g. IEEE C57.110-1998 IEEE Recommended Practice for Establishing Transformer Capability When Supplying Nonsinusoidal Load Currents
4. NEMA Standard ST-20
5. NEMA Standard TP-1 for Energy-Efficient Transformers
6. NEMA Standard TP-2 for Test Requirements For Energy Efficient Transformers
7. NFPA 70 National Electrical Code 2005
8. UL Standard 1561
9. Other applicable NRTL Standards

## 1.7 ENVIRONMENTAL CONDITIONS

A. Environmental conditions:

1. Conform to temperature range, humidity range, and elevation specified in Division 16 Section "Electrical - General".

## 1.8 SUBMITTALS

- A. Submittals shall conform to the General and Special Provisions.
- B. Compliance Statement: With each submittal, include a Compliance Statement listing each Specification Section, and Part 1, 2, and 3 Sub-Sections, stating, paragraph-by-paragraph, compliance with the Specification, each minor nonconformity that is within the intent of

the Specification, and proposed non-conformities. Provide short description of minor non-conformities, and detailed explanation of other non-conformities.

C. Shop Drawings

1. Compliance Statement
2. Specially prepared shop drawings including the following:
  - a. Equipment nameplate data and electrical ratings
  - b. Weights and overall dimensions
  - c. General arrangement, section view, and sub-assembly drawings cross-indexed to a complete bill of materials listing all components and part numbers
  - d. Connection diagrams and details.
  - e. Location of field wiring & conduit connections

D. Plans, elevations, sections, and details showing installation dimensions, required clearances for access, operation and maintenance, installation details, and special instructions.

E. Product Data Sheets

1. Technical data sheets, marked to show equipment selected for this project.

## 1.9 QUALITY ASSURANCE

- A. Quality Certification: The transformer manufacturer shall have quality certification to ISO 9000:2000 or an equivalent Quality Management System acceptable to the Engineer. Evidence of certification shall be submitted with equipment shop drawings.
- B. Comply with NFPA 70 National Electrical Code requirements, and Reference Standards listed herein.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. Eaton / Cutler-Hammer
  2. General Electric
  3. Square D / Groupe Schneider NA

### 2.2 DRY-TYPE DISTRIBUTION AND POWER TRANSFORMERS

- A. Dry type distribution transformer[s] shall have the following ratings:

DRY TYPE TRANSFORMERS  
(600V AND LESS)

1. kVA ratings as shown on the Drawings, 30 deg. C average, 40 deg. C max. ambient air temperature in accordance with IEEE C57.96-1999
  2. 220 deg. C standard insulation system for indoor transformers.
  3. Insulation Temperature Rise: maximum 115 deg C, maximum rise above 40 deg C., energy-efficient type.
  4. Voltage ratings as shown on the drawings.
  5. NEMA 2 painted steel enclosure for indoor locations, NEMA 3R painted steel enclosure for outdoor loadcenter locations.
- B. Dry-type two-winding transformers shall be in compliance with applicable portions of NEMA ST 20, IEEE C57.12.01, and UL 1562.
- C. Dry-type two-winding transformer minimum efficiencies shall comply with NEMA TP1 Table 4-2 requirements. A portion of the Table 4-2 is shown below for reference:
- | Single Phase kVA | Efficiency | 3 Phase kVA | Efficiency |
|------------------|------------|-------------|------------|
| 15               | 97.7%      | 15          | 97.0%      |
| 25               | 98.0%      | 30          | 97.5%      |
- D. Primary and Secondary Connections: Air terminal compartment with removable door. Tin-plated copper bar with predrilled NEMA spade terminals.
- E. Insulation Materials: IEEE C57.12.01, NEMA ST20, non-hygroscopic, thermosetting varnish for indoor transformers, non-hygroscopic vacuum pressure impregnated epoxy for outdoor loadcenter transformers.
- F. Core and Coil Assemblies: Transformer coils shall be copper wound on a core of electrical grade steel with high magnetic permeability and insulated laminations. Core and coil assembly shall be mounted on a structural steel base, which shall be isolated from the rest of the structure by vibration pads.
- G. Grounding: Provide equipment grounding terminal welded to the core support structural steel. Provide tin-plated braided copper grounding jumpers between the core and coil assembly and the enclosure ground. Provide tin-plated secondary neutral terminal with provisions for connecting a grounding electrode conductor directly to the neutral terminal, and a copper bonding jumper to the transformer equipment (enclosure) ground.
- H. The maximum temperature of the top of the enclosure shall not exceed 50 deg. C rise above 40 deg. C ambient.
- I. Enclosure shall be fabricated from heavy gauge steel, cleaned, degreased, primed and painted with electrostatic process polyester powder coat, ANSI 61 light gray.

## 2.3 QUALITY ASSURANCE

- A. Factory Tests: Perform design and routine tests according to standards specified for components. Conduct transformer tests according to NEMA ST-20 for standard transformers, and NEMA ST-20 and TP2 for energy-efficient transformers.

## **2.3 TOUCHUP PAINT**

- A. Furnish 0.5 pint (250 mL) of touchup paint.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine roughing-in of conduits and grounding systems to verify the following:
  - 1. Wiring entries comply with layout requirements.
  - 2. Entries are within conduit-entry tolerances specified by manufacturer and wiring will not have to cross section barriers to reach load or line lugs.
- B. Examine walls, floors, roofs, and concrete equipment pads for suitable mounting conditions where transformers will be installed.
- C. Verify that equipment grounding conductors are in place and that requirements in Division 16 Section "Grounding and Bonding" have been met. Maximum ground resistance shall be 5 ohms at transformer.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 DELIVERY, STORAGE, AND HANDLING**

- A. Store transformers in clean dry indoor rooms with a temporary dehumidifier and electric heating to maintain the storeroom between 5 and 40 deg. C with humidity less than 90%. Comply with manufacturer's additional written instructions for storing and periodic inspection and testing.
- B. Transformers shall be megger-tested monthly during storage. Units that have absorbed excessive moisture due to poor humidity and temperature control shall be returned to the manufacturer for drying-out and re-establishing acceptable megger test values at no additional cost to the Owner.

### **3.3 INSTALLATION**

- A. Transformers 75 kVA and larger shall be floor-mounted on concrete equipment pads. 45 kVA and smaller transformers shall be floor-, wall-, or ceiling-mounted, as shown on the Drawings. Loadcenter transformers shall be mounted inside the loadcenters.
  - 1. Construct concrete equipment pads of dimensions indicated, but not less than 2 inches larger in both directions than supported unit and 4 inches high.
  - 2. Use 3000-psi , 28-day compressive-strength concrete and reinforcement as specified in Division 3 Section "Cast-in-Place Concrete.
  - 3. Install dowel rods to connect concrete equipment pads to structural concrete floor. Unless otherwise indicated on the Drawings, install dowel rods on 12-inch centers around full perimeter of pad. Install epoxy anchor bolts for supported

equipment.

4. Place and secure anchorage devices. Use equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
- B. Maintain minimum clearances and workspace at equipment according to manufacturer's written instructions and the NEC.

### **3.4 CONNECTIONS**

- A. Ground equipment in conformance with Division 16 Section "Grounding and Bonding".
- B. Connect wiring in conformance with Division 16 Section "Wire and Cable".
- C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

-- END OF SECTION --