

**SPECIFICATIONS  
PROPOSAL AND CONTRACT DOCUMENTS**

**FOR**

**WASTEWATER TREATMENT PLANT  
CONTRACT NO. 2  
FUNDED BY USDA RURAL DEVELOPMENT**

Prepared for:

**TOWN OF KINSEY  
HOUSTON COUNTY, ALABAMA**

Prepared by:



**October 2023**

SPECIFICATIONS  
PROPOSAL AND CONTRACT DOCUMENTS  
FOR  
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TOWN OF KINSEY

October 2023



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JRA PROJECT NO. 223133  
USDA Wastewater Treatment Plant  
Town of Kinsey  
Kinsey, Alabama  
CLIENT JOB NO. R063519021  
BASED ON CLIENT TEMPLATE: "CDG Engineers - No Proj Name.docx"  
PRINTED ON: October 3, 2023

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## Advertisement for Bids

Separate sealed Bids for the Wastewater Treatment Plant for the Town of Kinsey, Alabama will be received by the Town of Kinsey at the Kinsey Senior Center at 6899 Walden Drive, Kinsey, Alabama 36303, until 2:00 PM CST, December 6, 2023 and then publicly opened and read aloud.

A mandatory Pre-bid Meeting will be held at 10:00 AM on the 21<sup>st</sup> day of November, 2023. Pre-bid Meeting will be held at the Kinsey Senior Center, located at 6899 Walden Drive, Kinsey, Alabama.

Work on the project consists of, in general, construction of a mechanical wastewater treatment system. This includes a wastewater lift station, force main, packaged wastewater treatment system with ultraviolet disinfection, a tertiary cloth media filter, influent and effluent samplers, gravity outfall line and site improvements including grading, piping, and electrical improvements. All work shall be completed within 270 consecutive calendar days.

The Contract Documents may be examined at the following locations:

TOWN OF KINSEY, ALABAMA  
6947 WALDEN DRIVE  
KINSEY, ALABAMA 36303  
(334) 793-5409

CDG, INC.  
1962 WEST MAIN STREET  
DOTHAN, AL 36301  
(334) 677-9431

Copies of the Contract Documents may be obtained at the Issuing Office, CDG, INC. located at 1962 WEST MAIN STREET, DOTHAN, AL 36301, upon non-refundable payment of \$100.00 for each set. PDF electronic copies are available via email at no cost to the bidder, contact: [ashley.roberts@cdge.com](mailto:ashley.roberts@cdge.com).

The OWNER reserves the right to reject any and all BIDS and to waive any informalities and award in the best interest of the Town of Kinsey.

Any contract awarded under this invitation for bids are to be funded by the USDA/Rural Development. Neither the United States nor any of its departments, agencies, or employees is or will be a party to this invitation for bids or any resulting contract.

The attention of the BIDDERS is particularly called to the requirements of a 5% Bid Bond or \$10,000, whichever is lesser, 100% Performance Bond, 100% Payment Bond, insurance coverage, Equal Employment Opportunity and goals for utilization of small, minority, and women's business.

No bidder may withdraw his bid within 60 days after the actual date of the opening thereof.

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 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 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. The de minimis and minor components waiver apply to this contract.

It is understood that all or part of this project will be paid for utilizing funds received by and through a subaward from Houston County, Alabama's American Rescue Plan Act (ARPA) award. Bidder agrees to comply with the requirements of section 603 of ARPA, Pub. L. No. 117-2 (March 11, 2021) (the "Act"), regulations adopted by Treasury pursuant to section 603(f) of the Act, codified as 31 C.F.R. Part 35, and guidance issued by Treasury regarding the foregoing.

10/31/23  
Date

Jason Reneau, Mayor

## INSTRUCTION TO BIDDERS

### ARTICLE 1—DEFINED TERMS

- 1.01 Terms used in these Instructions to Bidders have the meanings indicated in the General Conditions and Supplementary Conditions. Additional terms used in these Instructions to Bidders have the meanings indicated below:
- A. *Issuing Office*—The office from which the Bidding Documents are to be issued, and which registers plan holders.

### ARTICLE 2—BIDDING DOCUMENTS

- 2.01 Bidder shall obtain a complete set of Bidding Requirements and proposed Contract Documents (together, the Bidding Documents). See the Agreement for a list of the Contract Documents. It is Bidder's responsibility to determine that it is using a complete set of documents in the preparation of a Bid. Bidder assumes sole responsibility for errors or misinterpretations resulting from the use of incomplete documents, by Bidder itself or by its prospective Subcontractors and Suppliers.
- 2.02 Bidding Documents are made available for the sole purpose of obtaining Bids for completion of the Project and permission to download or distribution of the Bidding Documents does not confer a license or grant permission or authorization for any other use. Authorization to download documents, or other distribution, includes the right for plan holders to print documents solely for their use, and the use of their prospective Subcontractors and Suppliers, provided the plan holder pays all costs associated with printing or reproduction. Printed documents may not be re-sold under any circumstances.
- 2.03 Bidder may register as a plan holder and obtain complete sets of Bidding Documents, in the number and format stated in the Advertisement or invitation to bid, from the Issuing Office. Bidders may rely that sets of Bidding Documents obtained from the Issuing Office are complete, unless an omission is blatant. Registered plan holders will receive Addenda issued by Owner.
- 2.04 *Electronic Documents*
- A. When the Bidding Requirements indicate that electronic (digital) copies of the Bidding Documents are available, such documents will be made available to the Bidders as Electronic Documents in the manner specified.
1. Bidding Documents will be provided in Adobe PDF (Portable Document Format) (.pdf) that is readable by Adobe Acrobat Reader Version DC or later. It is the intent of the Engineer and Owner that such Electronic Documents are to be exactly representative of the paper copies of the documents. However, because the Owner and Engineer cannot totally control the transmission and receipt of Electronic Documents nor the Contractor's means of reproduction of such documents, the Owner and Engineer cannot and do not guarantee that Electronic Documents and reproductions prepared from those versions are identical in every manner to the paper copies.
- B. Unless otherwise stated in the Bidding Documents, the Bidder may use and rely upon complete sets of Electronic Documents of the Bidding Documents, described in Paragraph 2.06.A above. However, Bidder assumes all risks associated with differences arising from transmission/receipt of Electronic Documents versions of Bidding Documents and reproductions prepared from those versions and, further, assumes all risks, costs, and

responsibility associated with use of the Electronic Documents versions to derive information that is not explicitly contained in printed paper versions of the documents, and for Bidder's reliance upon such derived information.

### **ARTICLE 3—QUALIFICATIONS OF BIDDERS**

- 3.01 Bidder is to submit the following information with its Bid to demonstrate Bidder's qualifications to perform the Work:
- A. Written evidence establishing its qualifications such as financial data, previous experience, and present commitments.
  - B. A written statement that Bidder is authorized to do business in the state where the Project is located, or a written certification that Bidder will obtain such authority prior to the Effective Date of the Contract.
  - C. Bidder's state or other contractor license number, if applicable.
  - D. Subcontractor and Supplier qualification information.
  - E. Other required information regarding qualifications.
- 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.

### **ARTICLE 4—PRE-BID CONFERENCE**

- 4.01 A non-mandatory pre-bid conference will be held at the time and location indicated in the Advertisement or invitation to bid. Representatives of Owner and Engineer will be present to discuss the Project. Bidders are encouraged to attend and participate in the conference; however, attendance at this conference is not required to submit a Bid.
- 4.02 Information presented at the pre-Bid conference does not alter the Contract Documents. Owner will issue Addenda to make any changes to the Contract Documents that result from discussions at the pre-Bid conference. Information presented, and statements made at the pre-bid conference will not be binding or legally effective unless incorporated in an Addendum.

### **ARTICLE 5—SITE AND OTHER AREAS; EXISTING SITE CONDITIONS; EXAMINATION OF SITE; OWNER'S SAFETY PROGRAM; OTHER WORK AT THE SITE**

- 5.01 *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.
- 5.02 *Existing Site Conditions*
- A. *Subsurface and Physical Conditions; Hazardous Environmental Conditions*



1. The Supplementary Conditions identify the following regarding existing conditions at or adjacent to the Site:
    - a. Those reports of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data.
    - b. Those drawings known to Owner of existing physical conditions at or adjacent to the Site, including those drawings depicting existing surface or subsurface structures at or adjacent to the Site (except Underground Facilities), that contain Technical Data.
    - c. Reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site.
    - d. Technical Data contained in such reports and drawings.
  2. Owner will make copies of reports and drawings referenced above available to any Bidder on request. These reports and drawings are not part of the Contract Documents, but the Technical Data contained therein upon whose accuracy Bidder is entitled to rely, as provided in the General Conditions, has been identified and established in the Supplementary Conditions. Bidder is responsible for any interpretation or conclusion Bidder draws from any Technical Data or any other data, interpretations, opinions, or information contained in such reports or shown or indicated in such drawings.
  3. If the Supplementary Conditions do not identify Technical Data, the default definition of Technical Data set forth in Article 1 of the General Conditions will apply.
- B. *Underground Facilities:* Underground Facilities are shown or indicated on the Drawings, pursuant to Paragraph 5.05 of the General Conditions, and not in the drawings referred to in Paragraph 5.02.A of these Instructions to Bidders. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data.

5.03 *Site Visit and Testing by Bidders*

- A. Bidder is required to visit the Site and conduct a thorough visual examination of the Site and adjacent areas. During the visit the Bidder must 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 general 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. Bidder is responsible for establishing access needed to reach specific selected test sites.
- D. Bidder must 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 must fill all holes and clean up and restore the Site to its former condition upon completion of such explorations, investigations, tests, and studies.

5.04 *Owner's Safety Program*

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

5.05 *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 6—BIDDER'S REPRESENTATIONS AND CERTIFICATIONS**

6.01 *Express Representations and Certifications in Bid Form, Agreement*

- A. The Bid Form that each Bidder will submit contains express representations regarding the Bidder's examination of Project documentation, Site visit, and preparation of the Bid, and certifications regarding lack of collusion or fraud in connection with the Bid. Bidder should review these representations and certifications, and assure that Bidder can make the representations and certifications in good faith, before executing and submitting its Bid.
- B. If Bidder is awarded the Contract, Bidder (as Contractor) will make similar express representations and certifications when it executes the Agreement.

**ARTICLE 7—INTERPRETATIONS AND ADDENDA**

7.01 Owner on its own initiative may issue Addenda to clarify, correct, supplement, or change the Bidding Documents.

7.02 Bidder shall submit all questions about the meaning or intent of the Bidding Documents to Engineer in writing. Contact information and submittal procedures for such questions are as follows:

- A. **CDG ENGINEERS & ASSOCIATES, INC.**  
**ATTN: CARMEN CHOSIE, P.E.**  
**170 EAST MAIN STREET**  
**DOTHAN, ALABAMA 36301**

7.03 Interpretations or clarifications considered necessary by Engineer in response to such questions will be issued by Addenda delivered to all registered plan holders. Questions received less than seven days prior to the date for opening of Bids may not be answered.

7.04 Only responses set forth in an Addendum will be binding. Oral and other interpretations or clarifications will be without legal effect. Responses to questions are not part of the Contract

Documents unless set forth in an Addendum that expressly modifies or supplements the Contract Documents.

#### **ARTICLE 8—BID SECURITY**

- 8.01 A Bid must be accompanied by Bid security made payable to Owner in an amount of **5 percent** of Bidder's maximum Bid price (determined by adding the base bid and all alternates) and in the form of a Bid bond issued by a surety meeting the requirements of Paragraph 6.01 of the General Conditions. Such Bid bond will be issued in the form included in the Bidding Documents.
- 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, 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 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, in whole in the case of a penal sum bid bond, and to the extent of Owner's damages in the case of a damages-form bond. Such forfeiture will 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 7 days after the Effective Date of the Contract or 61 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 7 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 (a) substantially completed and (b) ready for final payment, and (c) Milestones (if any) are to be achieved, are set forth in the Agreement.
- 9.02 Provisions for liquidated damages, if any, for failure to timely attain a Milestone, Substantial Completion, or completion of the Work in readiness for final payment, are set forth in the Agreement.

#### **ARTICLE 10—SUBSTITUTE AND "OR EQUAL" ITEMS**

- 10.01 The Contract for the Work, as 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 within 10 days of the issuance of the Advertisement for Bids or invitation to Bidders. Each such request must comply with the requirements of Paragraphs 7.05 and 7.06 of the General Conditions, and the review of the request will be governed by the principles in those paragraphs. **Each such request shall include the Manufacturer's Certification for Compliance with AIS. Refer to the Manufacturer's Certification form provided in these construction**

**Contract Documents.** 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 registered Bidders. Bidders cannot rely upon approvals made in any other manner. **Substitutes and "or-equal" materials and equipment may be proposed by Contractor in accordance with Paragraphs 7.05 and 7.06 of the General Conditions after the Effective Date of the Contract. Each such request shall include Manufacturer's Certification letter to document compliance with AIS requirements of 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, if applicable. Refer to Manufacturer's Certification Letter provided in these Contract Documents.**

- 10.02 All prices that Bidder sets forth in its Bid will 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.

#### **ARTICLE 11—SUBCONTRACTORS, SUPPLIERS, AND OTHERS**

- 11.01 The apparent Successful Bidder, and any other Bidder so requested, must submit to Owner a list of the Subcontractors or Suppliers proposed.
- 11.02 If requested by Owner, such list must be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor or Supplier. If Owner or Engineer, after due investigation, has reasonable objection to any proposed Subcontractor or Supplier, Owner may, before the Notice of Award is given, request apparent Successful Bidder to submit an acceptable substitute, in which case apparent Successful Bidder will submit a substitute, Bidder's Bid price will be increased (or decreased) by the difference in cost occasioned by such substitution, and Owner may consider such price adjustment in evaluating Bids and making the Contract award.
- 11.03 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 and Suppliers. Declining to make requested substitutions will constitute grounds for forfeiture of the Bid security of any Bidder. Any Subcontractor or Supplier, 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 7.07 of the General Conditions.
- 11.04 **The Contractor shall not award work to Subcontractor(s) in excess of the limits stated in SC 7.07A.**

#### **ARTICLE 12—PREPARATION OF BID**

- 12.01 The Bid Form is included with the Bidding Documents.
- A. All blanks on the Bid Form must be completed in ink and the Bid Form signed in ink. Erasures or alterations must be initialed in ink by the person signing the Bid Form. A Bid price must 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.”
- 12.02 If Bidder has obtained the Bidding Documents as Electronic Documents, then Bidder shall prepare its Bid on a paper copy of the Bid Form printed from the Electronic Documents version of the Bidding Documents. The printed copy of the Bid Form must be clearly legible, printed on 8½ inch by 11-inch paper and as closely identical in appearance to the Electronic Document version of the Bid Form as may be practical. The Owner reserves the right to accept Bid Forms which nominally vary in appearance from the original paper version of the Bid Form, providing that all required information and submittals are included with the Bid.
- 12.03 A Bid by a corporation must 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 must be shown.
- 12.04 A Bid by a partnership must be executed in the partnership name and signed by a partner (whose title must appear under the signature), accompanied by evidence of authority to sign. The official address of the partnership must be shown.
- 12.05 A Bid by a limited liability company must 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 must be shown.
- 12.06 A Bid by an individual must show the Bidder’s name and official address.
- 12.07 A Bid by a joint venture must be executed by an authorized representative of each joint venturer in the manner indicated on the Bid Form. The joint venture must have been formally established prior to submittal of a Bid, and the official address of the joint venture must be shown.
- 12.08 All names must be printed in ink below the signatures.
- 12.09 The Bid must contain an acknowledgment of receipt of all Addenda, the numbers of which must be filled in on the Bid Form.
- 12.10 Postal and e-mail addresses and telephone number for communications regarding the Bid must be shown.
- 12.11 The Bid must contain evidence of Bidder’s authority to do business in the state where the Project is located, or Bidder must certify in writing that it will obtain such authority within the time for acceptance of Bids and attach such certification to the Bid.
- 12.12 If Bidder is required to be licensed to submit a Bid or perform the Work in the state where the Project is located, the Bid must contain evidence of Bidder’s licensure, or Bidder must certify in writing that it will obtain such licensure within the time for acceptance of Bids and attach such certification to the Bid. Bidder’s state contractor license number, if any, must also be shown on the Bid Form.

### **ARTICLE 13—BASIS OF BID**

#### 13.01 *Unit Price*

- A. Bidders must submit a Bid on a unit price basis for each item of Work listed in the unit price section of the Bid Form.

- B. The “Bid Price” (sometimes referred to as the extended price) for each unit price Bid item will be the product of the “Estimated Quantity”, which Owner or its representative has set forth in the Bid Form, for the item and the corresponding “Bid Unit Price” offered by the Bidder. The total of all unit price Bid items will be the sum of these “Bid Prices”; such total will be used by Owner for Bid comparison purposes. The final quantities and Contract Price will be determined in accordance with Paragraph 13.03 of the General Conditions.
- C. Discrepancies between the multiplication of units of Work and unit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum.

#### 13.02 Allowances

- A. For cash allowances the Bid price must include such amounts as the Bidder deems proper for Contractor's overhead, costs, profit, and other expenses on account of cash allowances, if any, named in the Contract Documents, in accordance with Paragraph 13.02.B of the General Conditions.

### **ARTICLE 14—SUBMITTAL OF BID**

- 14.01 The Bidding Documents include 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 2 of the Bid Form.
- 14.02 A Bid must be received no later than the date and time prescribed and at the place indicated in the Advertisement or invitation to bid and must 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 must 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 must be enclosed in a separate package plainly marked on the outside with the notation “BID ENCLOSED.” A mailed Bid must be addressed to the location designated in the Advertisement.
- 14.03 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 15—MODIFICATION AND WITHDRAWAL OF BID**

- 15.01 An unopened 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.
- 15.02 If a Bidder wishes to modify its Bid prior to Bid opening, Bidder must withdraw its initial Bid in the manner specified in Paragraph 15.01 and submit a new Bid prior to the date and time for the opening of Bids.
- 15.03 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, the Bidder may withdraw its Bid,

and the Bid security will be returned. Thereafter, if the Work is rebid, the Bidder will be disqualified from further bidding on the Work.

#### **ARTICLE 16—OPENING OF BIDS**

16.01 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 17—BIDS TO REMAIN SUBJECT TO ACCEPTANCE**

17.01 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 18—EVALUATION OF BIDS AND AWARD OF CONTRACT**

18.01 Owner reserves the right to reject any or all Bids, including without limitation, nonconforming, nonresponsive, unbalanced, or conditional Bids. Owner also reserves the right to waive all minor Bid informalities not involving price, time, or changes in the Work.

18.02 Owner will reject the Bid of any Bidder that Owner finds, after reasonable inquiry and evaluation, to not be responsible.

18.03 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, whether in the Bid itself or in a separate communication to Owner or Engineer, then Owner will reject the Bid as nonresponsive.

18.04 If Owner awards the contract for the Work, such award will be to the responsible Bidder submitting the lowest responsive Bid.

18.05 *Evaluation of Bids*

A. In evaluating Bids, Owner will consider whether 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.

B. In the comparison of Bids, alternates will be applied in the same order of priority as listed in the Bid Form. To determine the Bid prices for purposes of comparison, Owner will announce to all bidders a “Base Bid plus alternates” budget after receiving all Bids, but prior to opening them. For comparison purposes alternates will be accepted, following the order of priority established in the Bid Form, until doing so would cause the budget to be exceeded. After determination of the Successful Bidder based on this comparative process and on the responsiveness, responsibility, and other factors set forth in these Instructions, the award may be made to said Successful Bidder on its base Bid and any combination of its additive alternate Bids for which Owner determines funds will be available at the time of award.

C. For determination of the apparent low Bidder(s) when sectional bids are submitted, Bids will be compared on the basis of the aggregate of the Bids for separate sections and the Bids for combined sections that result in the lowest total amount for all of the Work.

- D. For the determination of the apparent low Bidder when unit price bids are submitted, Bids will be compared on the basis of the total of the products of the estimated quantity of each item and unit price Bid for that item, together with any lump sum items.
- 18.06 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.
- 18.07 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 19—BONDS AND INSURANCE**

- 19.01 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, other required bonds (if any), and insurance. When the Successful Bidder delivers the executed Agreement to Owner, it must be accompanied by required bonds and insurance documentation.
- 19.02 Article 8, Bid Security, of these Instructions, addresses any requirements for providing bid bonds as part of the bidding process.

#### **ARTICLE 20—SIGNING OF AGREEMENT**

- 20.01 When Owner issues a Notice of Award to the Successful Bidder, it will 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 must 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 10 days thereafter, Owner will 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 21—SALES AND USE TAXES**

- 21.01 Bid shall include all sales tax and other applicable taxes and fees.

#### **ARTICLE 22—CONTRACTS TO BE ASSIGNED (NOT APPLICABLE)**

#### **ARTICLE 23—ARTICLE 23 – FEDERAL REQUIREMENTS**

- 23.01 **If the contract price is in excess of \$100,000, provisions of the Contract Work Hours and Safety Standards Act at 29 CFR 5.5(b) apply.**
- 23.02 **Federal requirements at Article 19 of the Supplementary Conditions apply to this contract.**
- 23.03 **American Iron and Steel requirements apply to this project.**



# BID FORM FOR CONSTRUCTION CONTRACT

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 1—OWNER AND BIDDER

- 1.01 This Bid is submitted to: **TOWN OF KINSEY, ALABAMA**  
**6947 WALDEN DRIVE**  
**KINSEY, ALABAMA 36303**
- 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—ATTACHMENTS TO THIS BID

- 2.01 The following documents are submitted with and made a condition of this Bid:
- A. Required Bid security;
  - B. List of Proposed Subcontractors;
  - C. List of Proposed Suppliers;
  - D. Evidence of authority to do business in the state of the Project; or a written covenant to obtain such authority within the time for acceptance of Bids;
  - E. Contractor's license number as evidence of Bidder's State Contractor's License or a covenant by Bidder to obtain said license within the time for acceptance of Bids;
  - F. Required Bidder Qualification Statement with supporting data.
  - G. **If Bid amount exceeds \$10,000, signed Compliance Statement (RD-400-6). Refer to specific equal opportunity requirements set forth in the Supplementary Conditions of the Construction Contract (EJCDC C-800);**
  - H. **If Bid amount exceeds \$25,000, signed Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion – Lower Tier Covered Transactions (AD-1048);**
  - I. **If Bid amount exceeds \$100,000, signed RD Instruction 1940-Q Exhibit A-1, Certification for Contracts, Grants, and Loans.**
  - J. **Signed and witnessed Beason Hammon Certificate, as well as a copy of the Everify MOU signed with the Department of Homeland Security. See Code of Alabama (1975) Section 13-31-9.**
  - K. **Signed copy of Certificate of Compliance with Act 2016-312. See Code of Alabama (1975) Section 41-16-5.**
  - L. **If the contract will meet or exceed \$15,000, and the Bidder has 10 or more employees, signed copy of the Certification of Compliance with Act 2023-409.**

**ARTICLE 3—BASIS OF BID—UNIT PRICES**

3.01 *Unit Price Bids*

A. Bidder will perform the following Work at the indicated unit prices:

**Bid Form  
Wastewater Treatment Plant  
Contract 2  
Town of Kinsey**

**BASE BID**

NO.	DESCRIPTION	UNIT	QTY	UNIT PRICE	EXTENSION PRICE
1.	Mobilization	LS	1	\$	\$
2.	Erosion Control, Grassing and Restoration	LS	1	\$	\$
3.	Duplex Packaged Lift Station	LS	1	\$	\$
4.	4" PVC, SDR 21 Sewer Force Main Installation by Open-Cut	LF	1350	\$	\$
5.	10" PVC, SDR 26 Gravity Sewer Installation by Open-Cut	LF	1275	\$	\$
6.	4' Diameter Precast Sewer Manhole	EA	5	\$	\$
7.	0.100 MGD ADF Packaged Wastewater Treatment Plant with UV Disinfection and Related Structures/Improvements	LS	1	\$	\$
8.	Tertiary Filtration Equipment	LS	1	\$	\$
9.	Dewatering Equipment	LS	1	\$	\$
10.	Outfall Structure	LS	1	\$	\$
<b>TOTAL BASE BID:</b>					\$

**ADDITIVE ALTERNATE**

NO.	DESCRIPTION	UNIT	QTY	UNIT PRICE	EXTENSION PRICE
1.	WWTP Standby Generator with ATS and Concrete Pad	LS	1	\$	\$
2.	Lift Station Standby Generator with ATS and Concrete Pad	LS	1	\$	\$
<b>TOTAL ADDITIVE ALTERNATE BID:</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 Work will be based on actual quantities, determined as provided in the Contract Documents.

**ARTICLE 4—DELETED**

**ARTICLE 5—DELETED**

**ARTICLE 6—TIME OF COMPLETION**

- 6.01 Bidder agrees that the Work will be substantially complete and will be completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions on or before the dates or within the number of days indicated in the Agreement.
- 6.02 Bidder accepts the provisions of the Agreement as to liquidated damages.

**ARTICLE 7—BIDDER'S ACKNOWLEDGEMENTS: ACCEPTANCE PERIOD, INSTRUCTIONS, AND RECEIPT OF ADDENDA**

7.01 *Bid Acceptance Period*

- A. This Bid will remain subject to acceptance for 60 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

7.02 *Instructions to Bidders*

- A. Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security.

7.03 *Receipt of Addenda*

- A. Bidder hereby acknowledges receipt of the following Addenda:

<b>Addendum Number</b>	<b>Addendum Date</b>

**ARTICLE 8—BIDDER'S REPRESENTATIONS AND CERTIFICATIONS**

8.01 *Bidder's Representations*

- A. In submitting this Bid, Bidder represents the following:
1. Bidder has examined and carefully studied the Bidding Documents, including Addenda.
  2. Bidder has visited the Site, conducted a thorough visual examination of the Site and adjacent areas, and become familiar with the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

3. Bidder is familiar with all Laws and Regulations that may affect cost, progress, and performance of the Work, **including all American Iron and Steel requirements.**
4. Bidder has carefully studied the reports of explorations and tests of subsurface conditions at or adjacent to the Site and the drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, with respect to the Technical Data in such reports and drawings.
5. Bidder has carefully studied the reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, with respect to Technical Data in such reports and drawings.
6. 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 the Technical Data identified in the Supplementary Conditions or by definition, with respect to the effect of such information, observations, and Technical Data on (a) the cost, progress, and performance of the Work; (b) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, if selected as Contractor; and (c) Bidder's (Contractor's) safety precautions and programs.
7. Based on the information and observations referred to in the preceding paragraph, Bidder 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.
8. 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.
9. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and of discrepancies between Site conditions and the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.
10. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.
11. The submission of this Bid constitutes an incontrovertible representation by Bidder that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

#### 8.02 *Bidder's Certifications*

- A. The Bidder certifies the following:
  1. 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.
  2. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid.
  3. Bidder has not solicited or induced any individual or entity to refrain from bidding.

4. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 8.02.A:
  - a. Corrupt practice means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process.
  - b. 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.
  - c. 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.
  - d. 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.

BIDDER hereby submits this Bid as set forth above:

Bidder:

\_\_\_\_\_  
*(typed or printed name of organization)*

By: \_\_\_\_\_  
*(individual's signature)*

Name: \_\_\_\_\_  
*(typed or printed)*

Title: \_\_\_\_\_  
*(typed or printed)*

Date: \_\_\_\_\_  
*(typed or printed)*

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

Attest: \_\_\_\_\_  
*(individual's signature)*

Name: \_\_\_\_\_  
*(typed or printed)*

Title: \_\_\_\_\_  
*(typed or printed)*

Date: \_\_\_\_\_  
*(typed or printed)*

Address for giving notices:  
\_\_\_\_\_  
\_\_\_\_\_

Bidder's Contact:

Name: \_\_\_\_\_  
*(typed or printed)*

Title: \_\_\_\_\_  
*(typed or printed)*

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

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

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

Bidder's Contractor License No.: (if applicable) \_\_\_\_\_

## BID BOND (PENAL SUM FORM)

<b>Bidder</b> Name: Address <i>(principal place of business)</i> :	<b>Surety</b> Name: Address <i>(principal place of business)</i> :
<b>Owner</b> Name: <b>TOWN OF KINSEY, ALABAMA</b> Address <i>(principal place of business)</i> : <b>6947 WALDEN DRIVE</b> <b>KINSEY, ALABAMA 36303</b>	<b>Bid</b> Project <i>(name and location)</i> : <b>WASTEWATER TREATMENT PLANT -</b> <b>CONTRACT 2</b>  Bid Due Date:
<b>Bond</b> Penal Sum: Date of Bond:	
Surety and Bidder, intending to be legally bound hereby, subject to the terms set forth in this Bid Bond, do each cause this Bid Bond to be duly executed by an authorized officer, agent, or representative.	
Bidder	Surety
<i>(Full formal name of Bidder)</i>	<i>(Full formal name of Surety) (corporate seal)</i>
By: _____ <i>(Signature)</i>	By: _____ <i>(Signature) (Attach Power of Attorney)</i>
Name: _____ <i>(Printed or typed)</i>	Name: _____ <i>(Printed or typed)</i>
Title: _____	Title: _____
Attest: _____ <i>(Signature)</i>	Attest: _____ <i>(Signature)</i>
Name: _____ <i>(Printed or typed)</i>	Name: _____ <i>(Printed or typed)</i>
Title: _____	Title: _____
<i>Notes: (1) Note: Addresses are to be used for giving any required notice. (2) Provide execution by any additional parties, such as joint venturers, if necessary.</i>	

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 will be Owner's sole and exclusive remedy upon default of Bidder.
2. Default of Bidder occurs 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 will 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 does not in the aggregate exceed 120 days from the Bid due date without Surety's written consent.
6. No suit or action will 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 will be commenced only in a court of competent jurisdiction located in the state in which the Project is located.
8. Notices required hereunder must 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 Postal Service registered or certified mail, return receipt requested, postage pre-paid, and will 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 will 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 governs and the remainder of this Bond that is not in conflict therewith continues in full force and effect.
11. The term "Bid" as used herein includes a Bid, offer, or proposal as applicable.



# QUALIFICATIONS STATEMENT

## ARTICLE 1—GENERAL INFORMATION

1.01 Provide contact information for the Business:

Legal Name of Business:			
Corporate Office			
Name:		Phone number:	
Title:		Email address:	
Business address of corporate office:			
Local Office			
Name:		Phone number:	
Title:		Email address:	
Business address of local office:			

1.02 Provide information on the Business’s organizational structure:

Form of Business:	<input type="checkbox"/> Sole Proprietorship <input type="checkbox"/> Partnership <input type="checkbox"/> Corporation		
<input type="checkbox"/> Limited Liability Company <input type="checkbox"/> Joint Venture comprised of the following companies:			
1.			
2.			
3.			
Provide a separate Qualification Statement for each Joint Venturer.			
Date Business was formed:		State in which Business was formed:	
Is this Business authorized to operate in the Project location?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Pending	

1.03 Identify all businesses that own Business in whole or in part (25% or greater), or that are wholly or partly (25% or greater) owned by Business:

Name of business:		Affiliation:	
Address:			
Name of business:		Affiliation:	
Address:			

Name of business:		Affiliation:	
Address:			

1.04 Provide information regarding the Business’s officers, partners, and limits of authority.

Name:		Title:	
Authorized to sign contracts:	<input type="checkbox"/> Yes <input type="checkbox"/> No	Limit of Authority:	\$
Name:		Title:	
Authorized to sign contracts:	<input type="checkbox"/> Yes <input type="checkbox"/> No	Limit of Authority:	\$
Name:		Title:	
Authorized to sign contracts:	<input type="checkbox"/> Yes <input type="checkbox"/> No	Limit of Authority:	\$
Name:		Title:	

**ARTICLE 2—LICENSING**

2.01 Provide information regarding licensure for Business:

Name of License:			
Licensing Agency:			
License No:		Expiration Date:	
Name of License:			
Licensing Agency:			
License No:		Expiration Date:	

**ARTICLE 3—DIVERSE BUSINESS CERTIFICATIONS**

3.01 Provide information regarding Business’s Diverse Business Certification, if any. Provide evidence of current certification.

Certification	Certifying Agency	Certification Date
<input type="checkbox"/> Disadvantaged Business Enterprise		
<input type="checkbox"/> Minority Business Enterprise		
<input type="checkbox"/> Woman-Owned Business Enterprise		
<input type="checkbox"/> Small Business Enterprise		
<input type="checkbox"/> Disabled Business Enterprise		
<input type="checkbox"/> Veteran-Owned Business Enterprise		
<input type="checkbox"/> Service-Disabled Veteran-Owned Business		
<input type="checkbox"/> HUBZone Business (Historically Underutilized) Business		

<input type="checkbox"/> Other			
<input type="checkbox"/> None			

**ARTICLE 4—SAFETY**

4.01 Provide information regarding Business’s safety organization and safety performance.

Name of Business’s Safety Officer:			
Safety Certifications			
Certification Name	Issuing Agency	Expiration	

4.02 Provide Worker’s Compensation Insurance Experience Modification Rate (EMR), Total Recordable Frequency Rate (TRFR) for incidents, and Total Number of Recorded Manhours (MH) for the last 3 years and the EMR, TRFR, and MH history for the last 3 years of any proposed Subcontractor(s) that will provide Work valued at 10% or more of the Contract Price. Provide documentation of the EMR history for Business and Subcontractor(s).

Year									
Company	EMR	TRFR	MH	EMR	TRFR	MH	EMR	TRFR	MH

**ARTICLE 5—FINANCIAL**

5.01 Provide information regarding the Business’s financial stability. Provide the most recent audited financial statement, and if such audited financial statement is not current, also provide the most current financial statement.

Financial Institution:			
Business address:			
Date of Business’s most recent financial statement:		<input type="checkbox"/> Attached	
Date of Business’s most recent audited financial statement:		<input type="checkbox"/> Attached	
Financial indicators from the most recent financial statement			
Contractor’s Current Ratio (Current Assets ÷ Current Liabilities)			
Contractor’s Quick Ratio ((Cash and Cash Equivalents + Accounts Receivable + Short Term Investments) ÷ Current Liabilities)			

**ARTICLE 6—SURETY INFORMATION**

6.01 Provide information regarding the surety company that will issue required bonds on behalf of the Business, including but not limited to performance and payment bonds.

Surety Name:			
Surety is a corporation organized and existing under the laws of the state of:			
Is surety authorized to provide surety bonds in the Project location?	<input type="checkbox"/> Yes <input type="checkbox"/> No		
Is surety listed in “Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies” published in Department Circular 570 (as amended) by the Bureau of the Fiscal Service, U.S. Department of the Treasury? <input type="checkbox"/> Yes <input type="checkbox"/> No			
Mailing Address (principal place of business):			
Physical Address (principal place of business):			
Phone (main):		Phone (claims):	

**ARTICLE 7—INSURANCE**

7.01 Provide information regarding Business’s insurance company(s), including but not limited to its Commercial General Liability carrier. Provide information for each provider.

Name of insurance provider, and type of policy (CLE, auto, etc.):			
Insurance Provider		Type of Policy (Coverage Provided)	
Are providers licensed or authorized to issue policies in the Project location?			<input type="checkbox"/> Yes <input type="checkbox"/> No
Does provider have an A.M. Best Rating of A-VII or better?			<input type="checkbox"/> Yes <input type="checkbox"/> No
Mailing Address (principal place of business):			
Physical Address (principal place of business):			
Phone (main):		Phone (claims):	

**ARTICLE 8—CONSTRUCTION EXPERIENCE**

8.01 Provide information that will identify the overall size and capacity of the Business.

Average number of current full-time employees:	
Estimate of revenue for the current year:	
Estimate of revenue for the previous year:	

8.02 Provide information regarding the Business’s previous contracting experience.

Years of experience with projects like the proposed project:		
As a general contractor:		As a joint venturer:
Has Business, or a predecessor in interest, or an affiliate identified in Paragraph 1.03:		
Been disqualified as a bidder by any local, state, or federal agency within the last 5 years? <input type="checkbox"/> Yes <input type="checkbox"/> No		
Been barred from contracting by any local, state, or federal agency within the last 5 years? <input type="checkbox"/> Yes <input type="checkbox"/> No		
Been released from a bid in the past 5 years? <input type="checkbox"/> Yes <input type="checkbox"/> No		
Defaulted on a project or failed to complete any contract awarded to it? <input type="checkbox"/> Yes <input type="checkbox"/> No		
Refused to construct or refused to provide materials defined in the contract documents or in a change order? <input type="checkbox"/> Yes <input type="checkbox"/> No		
Been a party to any currently pending litigation or arbitration? <input type="checkbox"/> Yes <input type="checkbox"/> No		
Provide full details in a separate attachment if the response to any of these questions is Yes.		

8.03 List all projects currently under contract in Schedule A and provide indicated information.

8.04 List a minimum of three and a maximum of six projects completed in the last 5 years in Schedule B and provide indicated information to demonstrate the Business’s experience with projects similar in type and cost of construction.

8.05 In Schedule C, provide information on key individuals whom Business intends to assign to the Project. Provide resumes for those individuals included in Schedule C. Key individuals include the Project Manager, Project Superintendent, Quality Manager, and Safety Manager. Resumes may be provided for Business’s key leaders as well.

**ARTICLE 9—REQUIRED ATTACHMENTS**

9.01 Provide the following information with the Statement of Qualifications:

- A. If Business is a Joint Venture, separate Qualifications Statements for each Joint Venturer, as required in Paragraph 1.02.
- B. Diverse Business Certifications if required by Paragraph 3.01.
- C. Certification of Business’s safety performance if required by Paragraph 4.02.
- D. Financial statements as required by Paragraph 5.01.

- E. Attachments providing additional information as required by Paragraph 8.02.
- F. Schedule A (Current Projects) as required by Paragraph 8.03.
- G. Schedule B (Previous Experience with Similar Projects) as required by Paragraph 8.04.
- H. Schedule C (Key Individuals) and resumes for the key individuals listed, as required by Paragraph 8.05.
- I. Additional items as pertinent.

This Statement of Qualifications is offered by:

Business: \_\_\_\_\_  
*(typed or printed name of organization)*

By: \_\_\_\_\_  
*(individual's signature)*

Name: \_\_\_\_\_  
*(typed or printed)*

Title: \_\_\_\_\_  
*(typed or printed)*

Date: \_\_\_\_\_  
*(date signed)*

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

Attest: \_\_\_\_\_  
*(individual's signature)*

Name: \_\_\_\_\_  
*(typed or printed)*

Title: \_\_\_\_\_  
*(typed or printed)*

Address for giving notices:  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Designated Representative:

Name: \_\_\_\_\_  
*(typed or printed)*

Title: \_\_\_\_\_  
*(typed or printed)*

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

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

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

**Schedule A—Current Projects**

Name of Organization					
Project Owner			Project Name		
General Description of Project					
Project Cost			Date Project		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager	
Name					
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

Project Owner			Project Name		
General Description of Project					
Project Cost			Date Project		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager	
Name					
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

Project Owner			Project Name		
General Description of Project					
Project Cost			Date Project		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager	
Name					
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					



**Schedule B—Previous Experience with Similar Projects**

Name of Organization					
Project Owner			Project Name		
General Description of Project					
Project Cost			Date Project		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager	
Name					
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

Project Owner			Project Name		
General Description of Project					
Project Cost			Date Project		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager	
Name					
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

Project Owner			Project Name		
General Description of Project					
Project Cost			Date Project		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager	
Name					
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

**Schedule B—Previous Experience with Similar Projects**

Name of Organization					
Project Owner			Project Name		
General Description of Project					
Project Cost			Date Project		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager	
Name					
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

Project Owner			Project Name		
General Description of Project					
Project Cost			Date Project		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager	
Name					
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

Project Owner			Project Name		
General Description of Project					
Project Cost			Date Project		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager	
Name					
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

**Schedule C—Key Individuals**

<b>Project Manager</b>			
Name of individual			
Years of experience as project manager			
Years of experience with this organization			
Number of similar projects as project manager			
Number of similar projects in other positions			
Current Project Assignments			
Name of assignment		Percent of time used for this project	Estimated project completion date
Reference Contact Information (listing names indicates approval to contact named individuals as a reference)			
Name		Name	
Title/Position		Title/Position	
Organization		Organization	
Telephone		Telephone	
Email		Email	
Project		Project	
Candidate's role on project		Candidate's role on project	
<b>Project Superintendent</b>			
Name of individual			
Years of experience as project superintendent			
Years of experience with this organization			
Number of similar projects as project superintendent			
Number of similar projects in other positions			
Current Project Assignments			
Name of assignment		Percent of time used for this project	Estimated project completion date
Reference Contact Information (listing names indicates approval to contact named individuals as a reference)			
Name		Name	
Title/Position		Title/Position	
Organization		Organization	
Telephone		Telephone	
Email		Email	
Project		Project	
Candidate's role on project		Candidate's role on project	

<b>Safety Manager</b>			
Name of individual			
Years of experience as project manager			
Years of experience with this organization			
Number of similar projects as project manager			
Number of similar projects in other positions			
Current Project Assignments			
Name of assignment		Percent of time used for this project	Estimated project completion date
Reference Contact Information (listing names indicates approval to contact named individuals as a reference)			
Name		Name	
Title/Position		Title/Position	
Organization		Organization	
Telephone		Telephone	
Email		Email	
Project		Project	
Candidate's role on project		Candidate's role on project	
<b>Quality Control Manager</b>			
Name of individual			
Years of experience as project superintendent			
Years of experience with this organization			
Number of similar projects as project superintendent			
Number of similar projects in other positions			
Current Project Assignments			
Name of assignment		Percent of time used for this project	Estimated project completion date
Reference Contact Information (listing names indicates approval to contact named individuals as a reference)			
Name		Name	
Title/Position		Title/Position	
Organization		Organization	
Telephone		Telephone	
Email		Email	
Project		Project	
Candidate's role on project		Candidate's role on project	



**United States Department of Agriculture**

**AD 1048**

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

*The following statement is made in accordance with the Privacy Act of 1974 (5 U.S.C. § 552(a), as amended). This certification is required by the regulations implementing Executive Order 12549, Debarment and Suspension, and 2 C.F.R. §§ 180.300, 180.355, Participants' responsibilities. The regulations were amended and published on August 31, 2005, in 70 Fed. Reg. 51865-51880. Copies of the regulations may be obtained by contacting the Department of Agriculture agency offering the proposed covered transaction.*

*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 a valid OMB control number. The valid OMB control number for this information collection is 0505-0027. The time required to complete this information collection is estimated to average 15 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. The provisions of appropriate criminal and civil fraud privacy, and other statutes may be applicable to the information provided.*

***(Read Instructions On Page Two Before Completing Certification)***

- A. 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;
- B. 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 page 1 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 or debarment.
- (3) The prospective lower tier participant shall provide immediate written notice to the person(s) 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 the rules implementing Executive Order 12549, at 2 C.F.R. Parts 180 and 417. You may contact the department or agency to which this proposal is being 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 Transactions," without modification, in all lower tier covered transactions 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 System for Award Management (SAM) database.
- (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.

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

COMPLIANCE STATEMENT

This statement relates to a proposed contract with \_\_\_\_\_

\_\_\_\_\_  
(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: or  If the proposed nonconstruction 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):

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*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.*

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**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)*

**NOTICE OF AWARD**

Date of Issuance:

Owner: TOWN OF KINSEY, ALABAMA

Owner’s Project No.:

Engineer: CDG, INC.

Engineer’s Project No.: R063519021

Project: WASTEWATER TREATMENT PLANT – CONTRACT 2

Contract Name:

Bidder:

Bidder’s Address:

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:

\_\_\_\_\_

The Contract Price of the awarded Contract is \$\_\_\_\_\_. Contract Price is subject to adjustment based on the provisions of the Contract, including but not limited to those governing changes, Unit Price Work, and Work performed on a cost-plus-fee basis, as applicable.

\_\_\_\_ 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.

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 receipt of this Notice of Award:

1. Deliver to Owner [5] counterparts of the Agreement, signed by Bidder (as Contractor).
2. Deliver with the signed Agreement(s) the Contract security (such as required performance and payment bonds) and insurance documentation, as specified in the Instructions to Bidders and in the 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 10 days after you comply with the above conditions, Owner will return to you one fully signed counterpart of the Agreement, together with any additional copies of the Contract Documents as indicated in Paragraph 2.02 of the General Conditions.

Owner: **TOWN OF KINSEY, ALABAMA**

By (signature): \_\_\_\_\_

Name (printed): \_\_\_\_\_

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

Copy: Engineer

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

This Agreement is by and between **TOWN OF KINSEY, ALABAMA** (“Owner”) and \_\_\_\_\_  
\_\_\_\_\_ (“Contractor”).

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

Owner and Contractor hereby agree as follows:

## **ARTICLE 1—WORK**

1.01 Contractor shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows: **WASTEWATER TREATMENT PLANT – CONTRACT 2.**

## **ARTICLE 2—THE PROJECT**

2.01 The Project, of which the Work under the Contract Documents is a part, is generally described as follows: **WASTEWATER TREATMENT PLANT - CONTRACT 2.**

## **ARTICLE 3—ENGINEER**

3.01 The Owner has retained **CDG, INC.** (“Engineer”) to act as Owner’s representative, assume all duties and responsibilities of Engineer, and have the rights and authority assigned to Engineer in the Contract.

3.02 The part of the Project that pertains to the Work has been designed by **CDG, INC.**

## **ARTICLE 4—CONTRACT TIMES**

4.01 *Time is of the Essence*

A. All time limits for Milestones, if any, Substantial Completion, and completion and readiness for final payment as stated in the Contract Documents are of the essence of the Contract.

4.02 *Contract Times: Days*

A. The Work will be substantially complete within **270** days after the date when the Contract Times commence to run as provided in Paragraph 4.01 of the General Conditions, and completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions within **300** days after the date when the Contract Times commence to run.

4.05 *Liquidated Damages*

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 Contract Times, as duly modified. 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 **\$500** for each day that expires after the time (as duly adjusted pursuant to the Contract) specified above for Substantial Completion, until the Work is substantially complete.
  2. *Completion of Remaining Work:* After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Times (as duly adjusted pursuant to the Contract) for completion and readiness for final payment, Contractor shall pay Owner **\$500** for each day that expires after such time until the Work is completed and ready for final payment.
  4. Liquidated damages for failing to timely attain Milestones, Substantial Completion, and final completion are not additive, and will not be imposed concurrently.
- B. If Owner recovers liquidated damages for a delay in completion by Contractor, then such liquidated damages are Owner's sole and exclusive remedy for such delay, and Owner is precluded from recovering any other damages, whether actual, direct, excess, or consequential, for such delay, except for special damages (if any) specified in this Agreement.

#### **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 the basis of Contractor's Applications for Payment on or about the **25<sup>th</sup>** 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 the value of the Work completed (with the balance being retainage).

- b. **95** percent of cost of materials and equipment not incorporated in the Work (with the balance being retainage).
  - B. Upon Substantial Completion **of the entire construction to be provided under the construction Contract Documents**, 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 **100** 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, Owner shall pay the remainder of the Contract Price in accordance with Paragraph 15.06 of the General Conditions.
- 6.04 *Consent of Surety*
- A. Owner will not make final payment, or return or release retainage at Substantial Completion or any other time, unless Contractor submits written consent of the surety to such payment, return, or release.
- 6.05 *Interest*
- A. All amounts not paid when due will bear interest at the rate as provided in the General Conditions.

## **ARTICLE 7—CONTRACT DOCUMENTS**

### 7.01 *Contents*

- A. The Contract Documents consist of all of the following:
  - 1. This Agreement.
  - 2. Bonds:
    - a. Performance bond (together with power of attorney).
    - b. Payment bond (together with power of attorney).
  - 3. General Conditions.
  - 4. Supplementary Conditions.
  - 5. Specifications as listed in the table of contents of the project manual (copy of list attached).
  - 6. Drawings (not attached but incorporated by reference) consisting of **12 sheets** with each sheet bearing the following general title: **WASTEWATER TREATMENT PLANT – CONTRACT 2**.
  - 8. Addenda (numbers \_\_\_\_\_ to \_\_\_\_\_, inclusive).
  - 9. Exhibits to this Agreement (enumerated as follows):
    - a. **Contractor's Bid**
  - 10. The following which may be delivered or issued on or after the Effective Date of the Contract and are not attached hereto:

- a. Notice to Proceed.
  - b. Work Change Directives.
  - c. Change Orders.
  - d. Field Orders.
  - e. Warranty Bond, if any.
- B. The Contract Documents listed in Paragraph 7.01.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 7.
- D. The Contract Documents may only be amended, modified, or supplemented as provided in the Contract.

## **ARTICLE 8—REPRESENTATIONS, CERTIFICATIONS, AND STIPULATIONS**

### **8.01 Contractor's Representations**

- A. In order to induce Owner to enter into this Contract, Contractor makes the following representations:
1. Contractor has examined and carefully studied the Contract Documents, including Addenda.
  2. Contractor has visited the Site, conducted a thorough visual examination of the Site and adjacent areas, and become familiar with the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
  3. Contractor is familiar with all Laws and Regulations that may affect cost, progress, and performance of the Work.
  4. Contractor has carefully studied the reports of explorations and tests of subsurface conditions at or adjacent to the Site and the drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, with respect to the Technical Data in such reports and drawings.
  5. Contractor has carefully studied the reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, with respect to Technical Data in such reports and drawings.
  6. 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 Technical Data identified in the Supplementary Conditions or by definition, with respect to the effect of such information, observations, and Technical Data on (a) the cost, progress, and performance of the Work; (b) the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor; and (c) Contractor's safety precautions and programs.

7. 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.
8. 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.
9. Contractor has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and of discrepancies between Site conditions and the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.
10. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.
11. 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.

#### 8.02 *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 8.02:
  1. "corrupt practice" means the offering, giving, receiving, or soliciting of anything 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.

#### 8.03 *Standard General Conditions*

- A. Owner stipulates that if the General Conditions that are made a part of this Contract are EJCDC® C-700, Standard General Conditions for the Construction Contract (2018), 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 **indicate date on which Contract becomes effective** (which is the Effective Date of the Contract).

Owner:

TOWN OF KINSEY, ALABAMA

*(typed or printed name of organization)*

By:

*(individual's signature)*

Date:

*(date signed)*

Name: JASON RENEAU

*(typed or printed)*

Title: MAYOR

*(typed or printed)*

Attest:

*(individual's signature)*

Title:

*(typed or printed)*

Address for giving notices:

6947 WALDEN DRIVE

KINSEY, ALABAMA 36303

Designated Representative:

Name:

*(typed or printed)*

Title:

*(typed or printed)*

Address:

Phone:

Email:

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

Contractor:

*(typed or printed name of organization)*

By:

*(individual's signature)*

Date:

*(date signed)*

Name:

*(typed or printed)*

Title:

*(typed or printed)*

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

Attest:

*(individual's signature)*

Title:

*(typed or printed)*

Address for giving notices:

Designated Representative:

Name:

*(typed or printed)*

Title:

*(typed or printed)*

Address:

Phone:

Email:

License No.:

*(where applicable)*

State:



## NOTICE TO PROCEED

Owner: TOWN OF KINSEY, ALABAMA Owner's Project No.: N/A  
Engineer: CDG, INC. Engineer's Project No.: R063519021  
Contractor: \_\_\_\_\_ Contractor's Project No.: \_\_\_\_\_  
Project: WASTEWATER TREATMENT PLANT – CONTRACT 2  
Contract Name: WASTEWATER TREATMENT PLANT – CONTRACT 2  
Effective Date of Contract: \_\_\_\_\_

Owner hereby notifies Contractor that the Contract Times under the above Contract will commence to run on \_\_\_\_\_ pursuant to Paragraph 4.01 of the General Conditions.

On that date, Contractor shall start performing its obligations under the Contract Documents. No Work will be done at the Site prior to such date.

In accordance with the Agreement:

The date by which Substantial Completion must be achieved is \_\_\_\_\_, and the date by which readiness for final payment must be achieved is \_\_\_\_\_.

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

Owner: TOWN OF KINSEY, ALABAMA  
By (signature): \_\_\_\_\_  
Name (printed): JASON RENEAU  
Title: MAYOR  
Date Issued: \_\_\_\_\_

Copy: Engineer

## PERFORMANCE BOND

<p><b>Contractor</b></p> <p>Name: _____</p> <p>Address <i>(principal place of business)</i>: _____</p>	<p><b>Surety</b></p> <p>Name: _____</p> <p>Address <i>(principal place of business)</i>: _____</p>
<p><b>Owner</b></p> <p>Name: <b>TOWN OF KINSEY, ALABAMA</b></p> <p>Mailing address <i>(principal place of business)</i>:  <b>6947 WALDEN DRIVE</b>  <b>KINSEY, ALABAMA 36303</b></p>	<p><b>Contract</b></p> <p>Description <i>(name and location)</i>:  <b>WASTEWATER TREATMENT PLANT</b>  <b>CONTRACT 2</b></p> <p>Contract Price: _____</p> <p>Effective Date of Contract: _____</p>
<p><b>Bond</b></p> <p>Bond Amount: _____</p> <p>Date of Bond: _____  <i>(Date of Bond cannot be earlier than Effective Date of Contract)</i></p> <p>Modifications to this Bond form:  <input type="checkbox"/> None <input type="checkbox"/> See Paragraph 16</p>	
<p>Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth in this Performance Bond, do each cause this Performance Bond to be duly executed by an authorized officer, agent, or representative.</p>	
Contractor as Principal	Surety
_____ <i>(Full formal name of Contractor)</i>	_____ <i>(Full formal name of Surety) (corporate seal)</i>
By: _____ <i>(Signature)</i>	By: _____ <i>(Signature)(Attach Power of Attorney)</i>
Name: _____ <i>(Printed or typed)</i>	Name: _____ <i>(Printed or typed)</i>
Title: _____	Title: _____
Attest: _____ <i>(Signature)</i>	Attest: _____ <i>(Signature)</i>
Name: _____ <i>(Printed or typed)</i>	Name: _____ <i>(Printed or typed)</i>
Title: _____	Title: _____
<p><i>Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party is considered plural where applicable.</i></p>	

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 will 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 may 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 will 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 does 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 does 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 will not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety will 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 will not be reduced or set off on account of any such unrelated obligations. No right of action will 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 must be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and must 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 will be applicable.
- 12. Notice to the Surety, the Owner, or the Contractor must 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 will be deemed deleted therefrom and provisions conforming to such

statutory or other legal requirement will be deemed incorporated herein. When so furnished, the intent is that this Bond will 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 will be deemed to be Subcontractor and the term Owner will be deemed to be Contractor.

16. Modifications to this Bond are as follows: **None**

## PAYMENT BOND

<p><b>Contractor</b></p> <p>Name: _____</p> <p>Address (<i>principal place of business</i>): _____</p>	<p><b>Surety</b></p> <p>Name: _____</p> <p>Address (<i>principal place of business</i>): _____</p>
<p><b>Owner</b></p> <p>Name: <b>TOWN OF KINSEY, ALABAMA</b></p> <p>Mailing address (<i>principal place of business</i>):  <b>6947 WALDEN DRIVE</b>  <b>KINSEY, ALABAMA 36303</b></p>	<p><b>Contract</b></p> <p>Description (<i>name and location</i>):  <b>WASTEWATER TREATMENT PLANT</b>  <b>CONTRACT 2</b></p> <p>Contract Price: _____</p> <p>Effective Date of Contract: _____</p>
<p><b>Bond</b></p> <p>Bond Amount: _____</p> <p>Date of Bond: _____  <i>(Date of Bond cannot be earlier than Effective Date of Contract)</i></p> <p>Modifications to this Bond form:  <input type="checkbox"/> None <input type="checkbox"/> See Paragraph 18</p>	
<p>Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth in this Payment Bond, do each cause this Payment Bond to be duly executed by an authorized officer, agent, or representative.</p>	
Contractor as Principal	Surety
_____ <i>(Full formal name of Contractor)</i>	_____ <i>(Full formal name of Surety) (corporate seal)</i>
By: _____ <i>(Signature)</i>	By: _____ <i>(Signature)(Attach Power of Attorney)</i>
Name: _____ <i>(Printed or typed)</i>	Name: _____ <i>(Printed or typed)</i>
Title: _____	Title: _____
Attest: _____ <i>(Signature)</i>	Attest: _____ <i>(Signature)</i>
Name: _____ <i>(Printed or typed)</i>	Name: _____ <i>(Printed or typed)</i>
Title: _____	Title: _____
<p><i>Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party is considered plural where applicable.</i></p>	

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 will 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 will 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 will 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 will 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 will 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 will 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 satisfying 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 will 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 will be applicable.
13. Notice and Claims to the Surety, the Owner, or the Contractor must be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, will 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 will be deemed deleted here from and provisions conforming to such statutory or other legal requirement will be deemed incorporated herein. When so furnished, the intent is that this Bond will 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:
    - 16.1.1. The name of the Claimant;
    - 16.1.2. The name of the person for whom the labor was done, or materials or equipment furnished;
    - 16.1.3. 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;
    - 16.1.4. A brief description of the labor, materials, or equipment furnished;



- 16.1.5. The date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
  - 16.1.6. The total amount earned by the Claimant for labor, materials, or equipment furnished as of the date of the Claim;
  - 16.1.7. The total amount of previous payments received by the Claimant; and
  - 16.1.8. The total amount due and unpaid to the Claimant for labor, materials, or equipment furnished as of the date of the Claim.
- 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 is 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.
17. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond will be deemed to be Subcontractor and the term Owner will be deemed to be Contractor.
  18. Modifications to this Bond are as follows: **None**

**Contractor's Application for Payment**

<b>Owner:</b> _____	<b>Owner's Project No.:</b> _____
<b>Engineer:</b> _____	<b>Engineer's Project No.:</b> _____
<b>Contractor:</b> _____	<b>Contractor's Project No.:</b> _____
<b>Project:</b> _____	
<b>Contract:</b> _____	
<b>Application No.:</b> _____	<b>Application Date:</b> _____
<b>Application Period:</b> From _____	to _____

1. Original Contract Price	\$	-
2. Net change by Change Orders	\$	-
3. Current Contract Price (Line 1 + Line 2)	\$	-
4. Total Work completed and materials stored to date (Sum of Column G Lump Sum Total and Column J Unit Price Total)	\$	-
5. Retainage		
a. _____ X \$ _____ - Work Completed	\$	-
b. _____ X \$ _____ - Stored Materials	\$	-
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, including retainage (Line 3 - Line 4)	\$	-

**Contractor's Certification**

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.

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

**Signature:** \_\_\_\_\_ **Date:** \_\_\_\_\_

<b>Recommended by Engineer</b>	<b>Approved by Owner</b>
<b>By:</b> _____	<b>By:</b> _____
<b>Title:</b> _____	<b>Title:</b> _____
<b>Date:</b> _____	<b>Date:</b> _____
<b>Approved by Funding Agency</b>	
<b>By:</b> _____	<b>By:</b> _____
<b>Title:</b> _____	<b>Title:</b> _____
<b>Date:</b> _____	<b>Date:</b> _____

**Progress Estimate - Unit Price Work**

**Contractor's Application for Payment**

Owner: \_\_\_\_\_  
 Engineer: \_\_\_\_\_  
 Contractor: \_\_\_\_\_  
 Project: \_\_\_\_\_  
 Contract: \_\_\_\_\_

Owner's Project No.: \_\_\_\_\_  
 Engineer's Project No.: \_\_\_\_\_  
 Contractor's Project No.: \_\_\_\_\_

Application No.: \_\_\_\_\_ Application Period: From \_\_\_\_\_ to \_\_\_\_\_ Application Date: \_\_\_\_\_

A	B	C	D	E	F	G	H	I	J	K	L
Bid Item No.	Description	Contract Information				Work Completed		Materials Currently Stored (not in G) (\$)	Work Completed and Materials Stored to Date (H + I) (\$)	% of Value of Item (I / F) (%)	Balance to Finish (F - J) (\$)
		Item Quantity	Units	Unit Price (\$)	Value of Bid Item (C X E) (\$)	Estimated Quantity Incorporated in the Work	Value of Work Completed to Date (E X G) (\$)				
<b>Original Contract</b>											
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<b>Original Contract Totals</b>					\$ -		\$ -	\$ -	\$ -		\$ -

**Progress Estimate - Unit Price Work**

**Contractor's Application for Payment**

Owner: \_\_\_\_\_  
 Engineer: \_\_\_\_\_  
 Contractor: \_\_\_\_\_  
 Project: \_\_\_\_\_  
 Contract: \_\_\_\_\_

Owner's Project No.: \_\_\_\_\_  
 Engineer's Project No.: \_\_\_\_\_  
 Contractor's Project No.: \_\_\_\_\_

Application No.: \_\_\_\_\_ Application Period: From \_\_\_\_\_ to \_\_\_\_\_ Application Date: \_\_\_\_\_

A	B	C	D	E	F	G	H	I	J	K	L
Bid Item No.	Description	Contract Information				Work Completed		Materials Currently Stored (not in G) (\$)	Work Completed and Materials Stored to Date (H + I) (\$)	% of Value of Item (I / F) (%)	Balance to Finish (F - J) (\$)
		Item Quantity	Units	Unit Price (\$)	Value of Bid Item (C X E) (\$)	Estimated Quantity Incorporated in the Work	Value of Work Completed to Date (E X G) (\$)				
<b>Change Orders</b>											
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<b>Change Order Totals</b>					\$ -		\$ -	\$ -	\$ -		\$ -
<b>Original Contract and Change Orders</b>											
<b>Project Totals</b>					\$ -		\$ -	\$ -	\$ -		\$ -

**Stored Materials Summary**

**Contractor's Application for Payment**

Owner: _____	Owner's Project No.: _____
Engineer: _____	Engineer's Project No.: _____
Contractor: _____	Contractor's Project No.: _____
Project: _____	
Contract: _____	

Application No.:		Application Period: From _____ to _____						Application Date: _____					
A	B	C	D	E	F	Materials Stored			Incorporated in Work		M		
Item No. (Lump Sum Tab) or Bid Item No. (Unit Price Tab)	Supplier Invoice No.	Submittal No. (with Specification Section No.)	Description of Materials or Equipment Stored	Storage Location	Application No. When Materials Placed in Storage	Previous Amount Stored (\$)	Amount Stored this Period (\$)	Amount Stored to Date (G+H) (\$)	Amount Previously Incorporated in the Work (\$)	Amount Incorporated in the Work this Period (\$)	Total Amount Incorporated in the Work (J+K) (\$)	Materials Remaining in Storage (I-L) (\$)	
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<b>Totals</b>						\$	-	\$	-	\$	-	\$	-

# CERTIFICATE OF SUBSTANTIAL COMPLETION

Owner: TOWN OF KINSEY, ALABAMA                      Owner's Project No.: N/A  
Engineer: CDG, INC.    Engineer's Project No.: R063519021  
Contractor:    Contractor's Project No.:  
Project: WASTEWATER TREATMENT PLANT – CONTRACT 2  
Contract Name: WASTEWATER TREATMENT PLANT – CONTRACT 2

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 Documents.

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.

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 must be as provided in the Contract, except as amended as follows:

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:

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 Documents.

Engineer

By (*signature*): \_\_\_\_\_

Name (*printed*): \_\_\_\_\_

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

**NOTICE OF ACCEPTABILITY OF WORK**

Owner: TOWN OF KINSEY, ALABAMA Owner’s Project No.: N/A  
Engineer: CDG, INC. Engineer’s Project No.: R063519021  
Contractor: Contractor’s Project No.:  
Project: WASTEWATER TREATMENT PLANT – CONTRACT 2  
Contract Name: WASTEWATER TREATMENT PLANT – CONTRACT 2  
Effective Date of the Construction  
Notice Date: Contract:

The Engineer hereby gives notice to the Owner and Contractor that Engineer recommends final payment to Contractor, and that the Work furnished and performed by Contractor under the Construction Contract is acceptable, expressly subject to the provisions of the Construction Contract’s Contract Documents (“Contract Documents”) and of the Agreement between Owner and Engineer for Professional Services dated \_\_\_\_\_ (“Owner-Engineer Agreement”). This Notice of Acceptability of Work (Notice) is made expressly subject to the following terms and conditions to which all who receive and rely on said Notice agree:

- 1. This Notice has been prepared with the skill and care ordinarily used by members of the engineering profession practicing under similar conditions at the same time and in the same locality.
- 2. This Notice reflects and is an expression of the Engineer’s professional opinion.
- 3. This Notice has been prepared to the best of Engineer’s knowledge, information, and belief as of the Notice Date.
- 4. This Notice is based entirely on and expressly limited by the scope of services Engineer has been employed by Owner to perform or furnish during construction of the Project (including observation of the Contractor’s Work) under the Owner-Engineer Agreement, and applies only to facts that are within Engineer’s knowledge or could reasonably have been ascertained by Engineer as a result of carrying out the responsibilities specifically assigned to Engineer under such Owner-Engineer Agreement.
- 5. This Notice is not a guarantee or warranty of Contractor’s performance under the Construction Contract, an acceptance of Work that is not in accordance with the Contract Documents, including but not limited to defective Work discovered after final inspection, nor an assumption of responsibility for any failure of Contractor to furnish and perform the Work thereunder in accordance with the Contract Documents, or to otherwise comply with the Contract Documents or the terms of any special guarantees specified therein.
- 6. This Notice does not relieve Contractor of any surviving obligations under the Construction Contract, and is subject to Owner’s reservations of rights with respect to completion and final payment.

Engineer

By (signature): \_\_\_\_\_  
Name (printed): \_\_\_\_\_  
Title: \_\_\_\_\_

# STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

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# STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

## 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 document prepared by Contractor, in a form acceptable to Engineer, to request 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; 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; 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.
- 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.
  - c. A demand or assertion by Owner or Contractor, duly submitted in compliance with the procedural requirements set forth herein, made pursuant to Paragraph 12.01.A.4, concerning disputes arising after Engineer has issued a recommendation of final payment.
  - d. 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), lead-based paint (as defined by the HUD/EPA standard), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to Laws and Regulations 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 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. *Electronic Document*—Any Project-related correspondence, attachments to correspondence, data, documents, drawings, information, or graphics, including but not limited to Shop Drawings and other Submittals, that are in an electronic or digital format.
21. *Electronic Means*—Electronic mail (email), upload/download from a secure Project website, or other communications methods that allow: (a) the transmission or communication of Electronic Documents; (b) the documentation of transmissions, including sending and receipt; (c) printing of the transmitted Electronic Document by the

recipient; (d) the storage and archiving of the Electronic Document by sender and recipient; and (e) the use by recipient of the Electronic Document for purposes permitted by this Contract. Electronic Means does not include the use of text messaging, or of Facebook, Twitter, Instagram, or similar social media services for transmission of Electronic Documents.

22. *Engineer*—The individual or entity named as such in the Agreement.
23. *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.
24. *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.
  - a. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated into the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, is not a Hazardous Environmental Condition.
  - b. The presence of Constituents of Concern that are to be removed or remediated as part of the Work is not a Hazardous Environmental Condition.
  - c. The presence of Constituents of Concern as part of the routine, anticipated, and obvious working conditions at the Site, is not a Hazardous Environmental Condition.
25. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and binding decrees, resolutions, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
26. *Liens*—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.
27. *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.
28. *Notice of Award*—The written notice by Owner to a Bidder of Owner's acceptance of the Bid.
29. *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.
30. *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.
31. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising Contractor's plan to accomplish the Work within the Contract Times.
32. *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.

33. *Resident Project Representative*—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative (RPR) includes any assistants or field staff of Resident Project Representative.
34. *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.
35. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements for Engineer’s review of the submittals.
36. *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.
37. *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.
38. *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 or areas furnished by Owner which are designated for the use of Contractor.
39. *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.
40. *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.
41. *Submittal*—A written or graphic document, prepared by or for Contractor, which the Contract Documents require Contractor to submit to Engineer, or that is indicated as a Submittal in the Schedule of Submittals accepted by Engineer. Submittals may include Shop Drawings and Samples; schedules; product data; Owner-delegated designs; sustainable design information; information on special procedures; testing plans; results of tests and evaluations, source quality-control testing and inspections, and field or Site quality-control testing and inspections; warranties and certifications; Suppliers’ instructions and reports; records of delivery of spare parts and tools; operations and maintenance data; Project photographic documentation; record documents; and other such documents required by the Contract Documents. Submittals, whether or not approved or accepted by Engineer, are not Contract Documents. Change Proposals, Change Orders, Claims, notices, Applications for Payment, and requests for interpretation or clarification are not Submittals.
42. *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 of such Work.



43. *Successful Bidder*—The Bidder to which the Owner makes an award of contract.
44. *Supplementary Conditions*—The part of the Contract that amends or supplements these General Conditions.
45. *Supplier*—A manufacturer, fabricator, supplier, distributor, 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.
46. *Technical Data*
- a. Those items expressly identified as Technical Data in the Supplementary Conditions, with respect to either (1) existing subsurface conditions at or adjacent to the Site, or existing physical conditions at or adjacent to the Site including existing surface or subsurface structures (except Underground Facilities) or (2) Hazardous Environmental Conditions at the Site.
  - b. If no such express identifications of Technical Data have been made with respect to conditions at the Site, then Technical Data is defined, with respect to conditions at the Site under Paragraphs 5.03, 5.04, and 5.06, as the data contained in boring logs, recorded measurements of subsurface water levels, assessments of the condition of subsurface facilities, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical, environmental, or other Site or facilities conditions report prepared for the Project and made available to Contractor.
  - c. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data, and instead Underground Facilities are shown or indicated on the Drawings.
47. *Underground Facilities*—All active or not-in-service underground lines, pipelines, conduits, ducts, encasements, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or systems at the Site, including but not limited to those facilities or systems that produce, transmit, distribute, or convey telephone or other communications, cable television, fiber optic transmissions, power, electricity, light, heat, gases, oil, crude oil products, liquid petroleum products, water, steam, waste, wastewater, storm water, other liquids or chemicals, or traffic or other control systems. An abandoned facility or system is not an Underground Facility.
48. *Unit Price Work*—Work to be paid for on the basis of unit prices.
49. *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.
50. *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 Paragraphs 1.02.B, C, D, and E are not defined terms that require initial capital letters, but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.
- B. *Intent of Certain Terms or Adjectives:* 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:* The word “day” means a calendar day of 24 hours measured from midnight to the next midnight.
- D. *Defective:* The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:
1. does not conform to the Contract Documents;
  2. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or
  3. 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 Paragraph 15.04).
- E. *Furnish, Install, Perform, Provide*
1. The word “furnish,” when used in connection with services, materials, or equipment, means 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, means 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, means 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. *Contract Price or Contract Times*: References to a change in “Contract Price or Contract Times” or “Contract Times or Contract Price” or similar, indicate that such change applies to (1) Contract Price, (2) Contract Times, or (3) both Contract Price and Contract Times, as warranted, even if the term “or both” is not expressed.
- G. 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 Performance and Payment Bonds; Evidence of Insurance***

- A. *Performance and Payment Bonds*: When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner the performance bond and payment bond (if the Contract requires Contractor to furnish such bonds).
- B. *Evidence of Contractor’s Insurance*: When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each additional insured (as identified in the Contract), the certificates, endorsements, and other evidence of insurance required to be provided by Contractor in accordance with Article 6, except to the extent the Supplementary Conditions expressly establish other dates for delivery of specific insurance policies.
- C. *Evidence of Owner’s Insurance*: After receipt of the signed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor, with copies to each additional insured (as identified in the Contract), 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 signed 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 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 *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 the schedules submitted in accordance with Paragraph 2.03.A. No progress payment will 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.
  - 4. If a schedule is not acceptable, Contractor will have an additional 10 days to revise and resubmit the schedule.

2.06 *Electronic Transmittals*

- A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may send, and shall accept, Electronic Documents transmitted by Electronic Means.
- B. If the Contract does not establish protocols for Electronic Means, then Owner, Engineer, and Contractor shall jointly develop such protocols.
- C. Subject to any governing protocols for Electronic Means, when transmitting Electronic Documents by Electronic Means, the transmitting party makes no representations as to long-term compatibility, usability, or readability of the Electronic Documents 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 Electronic Documents.

## ARTICLE 3—CONTRACT DOCUMENTS: INTENT, REQUIREMENTS, REUSE

### 3.01 *Intent*

- A. The Contract Documents are complementary; what is required by one Contract Document 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 versions of the Contract Documents (including any printed copies derived from such electronic versions) and the printed record version, the printed record version will 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.
- F. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation will be deemed stricken, and all remaining provisions will continue to be valid and binding upon Owner and Contractor, which agree that the Contract Documents will 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.
- G. Nothing in the Contract Documents creates:
  - 1. any contractual relationship between Owner or Engineer and any Subcontractor, Supplier, or other individual or entity performing or furnishing any of the Work, for the benefit of such Subcontractor, Supplier, or other individual or entity; or
  - 2. 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.

### 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, means 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, and no instruction of a Supplier, will be effective to change the duties or responsibilities of Owner, Contractor, or Engineer 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 or Engineer 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 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 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 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 in writing 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.

- 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 notify Owner and Contractor in writing 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 versions, 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 precludes 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 30th 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 60th day after the day of Bid opening or the 30th 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 may 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 must 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 will 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 Contract Price or 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. Such an adjustment will 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 third-party utility owners or other third-party entities (other than those third-party utility owners or other third-party entities performing other work at or adjacent to the Site as arranged by or under contract with Owner, as contemplated in Article 8); and
  - 4. Acts of war or terrorism.



- D. Contractor's entitlement to an adjustment of Contract Times or Contract Price is limited as follows:
1. Contractor's entitlement to an adjustment of the Contract Times is conditioned on the delay, disruption, or interference adversely affecting an activity on the critical path to completion of the Work, as of the time of the delay, disruption, or interference.
  2. Contractor shall not be entitled to an adjustment in Contract Price 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. Such a concurrent delay by Contractor shall not preclude an adjustment of Contract Times to which Contractor is otherwise entitled.
  3. Adjustments of Contract Times or Contract Price are subject to the provisions of Article 11.
- E. Each Contractor request or Change Proposal seeking an increase in Contract Times or Contract Price must be supplemented by supporting data that sets forth in detail the following:
1. The circumstances that form the basis for the requested adjustment;
  2. The date upon which each cause of delay, disruption, or interference began to affect the progress of the Work;
  3. The date upon which each cause of delay, disruption, or interference ceased to affect the progress of the Work;
  4. The number of days' increase in Contract Times claimed as a consequence of each such cause of delay, disruption, or interference; and
  5. The impact on Contract Price, in accordance with the provisions of Paragraph 11.07.
- Contractor shall also furnish such additional supporting documentation as Owner or Engineer may require including, where appropriate, a revised progress schedule indicating all the activities affected by the delay, disruption, or interference, and an explanation of the effect of the delay, disruption, or interference on the critical path to completion of the Work.
- F. 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, together with the provisions of Paragraphs 4.05.D and 4.05.E.
- G. Paragraph 8.03 addresses 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.

## **ARTICLE 5—SITE; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS**

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

- A. Owner shall furnish the Site. Owner shall notify Contractor in writing 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, or to improvements, structures, utilities, or similar facilities located at such adjacent lands 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 7.13, 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 in a court of competent jurisdiction; 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 will 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 of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data;
2. Those drawings of existing physical conditions at or adjacent to the Site, including those drawings depicting existing surface or subsurface structures at or adjacent to the Site (except Underground Facilities), that contain Technical Data; and
3. Technical Data contained in such reports and drawings.

- B. *Underground Facilities:* Underground Facilities are shown or indicated on the Drawings, pursuant to Paragraph 5.05, and not in the drawings referred to in Paragraph 5.03.A. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data.

- C. *Reliance by Contractor on Technical Data:* 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 Paragraph 1.01.A.46.b.

- D. *Limitations of Other Data and Documents:* 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;
2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings;
3. the contents of other Site-related documents made available to Contractor, such as record drawings from other projects at or adjacent to the Site, or Owner's archival documents concerning the Site; or
4. 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:
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;
  2. is of such a nature as to require a change in the Drawings or Specifications;
  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 whether it is necessary for Owner to obtain 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; 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. *Early Resumption of Work:* If at any time Engineer determines that Work in connection with the subsurface or physical condition in question may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the condition in question has been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.
- E. *Possible Price and Times Adjustments*
1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, 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 subject to the provisions of Paragraphs 4.05.D and 4.05.E.
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;
  - 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 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, then any such adjustment will 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, 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.
- F. *Underground Facilities; Hazardous Environmental Conditions*: Paragraph 5.05 governs rights and responsibilities regarding the presence or location of Underground Facilities. Paragraph 5.06 governs rights and responsibilities regarding Hazardous Environmental Conditions. The provisions of Paragraphs 5.03 and 5.04 are not applicable to the presence or location of Underground Facilities, or to Hazardous Environmental Conditions.

#### 5.05 *Underground Facilities*

- A. *Contractor's Responsibilities*: Unless it is otherwise expressly provided in the Supplementary Conditions, the cost of all of the following are included in the Contract Price, and Contractor shall have full responsibility for:
1. reviewing and checking all information and data regarding existing Underground Facilities at the Site;
  2. complying with applicable state and local utility damage prevention Laws and Regulations;

3. verifying the actual location of those Underground Facilities shown or indicated in the Contract Documents as being within the area affected by the Work, by exposing such Underground Facilities during the course of construction;
  4. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and
  5. 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 on the Drawings, or was not shown or indicated on the Drawings 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), notify Owner and Engineer in writing regarding such Underground Facility.
- C. *Engineer's Review:* Engineer will:
1. promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated on the Drawings, or was not shown or indicated with reasonable accuracy;
  2. identify and communicate with the owner of the Underground Facility; prepare recommendations to Owner (and if necessary issue any preliminary instructions to Contractor) regarding the Contractor's resumption of Work in connection with the Underground Facility in question;
  3. obtain any pertinent cost or schedule information from Contractor; 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
  4. 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. *Early Resumption of Work:* If at any time Engineer determines that Work in connection with the Underground Facility may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the Underground Facility in question and conditions affected by its presence have been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.
- F. *Possible Price and Times Adjustments*
1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, to the extent that any existing Underground Facility at the Site that was not shown

or indicated on the Drawings, 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. 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;
  - b. Contractor's entitlement to an adjustment of the Contract Times is subject to the provisions of Paragraphs 4.05.D and 4.05.E; and
  - c. 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, then any such adjustment will 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, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.
  4. The information and data shown or indicated on the Drawings with respect to existing Underground Facilities at the Site is based on information and data (a) furnished by the owners of such Underground Facilities, or by others, (b) obtained from available records, or (c) gathered in an investigation conducted in accordance with the current edition of ASCE 38, Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data, by the American Society of Civil Engineers. If such information or data is incorrect or incomplete, Contractor's remedies are limited to those set forth in this Paragraph 5.05.F.

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

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

1. those reports known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site;
2. drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; 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 on the accuracy of the Technical Data as defined in Paragraph 1.01.A.46.b. 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;
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, as a result of such Work stoppage, such special conditions under which Work is agreed to be resumed by Contractor, or any costs or expenses incurred in response to the Hazardous Environmental Condition, 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. Entitlement to any such adjustment is subject to the provisions of Paragraphs 4.05.D, 4.05.E, 11.07, and 11.08.
- 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, 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 obligates 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 obligates 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 Contractor's obligations under the Contract. These bonds must 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 terms of a prescribed bond form, the Supplementary Conditions, or other provisions of the Contract.
- B. Contractor shall also furnish such other bonds (if any) as are required by the Supplementary Conditions or other provisions of the Contract.
- C. All bonds must be in the form included in the Bidding Documents or otherwise specified by Owner prior to execution of the Contract, except as provided otherwise by Laws or

Regulations, and must be issued and signed by a surety named in “Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies” as published in Department Circular 570 (as amended and supplemented) by the Bureau of the Fiscal Service, 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 must show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.

- D. Contractor shall obtain the required bonds from surety companies that are duly licensed or authorized, in the state or jurisdiction in which the Project is located, to issue bonds in the required amounts.
- E. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or the surety ceases to meet the requirements above, then Contractor shall promptly notify Owner and Engineer in writing and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which must comply with the bond and surety requirements above.
- F. 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.
- G. Upon request to Owner from any Subcontractor, Supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of the Work, Owner shall provide a copy of the payment bond to such person or entity.
- H. Upon request to Contractor from any Subcontractor, Supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of the Work, Contractor shall provide a copy of the payment bond to such person or entity.

#### 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. Alternative forms of insurance coverage, including but not limited to self-insurance and “Occupational Accident and Excess Employer’s Indemnity Policies,” are not sufficient to meet the insurance requirements of this Contract, unless expressly allowed in the Supplementary Conditions.
- D. Contractor shall deliver to Owner, with copies to each additional insured identified in the Contract, certificates of insurance and endorsements establishing that Contractor has obtained and is maintaining the policies and coverages 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, documentation of applicable self-insured retentions (if allowed) and deductibles, full disclosure of all relevant exclusions, and evidence of insurance required to be purchased and maintained by

- Subcontractors or Suppliers. In any documentation furnished under this provision, Contractor, Subcontractors, and Suppliers may block out (redact) (1) any confidential premium or pricing information and (2) any wording specific to a project or jurisdiction other than those applicable to this Contract.
- E. Owner shall deliver to Contractor, with copies to each additional insured identified in the Contract, certificates of insurance and endorsements establishing that Owner has obtained and is maintaining the policies and coverages 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, documentation of applicable self-insured retentions (if allowed) and deductibles, and full disclosure of all relevant exclusions. In any documentation furnished under this provision, Owner may block out (redact) (1) any confidential premium or pricing information and (2) any wording specific to a project or jurisdiction other than those relevant to this Contract.
  - F. 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, will not be construed as a waiver of the other party's obligation to obtain and maintain such insurance.
  - G. In addition to the liability insurance required to be provided by Contractor, the Owner, at Owner's option, may purchase and maintain Owner's own liability insurance. 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.
  - H. Contractor shall require:
    - 1. Subcontractors to purchase and maintain worker's compensation, commercial general liability, and other insurance that is appropriate for their participation in the Project, and to name as additional insureds Owner and Engineer (and any other individuals or entities identified in the Supplementary Conditions as additional insureds on Contractor's liability policies) on each Subcontractor's commercial general liability insurance policy; and
    - 2. Suppliers to purchase and maintain insurance that is appropriate for their participation in the Project.
  - I. If either party does not purchase or maintain 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.
  - J. If Contractor has failed to obtain and maintain required insurance, Contractor's entitlement to enter or remain at the Site will end immediately, and Owner may impose an appropriate set-off against payment for any associated costs (including but not limited to the cost of purchasing necessary insurance coverage), and exercise Owner's termination rights under Article 16.
  - K. Without prejudice to any other right or remedy, if a party has failed to obtain required insurance, the other party may elect (but is in no way obligated) 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 will be adjusted accordingly.

- L. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor or Contractor's interests. Contractor is responsible for determining whether such coverage and limits are adequate to protect its interests, and for obtaining and maintaining any additional insurance that Contractor deems necessary.
- M. The insurance and insurance limits required herein will not be deemed as a limitation on Contractor's liability, or that of its Subcontractors or Suppliers, under the indemnities granted to Owner and other individuals and entities in the Contract or otherwise.
- N. All the policies of insurance required to be purchased and maintained under this Contract will contain a provision or endorsement that the coverage afforded will not be canceled, 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 and Engineer.

6.03 *Contractor's Insurance*

- A. *Required Insurance:* Contractor shall purchase and maintain Worker's Compensation, Commercial General Liability, and other insurance pursuant to the specific requirements of the Supplementary Conditions.
- B. *General Provisions:* The policies of insurance required by this Paragraph 6.03 as supplemented must:
  - 1. include at least the specific coverages required;
  - 2. be written for not less than the limits provided, or those required by Laws or Regulations, whichever is greater;
  - 3. remain in effect at least until the Work is complete (as set forth in Paragraph 15.06.D), and longer if expressly required elsewhere in this Contract, 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;
  - 4. apply with respect to the performance of the Work, whether such performance is 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; and
  - 5. include all necessary endorsements to support the stated requirements.
- C. *Additional Insureds:* The Contractor's commercial general liability, automobile liability, employer's liability, umbrella or excess, pollution liability, and unmanned aerial vehicle liability policies, if required by this Contract, must:
  - 1. include and list as additional insureds Owner and Engineer, and any individuals or entities identified as additional insureds in the Supplementary Conditions;
  - 2. include coverage for the respective officers, directors, members, partners, employees, and consultants of all such additional insureds;
  - 3. afford primary coverage to these additional insureds for all claims covered thereby (including as applicable those arising from both ongoing and completed operations);

4. not seek contribution from insurance maintained by the additional insured; and
5. as to commercial general liability insurance, apply to additional insureds with respect to liability caused in whole or in part by Contractor's acts or omissions, or the acts and omissions of those working on Contractor's behalf, in the performance of Contractor's operations.

#### 6.04 *Builder's Risk and Other 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 Work's full insurable replacement cost (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). The specific requirements applicable to the builder's risk insurance are set forth in the Supplementary Conditions.
- B. *Property Insurance for Facilities of Owner Where Work Will Occur*: Owner is responsible for obtaining and maintaining property insurance covering each existing structure, building, or facility in which any part of the Work will occur, or to which any part of the Work will attach or be adjoined. Such property insurance will be written on a special perils (all-risk) form, on a replacement cost basis, providing coverage consistent with that required for the builder's risk insurance, and will be maintained until the Work is complete, as set forth in Paragraph 15.06.D.
- C. *Property Insurance for Substantially Complete Facilities*: Promptly after Substantial Completion, and before actual occupancy or use of the substantially completed Work, Owner will obtain property insurance for such substantially completed Work, and maintain such property insurance at least until the Work is complete, as set forth in Paragraph 15.06.D. Such property insurance will be written on a special perils (all-risk) form, on a replacement cost basis, and provide coverage consistent with that required for the builder's risk insurance. The builder's risk insurance may terminate upon written confirmation of Owner's procurement of such property insurance.
- 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 advance notice of such occupancy or use to the builder's risk insurer, and obtain an endorsement consenting to the continuation of coverage prior to commencing such partial occupancy or use.
- E. *Insurance of Other Property; Additional Insurance*: If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, then the entity or individual owning such property item will be responsible for insuring it. 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 6.04, it may do so at Contractor's expense.

#### 6.05 *Property Losses; Subrogation*

- A. The builder's risk insurance policy purchased and maintained in accordance with Paragraph 6.04 (or an installation floater policy if authorized by the Supplementary Conditions), will contain provisions to the effect that in the event of payment of any loss or damage the insurer 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.

1. 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, risks, 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 individuals or entities identified in the Supplementary Conditions as builder's risk or installation floater 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.
  2. None of the above waivers extends 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. Any property insurance policy maintained by Owner covering any loss, damage, or consequential loss to Owner's existing structures, buildings, or facilities in which any part of the Work will occur, or to which any part of the Work will attach or adjoin; to adjacent structures, buildings, or facilities of Owner; or to part or all of the completed or substantially completed Work, 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, will contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any insureds thereunder, or against Contractor, Subcontractors, or Engineer, or the officers, directors, members, partners, employees, agents, consultants, or subcontractors of each and any of them, and that the insured is allowed to waive the insurer's rights of subrogation in a written contract executed prior to the loss, damage, or consequential loss.
1. 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 all losses and damages caused by, arising out of, or resulting from fire or any of the perils, risks, or causes of loss covered by such policies.
- C. The waivers in this Paragraph 6.05 include the waiver of rights 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 insured peril, risk, or cause of loss.
- D. Contractor shall be responsible for assuring that each Subcontract 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 fire or other peril, risk, or cause of loss covered by builder's risk insurance, installation floater, and any other property insurance applicable to the Work.

6.06 *Receipt and Application of Property Insurance Proceeds*

- A. Any insured loss under the builder's risk and other policies of property insurance required by Paragraph 6.04 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 6.04 shall maintain such proceeds in a segregated account, and 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, Contractor shall repair or replace the damaged Work, using allocated insurance proceeds.

**ARTICLE 7—CONTRACTOR'S RESPONSIBILITIES**

7.01 *Contractor's Means and Methods of Construction*

- A. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction.
- B. If the Contract Documents note, or Contractor determines, that professional engineering or other design services are needed to carry out Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures, or for Site safety, then Contractor shall cause such services to be provided by a properly licensed design professional, at Contractor's expense. Such services are not Owner-delegated professional design services under this Contract, and neither Owner nor Engineer has any responsibility with respect to (1) Contractor's determination of the need for such services, (2) the qualifications or licensing of the design professionals retained or employed by Contractor, (3) the performance of such services, or (4) any errors, omissions, or defects in such services.

7.02 *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.
- B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who will not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

7.03 *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 maintain good discipline and order at the Site.

- B. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of Contractor's employees; of Suppliers and Subcontractors, and their employees; and of any other individuals or entities performing or furnishing any of the Work, just as Contractor is responsible for Contractor's own acts and omissions.
- C. 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 will 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.

#### 7.04 *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 must be new and of good quality, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications will 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 must 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.

#### 7.05 *"Or Equals"*

- A. *Contractor's Request; Governing Criteria:* Whenever an item of equipment or material is specified or described in the Contract Documents by using the names of one or more proprietary items or specific Suppliers, 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 equipment or material, or items from other proposed Suppliers, under the circumstances described below.
  - 1. If Engineer in its sole discretion determines that an item of equipment or material proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, Engineer will deem it an "or equal" item. For the purposes of this paragraph, a proposed item of equipment or material will be considered functionally equal to an item so named if:
    - a. in the exercise of reasonable judgment Engineer determines that the proposed item:
      - 1) is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;



- 2) 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) has a proven record of performance and availability of responsive service; and
  - 4) is not objectionable to Owner.
- b. Contractor certifies that, if the proposed item is approved and incorporated into the Work:
- 1) there will be no increase in cost to the Owner or increase in Contract Times; and
  - 2) the item 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 will result in any change in Contract Price. The Engineer's denial of an "or-equal" request will be final and binding, and may not be reversed through an appeal under any provision of the Contract.
- E. *Treatment as a Substitution Request*: If Engineer determines that an item of equipment or material proposed by Contractor does not qualify as an "or-equal" item, Contractor may request that Engineer consider the item a proposed substitute pursuant to Paragraph 7.06.

#### 7.06 *Substitutes*

- A. *Contractor's Request; Governing Criteria*: Unless the specification or description of an item of equipment or material 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 equipment or material under the circumstances described below. To the extent possible such requests must 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 equipment or material from anyone other than Contractor.
  2. The requirements for review by Engineer will be as set forth in Paragraph 7.06.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 equipment or material that Contractor seeks to furnish or use. The application:
  - a. will 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 the item specified; and
    - 3) be suited to the same use as the item 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 the item specified; and
    - 2) available engineering, sales, maintenance, repair, and replacement services.
  - d. will 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 will be final and binding, and may not be reversed through an appeal under any provision of the Contract. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.06.D, by timely submittal of a Change Proposal.

7.07 *Concerning Subcontractors and Suppliers*

- A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner. The Contractor's retention of a Subcontractor or Supplier for the performance of parts of the Work will not relieve Contractor's obligation to Owner to perform and complete the Work in accordance with the Contract Documents.
- B. Contractor shall retain specific Subcontractors and Suppliers 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 or Supplier 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 5 days.
- E. Owner may require the replacement of any Subcontractor or Supplier. 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 or Suppliers 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 or Supplier so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor or Supplier.
- F. If Owner requires the replacement of any Subcontractor or Supplier retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, 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 or Supplier, whether initially or as a replacement, will 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 solely responsible for scheduling and coordinating the work of Subcontractors and Suppliers.
- J. The divisions and sections of the Specifications and the identifications of any Drawings do not control Contractor in dividing the Work among Subcontractors or Suppliers, or in delineating the Work to be performed by any specific trade.
- K. All Work performed for Contractor by a Subcontractor or Supplier must be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract for the benefit of Owner and Engineer.
- L. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor for Work performed for Contractor by the Subcontractor or Supplier.
- M. Contractor shall restrict all Subcontractors and Suppliers from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed in this Contract.

7.08 *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 an 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 will be disclosed 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.

#### 7.09 *Permits*

- A. Unless otherwise provided in the Contract Documents, Contractor shall obtain and pay for all construction permits, licenses, and certificates of occupancy. 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.

#### 7.10 *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.

#### 7.11 *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. 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 is not Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this does not relieve Contractor of its obligations under Paragraph 3.03.
- C. Owner or Contractor may give written 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 written notice Contractor may submit a Change Proposal, or Owner may initiate a Claim.

#### 7.12 *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.

### 7.13 *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.
- B. Contractor shall designate a qualified and experienced safety representative whose duties and responsibilities are the prevention of Work-related accidents and the maintenance and supervision of safety precautions and programs.
- C. 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.
- D. All damage, injury, or loss to any property referred to in Paragraph 7.13.C.2 or 7.13.C.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).
- E. 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.
- F. Contractor shall notify Owner; the owners of adjacent property; the owners of Underground Facilities and other utilities (if the identity of such owners is known to Contractor); and other contractors and utility owners performing work at or adjacent to the Site, in writing, when Contractor knows that 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.
- G. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. Any Owner's safety programs that are applicable to the Work are identified or included in the Supplementary Conditions or Specifications.
- H. 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.

- I. Contractor's duties and responsibilities for safety and protection will continue until all the Work is completed, Engineer has issued a written notice to Owner and Contractor in accordance with Paragraph 15.06.C that the Work is acceptable, and Contractor has left the Site (except as otherwise expressly provided in connection with Substantial Completion).
- J. Contractor's duties and responsibilities for safety and protection will 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.

7.14 *Hazard Communication Programs*

- A. Contractor shall be responsible for coordinating any exchange of safety data sheets (formerly known as 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 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 by an emergency, or are required as a result of Contractor's response to an emergency. If Engineer determines that a change in the Contract Documents is required because of an emergency or Contractor's response, a Work Change Directive or Change Order will be issued.

7.16 *Submittals*

A. *Shop Drawing and Sample Requirements*

- 1. Before submitting a Shop Drawing or Sample, Contractor shall:
  - a. review and coordinate the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
  - b. determine and verify:
    - 1) all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect to the Submittal;
    - 2) 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
    - 3) all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto;
  - c. confirm that the Submittal is complete with respect to all related data included in the Submittal.
- 2. Each Shop Drawing or Sample must 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 Shop Drawing or Sample, Contractor shall give Engineer specific written notice of any variations that the Submittal may have from the requirements of the Contract Documents. This notice must be set forth in a written communication separate from the Submittal; and, in addition, in the case of a Shop Drawing by a specific notation made on the Shop Drawing itself.
- B. *Submittal Procedures for Shop Drawings and Samples:* Contractor shall label and submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals.
1. *Shop Drawings*
    - a. Contractor shall submit the number of copies required in the Specifications.
    - b. Data shown on the Shop Drawings must 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.C.
  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.C.
  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. *Engineer's Review of Shop Drawings and Samples*
1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the accepted Schedule of Submittals. 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, comply with the requirements of 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 will 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 or other appropriate Contract modification.

5. Engineer's review and approval of a Shop Drawing or Sample will not relieve Contractor from responsibility for complying with the requirements of Paragraphs 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, will 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 or Sample will 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.C.4.

*D. Resubmittal Procedures for Shop Drawings and Samples*

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 Shop Drawing and Sample submittals with sufficient information and accuracy to obtain required approval of an item with no more than two resubmittals. Engineer will record Engineer's time for reviewing a third or subsequent resubmittal of a Shop Drawing or Sample, and Contractor shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due Contractor to secure reimbursement for such charges.
3. If Contractor requests a change of a previously approved Shop Drawing or Sample, Contractor shall be responsible for Engineer's charges to Owner for its review time, and Owner may impose a set-off against payments due Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.

*E. Submittals Other than Shop Drawings, Samples, and Owner-Delegated Designs*

1. The following provisions apply to all Submittals other than Shop Drawings, Samples, and Owner-delegated designs:
  - a. Contractor shall submit all such Submittals to the Engineer in accordance with the Schedule of Submittals and pursuant to the applicable terms of the Contract Documents.
  - b. Engineer will provide timely review of all such Submittals in accordance with the Schedule of Submittals and return such Submittals with a notation of either Accepted or Not Accepted. Any such Submittal that is not returned within the time established in the Schedule of Submittals will be deemed accepted.
  - c. Engineer's review will be only to determine if the Submittal is acceptable under the requirements of the Contract Documents as to general form and content of the Submittal.

- d. If any such Submittal is not accepted, Contractor shall confer with Engineer regarding the reason for the non-acceptance, and resubmit an acceptable document.
  2. Procedures for the submittal and acceptance of the Progress Schedule, the Schedule of Submittals, and the Schedule of Values are set forth in Paragraphs 2.03, 2.04, and 2.05.
- F. Owner-delegated Designs: Submittals pursuant to Owner-delegated designs are governed by the provisions of Paragraph 7.19.

**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 is entitled to rely on Contractor's warranty and guarantee.
- B. Owner's rights under this warranty and guarantee are in addition to, and are not limited by, Owner's rights under the correction period provisions of Paragraph 15.08. The time in which Owner may enforce its warranty and guarantee rights under this Paragraph 7.17 is limited only by applicable Laws and Regulations restricting actions to enforce such rights; provided, however, that after the end of the correction period under Paragraph 15.08:
1. Owner shall give Contractor written notice of any defective Work within 60 days of the discovery that such Work is defective; and
  2. Such notice will be deemed the start of an event giving rise to a Claim under Paragraph 12.01.B, such that any related Claim must be brought within 30 days of the notice.
- C. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:
1. abuse, or improper modification, 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.
- D. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents is absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents, a release of Contractor's obligation to perform the Work in accordance with the Contract Documents, or a release of Owner's warranty and guarantee rights under this Paragraph 7.17:
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. The end of the correction period established in Paragraph 15.08;
  8. Any inspection, test, or approval by others; or

9. Any correction of defective Work by Owner.
- E. 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 will 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 losses, damages, costs, and judgments (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 from third-party claims or actions relating to or resulting from the performance or furnishing of the Work, provided that any such claim, action, loss, cost, judgment or damage is attributable to bodily injury, sickness, disease, or death, or to damage 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 will 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.

7.19 *Delegation of Professional Design Services*

- A. Owner may require Contractor to provide professional design services for a portion of the Work by express delegation in the Contract Documents. Such delegation will specify the performance and design criteria that such services must satisfy, and the Submittals that Contractor must furnish to Engineer with respect to the Owner-delegated design.
- B. Contractor shall cause such Owner-delegated professional design services to be provided pursuant to the professional standard of care by a properly licensed design professional, whose signature and seal must appear on all drawings, calculations, specifications, certifications, and Submittals prepared by such design professional. Such design professional must issue all certifications of design required by Laws and Regulations.
- C. If a Shop Drawing or other Submittal related to the Owner-delegated design is prepared by Contractor, a Subcontractor, or others for submittal to Engineer, then such Shop Drawing or other Submittal must bear the written approval of Contractor's design professional when submitted by Contractor to Engineer.

- D. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, and approvals performed or provided by the design professionals retained or employed by Contractor under an Owner-delegated design, subject to the professional standard of care and the performance and design criteria stated in the Contract Documents.
- E. Pursuant to this Paragraph 7.19, Engineer's review, approval, and other determinations regarding design drawings, calculations, specifications, certifications, and other Submittals furnished by Contractor pursuant to an Owner-delegated design will be only for the following limited purposes:
  - 1. Checking for conformance with the requirements of this Paragraph 7.19;
  - 2. Confirming that Contractor (through its design professionals) has used the performance and design criteria specified in the Contract Documents; and
  - 3. Establishing that the design furnished by Contractor is consistent with the design concept expressed in the Contract Documents.
- F. Contractor shall not be responsible for the adequacy of performance or design criteria specified by Owner or Engineer.
- G. Contractor is not required to provide professional services in violation of applicable Laws and Regulations.

## **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 third-party utility work that Owner has arranged to take place at or adjacent to the Site, Owner shall provide such information to Contractor.
- C. Contractor shall afford proper and safe access to the Site to each contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner's employees, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work.
- D. 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.

- E. If the proper execution or results of any part of Contractor's Work depends upon work performed by others, 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.
- F. The provisions of this article are not applicable to work that is performed by third-party utilities or other third-party entities without a contract with Owner, or that is performed without having been arranged by Owner. If such work occurs, then any related delay, disruption, or interference incurred by Contractor is governed by the provisions of Paragraph 4.05.C.3.

#### 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 for Owner at or adjacent to the Site, the Owner's employees, any other contractor working for Owner, or any utility owner that Owner has arranged to perform work, 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. 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 will 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, and any remedies available to Contractor under Laws or Regulations concerning utility action or inaction. When applicable, any such equitable adjustment in Contract Price will 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 or Contract Price is subject to the provisions of Paragraphs 4.05.D and 4.05.E.

- 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.
  - 1. 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 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 8.03.B.
  - 2. 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 Contractor.
- C. 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 will 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 (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 10.07. 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 *Resident 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 the Supplementary Conditions and in Paragraph 10.07.
- B. If Owner designates an individual or entity who is not Engineer's consultant, agent, or employee to represent Owner at the Site, then the responsibilities and authority of such individual or entity will be as provided in the Supplementary Conditions.

### 10.04 *Engineer's Authority*

- A. Engineer has the authority to reject Work in accordance with Article 14.
- B. Engineer's authority as to Submittals is set forth in Paragraph 7.16.
- C. Engineer's authority as to design drawings, calculations, specifications, certifications and other Submittals from Contractor in response to Owner's delegation (if any) to Contractor of professional design services, is set forth in Paragraph 7.19.
- D. Engineer's authority as to changes in the Work is set forth in Article 11.



E. Engineer's authority as to Applications for Payment is set forth in Article 15.

10.05 *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.

10.06 *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.

10.07 *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, will 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 Contractor under 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 10.07 also apply to the Resident Project Representative, if any.

10.08 *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 of which Engineer has been informed.

## **ARTICLE 11—CHANGES TO THE CONTRACT**

### **11.01 *Amending and Supplementing the Contract***

- A. The Contract may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.
- B. If an amendment or supplement to the Contract includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order.
- C. All changes to the Contract that 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, must be supported by Engineer's recommendation. Owner and Contractor may amend other terms and conditions of the Contract without the recommendation of the Engineer.

### **11.02 *Change Orders***

- A. Owner and Contractor shall execute appropriate Change Orders covering:
  - 1. Changes in 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 11.05, (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 that embody the substance of any final and binding results under: Paragraph 11.03.B, resolving the impact of a Work Change Directive; Paragraph 11.09, concerning Change Proposals; Article 12, Claims; Paragraph 13.02.D, final adjustments resulting from allowances; Paragraph 13.03.D, final adjustments relating to determination of quantities for Unit Price Work; and similar provisions.
- B. If Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of Paragraph 11.02.A, it will be deemed to be of full force and effect, as if fully executed.

### **11.03 *Work Change Directives***

- A. 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 11.07 regarding change of Contract Price.

- B. If Owner has issued a Work Change Directive and:
  - 1. Contractor believes that an adjustment in Contract Times or Contract Price is necessary, then Contractor shall submit any Change Proposal seeking such an adjustment no later than 30 days after the completion of the Work set out in the Work Change Directive.
  - 2. Owner believes that an adjustment in Contract Times or Contract Price is necessary, then Owner shall submit any Claim seeking such an adjustment no later than 60 days after issuance of the Work Change Directive.

#### 11.04 *Field Orders*

- A. 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.
- B. If Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, then before proceeding with the Work at issue, Contractor shall submit a Change Proposal as provided herein.

#### 11.05 *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. Changes involving the design (as set forth in the Drawings, Specifications, or otherwise) or other engineering or technical matters will be supported by Engineer's recommendation.
- B. Such changes in the Work 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 must be performed under the applicable conditions of the Contract Documents.
- C. Nothing in this Paragraph 11.05 obligates 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.

#### 11.06 *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.C.2.

#### 11.07 *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 must comply with the provisions of Paragraph 11.09. Any Claim for an adjustment of Contract Price must 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);
  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 11.07.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 11.07.C).
- C. *Contractor's Fee:* When applicable, the Contractor's fee for overhead and profit will 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 will be 15 percent;
    - b. For costs incurred under Paragraph 13.01.B.3, the Contractor's fee will be 5 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 11.07.C.2.a and 11.07.C.2.b is that the Contractor's fee will be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.B.1 and 13.01.B.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 5 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 will be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the Work;
    - d. No fee will 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 of the Work will be the amount of the actual net decrease in Cost of the Work and a deduction of an additional amount equal to 5 percent of such actual net decrease in Cost of the Work; and
    - f. When both additions and credits are involved in any one change or Change Proposal, the adjustment in Contractor's fee will be computed by determining the sum of the costs in each of the cost categories in Paragraph 13.01.B (specifically, payroll costs, Paragraph 13.01.B.1; incorporated materials and equipment costs, Paragraph 13.01.B.2; Subcontract costs, Paragraph 13.01.B.3; special consultants costs, Paragraph 13.01.B.4; and other costs, Paragraph 13.01.B.5) and applying to each such cost category sum the appropriate fee from Paragraphs 11.07.C.2.a through 11.07.C.2.e, inclusive.

#### 11.08 *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 must comply with the provisions of Paragraph 11.09. Any Claim for an adjustment in the Contract Times must comply with the provisions of Article 12.
- B. Delay, disruption, and interference in the Work, and any related changes in Contract Times, are addressed in and governed by Paragraph 4.05.

#### 11.09 *Change Proposals*

- A. *Purpose and Content:* Contractor shall submit a Change Proposal to Engineer to request an adjustment in the Contract Times or Contract Price; contest an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; challenge a set-off against payment due; or seek other relief under the Contract. The Change Proposal will specify any proposed change in Contract Times or Contract Price, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents. Each Change Proposal will address only one issue, or a set of closely related issues.

#### B. *Change Proposal Procedures*

1. *Submittal:* Contractor shall submit each Change Proposal to Engineer within 30 days after the start of the event giving rise thereto, or after such initial decision.
2. *Supporting Data:* 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.
  - a. Change Proposals based on or related to delay, interruption, or interference must comply with the provisions of Paragraphs 4.05.D and 4.05.E.
  - b. Change proposals related to a change of Contract Price must include full and detailed accounts of materials incorporated into the Work and labor and equipment used for the subject Work.

The supporting data must 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.

3. *Engineer's Initial Review:* Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal. If in its discretion Engineer concludes that additional supporting data is needed before conducting a full review and making a decision regarding the Change Proposal, then Engineer may request that Contractor submit such additional supporting data by a date specified by Engineer, prior to Engineer beginning its full review of the Change Proposal.
4. *Engineer's Full Review and Action on the Change Proposal:* Upon receipt of Contractor's supporting data (including any additional data requested by Engineer), Engineer will conduct a full review of each Change Proposal and, within 30 days after such receipt of the Contractor's supporting data, either approve the Change Proposal in whole, deny it in whole, or approve it in part and deny it in part. Such actions must 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.

5. *Binding Decision*: Engineer's decision is final and binding upon Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under Article 12.
- C. *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 in writing that the Engineer is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice will be deemed a denial, and Contractor may choose to seek resolution under the terms of Article 12.
- D. *Post-Completion*: Contractor shall not submit any Change Proposals after Engineer issues a written recommendation of final payment pursuant to Paragraph 15.06.B.

#### 11.10 *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 are subject 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;
  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; and
  4. Subject to the waiver provisions of Paragraph 15.07, any dispute arising after Engineer has issued a written recommendation of final payment pursuant to Paragraph 15.06.B.
- 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 rests with the party making the Claim. In the case of a Claim by Contractor seeking an increase in the Contract Times or Contract Price, 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 will 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 will 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 will 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 will 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 will 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 will 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 will be incorporated in a Change Order or other written document 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. When needed 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 will be in amounts no higher than those commonly incurred in the locality of the Project, will not include any of the costs itemized in Paragraph 13.01.C, and will 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 in advance of the subject Work. Such employees include, without limitation, superintendents, foremen, safety managers, safety representatives, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work will be apportioned on the basis of their time spent on the Work. Payroll costs include, but are not limited to, salaries and wages plus the cost of fringe benefits, which include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, 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, will 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 accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts will accrue to Owner. All trade discounts, rebates, and refunds and returns from sale of surplus materials and equipment will 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, which 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 will 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 or retained for services specifically related to the Work.
  5. Other costs consisting of 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, 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.

- 1) In establishing included costs for materials such as scaffolding, plating, or sheeting, consideration will be given to the actual or the estimated life of the material for use on other projects; or rental rates may be established on the basis of purchase or salvage value of such items, whichever is less. Contractor will not be eligible for compensation for such items in an amount that exceeds the purchase cost of such item.

c. *Construction Equipment Rental*

- 1) Rentals of all construction equipment and machinery, and the parts thereof, in accordance with rental agreements approved by Owner as to price (including any surcharge or special rates applicable to overtime use of the construction equipment or machinery), and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs will be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts must cease when the use thereof is no longer necessary for the Work.
- 2) Costs for equipment and machinery owned by Contractor or a Contractor-related entity will be paid at a rate shown for such equipment in the equipment rental rate book specified in the Supplementary Conditions. An hourly rate will be computed by dividing the monthly rates by 176. These computed rates will include all operating costs.
- 3) With respect to Work that is the result of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price ("changed Work"), included costs will be based on the time the equipment or machinery is in use on the changed Work and the costs of transportation, loading, unloading, assembly, dismantling, and removal when directly attributable to the changed Work. The cost of any such equipment or machinery, or parts thereof, must cease to accrue when the use thereof is no longer necessary for the changed 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 builder's risk or other property insurance established in accordance with Paragraph 6.04), 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 include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses will 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 does not include any of the following items:

- 1. Payroll costs and other compensation of Contractor's officers, executives, principals, general 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. The cost of purchasing, renting, or furnishing small tools and hand tools.
- 3. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.
- 4. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
- 5. 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.
- 6. Expenses incurred in preparing and advancing Claims.
- 7. 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*

- 1. When the Work as a whole is performed on the basis of cost-plus-a-fee, then:
  - a. Contractor's fee for the Work set forth in the Contract Documents as of the Effective Date of the Contract will be determined as set forth in the Agreement.
  - b. for any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work, Contractor's fee will be determined as follows:
    - 1) When the fee for the Work as a whole is a percentage of the Cost of the Work, the fee will automatically adjust as the Cost of the Work changes.
    - 2) When the fee for the Work as a whole is a fixed fee, the fee for any additions or deletions will be determined in accordance with Paragraph 11.07.C.2.
- 2. When the Work as a whole is performed on the basis of a stipulated sum, or any other basis other than cost-plus-a-fee, then Contractor's fee for any Work covered by a Change

Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work will be determined in accordance with Paragraph 11.07.C.2.

- E. *Documentation and Audit*: Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 13, Contractor and pertinent Subcontractors will establish and maintain records of the costs in accordance with generally accepted accounting practices. Subject to prior written notice, Owner will be afforded reasonable access, during normal business hours, to all Contractor's accounts, records, books, correspondence, instructions, drawings, receipts, vouchers, memoranda, and similar data relating to the Cost of the Work and Contractor's fee. Contractor shall preserve all such documents for a period of three years after the final payment by Owner. Pertinent Subcontractors will afford such access to Owner, and preserve such documents, to the same extent required of Contractor.

### 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 for any of the foregoing will be valid.
- C. *Owner's Contingency Allowance*: Contractor agrees that an Owner's 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 for Work covered by allowances, and the Contract Price will 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, and the final adjustment of Contract Price will be set forth in a Change Order, subject to the provisions of the following paragraph.

E. *Adjustments in Unit Price*

1. Contractor or Owner shall be entitled to an adjustment in the unit price with respect to an item of Unit Price Work if:
  - a. the quantity of the item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and
  - b. Contractor's unit costs to perform the item of Unit Price Work have changed materially and significantly as a result of the quantity change.
2. The adjustment in unit price will account for and be coordinated with any related changes in quantities of other items of Work, and in Contractor's costs to perform such other Work, such that the resulting overall change in Contract Price is equitable to Owner and Contractor.
3. Adjusted unit prices will apply to all units of that item.

**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 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 with such procedures and programs 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 will 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 will 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 will 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 written 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 will 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, 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 will 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 defective Work as required by Engineer, then Owner may, after 7 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 for 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.
  - 2. 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 must also be accompanied by: (a) a bill of sale, invoice, copies of subcontract or purchase order payments, or other documentation

establishing full payment by Contractor for the materials and equipment; (b) at Owner's request, documentation warranting that Owner has received the materials and equipment free and clear of all Liens; and (c) 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.

3. Beginning with the second Application for Payment, each Application must include an affidavit of Contractor stating that all previous progress payments received by Contractor have been applied to discharge Contractor's legitimate obligations associated with prior Applications for Payment.
4. 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;
  - b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto;
  - c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work;
  - d. to make any examination to ascertain how or for what purposes Contractor has used the money paid by Owner; 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 based on Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages resulting from 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 has occurred that would constitute a default by Contractor and therefore justify a termination for cause;
  - j. Liquidated or other 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; or
  - l. Other items entitle 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 will 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 will be treated as an amount due as determined by Paragraph 15.01.D.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 7 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 will 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 7 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 15.03.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 6.04 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 7.12), and other documents, Contractor may make application for final payment.
2. The final Application for Payment must 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 duly pending Change Proposals and Claims; 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 Final Application and Recommendation of Payment:* 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 10 days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the final Application for Payment to Owner for payment. Such recommendation will 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. 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. *Notice of Acceptability:* In support of its recommendation of payment of the final Application for Payment, Engineer will also give written notice to Owner and Contractor that the Work is acceptable, subject to stated limitations in the notice and to the provisions of Paragraph 15.07.
- D. *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 and issuance of notice of the acceptability of the Work.
- E. *Final Payment Becomes Due:* Upon receipt from Engineer of the final Application for Payment and accompanying documentation, Owner shall set off against the amount recommended by Engineer for final payment any further sum to which Owner is entitled, including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions of this Contract with respect to progress payments. Owner shall pay the resulting balance due to Contractor within 30 days of Owner's receipt of the final Application for Payment from Engineer.

#### 15.07 *Waiver of Claims*

- A. By making final payment, Owner waives its claim or right to liquidated damages or other damages for late completion by Contractor, except as set forth in an outstanding Claim,

appeal under the provisions of Article 17, set-off, or express reservation of rights by Owner. Owner reserves all other claims or rights after final payment.

- 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 as a Claim, 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 Supplementary Conditions or the terms of any applicable special guarantee required by the Contract Documents), Owner gives Contractor written notice that any Work has been found to be defective, or that Contractor's repair of any damages to the Site or adjacent areas has been found to be defective, then after receipt of such notice of defect 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 adjacent areas;
  - 2. correct such defective Work;
  - 3. remove the defective Work from the Project and replace it with Work that is not defective, if the defective Work has been rejected by Owner, 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 from the corrective measures.
- B. Owner shall give any such notice of defect within 60 days of the discovery that such Work or repairs is defective. If such notice is given within such 60 days but after the end of the correction period, the notice will be deemed a notice of defective Work under Paragraph 7.17.B.
- C. If, after receipt of a notice of defect within 60 days and within the correction period, 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 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). Contractor's failure to pay such costs, losses, and damages within 10 days of invoice from Owner will be deemed the start of an event giving rise to a Claim under Paragraph 12.01.B, such that any related Claim must be brought within 30 days of the failure to pay.
- D. 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.
- E. 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.

- F. Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph are not to 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 directly attributable to any such suspension. Any Change Proposal seeking such adjustments must 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) 10 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) written 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 7 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 will govern over any inconsistent provisions of Paragraphs 16.02.B and 16.02.D.

#### 16.03 *Owner May Terminate for Convenience*

- A. Upon 7 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 for any loss of anticipated profits or revenue, post-termination overhead costs, 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 7 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, 7 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, pursuant to Article 12; and
  2. Disputes between Owner and Contractor concerning the Work, or obligations under the Contract Documents, that arise 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;
  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 requires the giving of written notice to Owner, Engineer, or Contractor, it will be deemed to have been validly given only if delivered:
1. in person, by a commercial courier service or otherwise, to the recipient's place of business;
  2. by registered or certified mail, postage prepaid, to the recipient's place of business; or
  3. by e-mail to the recipient, with the words "Formal Notice" or similar in the e-mail's subject line.

### **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 will not constitute a waiver of that provision, nor will 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 of the Contract or 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 *Assignment of Contract*

- A. Unless expressly agreed to elsewhere in the Contract, no assignment by a party to this Contract of any rights under or interests in the Contract will be binding on the other party 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.

18.09 *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.

18.10 *Headings*

- A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

# SUPPLEMENTARY CONDITIONS OF THE CONSTRUCTION CONTRACT

These Supplementary Conditions amend or supplement EJCDC® C-700, Standard General Conditions of the Construction Contract (2018). The General Conditions remain in full force and effect except as amended.

The terms used in these Supplementary Conditions have the meanings stated in the General Conditions. Additional terms used in these Supplementary Conditions have the meanings stated below, which are applicable to both the singular and plural thereof.

The address system used in these Supplementary Conditions is the same as the address system used in the General Conditions, with the prefix "SC" added—for example, "Paragraph SC-4.05."

## ARTICLE 1—DEFINITIONS AND TERMINOLOGY

### 1.01 *Defined Terms*

SC-1.01 Add the following at the end of Paragraph 1.01.A.8:

The Change Order form to be used on this Project is EJCDC C-941 (2018). Agency approval is required before Change Orders are effective.

SC-1.01 Add the following at the end of Paragraph 1.01.A.30:

For the purposes of Rural Development, this term is synonymous with the term "applicant" as defined in 7 CFR 1780.1 (a) (1), (2) and (3) and is an entity receiving financial assistance from the federal programs.

SC-1.01 Add the following at the end of Paragraph 1.01.A.50:

The Work Change Directive form to be used on this Project is EJCDC C-940 (2018). Agency approval is required before a Work Change Directive is issued.

SC-1.01 Add the following new paragraph immediately after Paragraph 1.01.A.50:

51. 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.

SC-1.01 Add the following new paragraph with the title "American Iron and Steel Definitions" immediately after Paragraph 1.01.A.51:

52.a *American Iron and Steel (AIS)* – Requirements mandated by 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 for "iron and steel products," meaning the following products, if 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. AIS requirements apply in each of the several states, the District of Columbia, and each federally recognized Tribe, but not the U.S. Territories.

52.b *Coating* – 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 United States, said product would 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 United States. This exemption only applies to Coatings on the *external surface* of Iron and Steel components. It does not apply to Coatings or linings on internal surfaces 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 the United States for the product to be compliant with AIS requirements.

52.c *Construction Materials* – Those articles, materials, or supplies made primarily of iron and/or steel, that are permanently incorporated into the project, not including 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 definitions of Mechanical Equipment and Electrical Equipment.

52.d *Contractor’s Certification* – Documentation submitted by the Contractor upon Substantial Completion of the Contract that all Iron and Steel products installed were Produced in the United States.

52.e *De Minimis* – Various miscellaneous, incidental low-cost components that are essential for, but incidental to, the construction and are incorporated into the physical structure of the project. Examples of *De Minimis* 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 such *De Minimis* 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.

52.f *Electrical Equipment* – Typically any machine powered by electricity and includes components that are part of the electrical distribution system. AIS does not apply to Electrical Equipment.

52.g *Engineer’s Certification* – Documentation submitted by the Engineer that Drawings, Specifications, and Bidding Documents comply with AIS.

52.h *Iron and Steel products* – 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

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Exhibit C—Geotechnical Baseline Report Supplement to the Supplementary Conditions.

EJCDC® C-800, Supplementary Conditions of the Construction Contract.

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Construction Materials. Only items on the above list made primarily of iron or steel, permanently incorporated into the project must be Produced in the United States. 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.

52.i *Manufacturer* – A Supplier, fabricator, distributor, materialman, or vendor is an entity with which the Owner, Contractor or any subcontractor has contracted to furnish materials or equipment to be incorporated in the project by the Owner, Contractor or subcontractor.

52.j *Manufacturer's Certification* – Documentation provided by the Manufacturer stating that the Iron and Steel products to be used in the project are produced in the United States in accordance with American Iron and Steel (AIS) Requirements. If items are purchased via a Supplier, distributor, vendor, etc. from the Manufacturer directly, then the Supplier, distributor, vendor, etc. will be responsible for obtaining and providing these certifications to the parties purchasing the products.

52.k *Manufacturing Processes* – Processes such as melting, refining, pouring, forming, rolling, drawing, finishing, and fabricating. Further, if a domestic Iron and Steel product is taken out of the United States 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 requirement, and the material(s), if any, being applied as a Coating are similarly not covered. Non-iron or Steel components of an Iron and Steel product may come from non-US 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.

52.l *Mechanical Equipment* – Typically equipment which has motorized parts and/or is powered by a motor. AIS does not apply to Mechanical Equipment.

52.m *Minor Components* – Components *within* an iron and/or Steel product otherwise compliant with the American Iron and Steel requirements; this waiver is typically used by Manufacturers. It differs from the *De Minimis* definition in the *De Minimis* pertains to the entire project and the minor component definition pertains to a single product. This waiver allows use of 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. However, unless a separate waiver for a project 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.

52.n *Municipal Castings* – Cast iron or 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.

52.o *Primarily Iron or Steel* – A product is made of greater than 50 percent iron or Steel on a material cost basis. An exception to this definition is reinforced precast concrete (see Definitions). 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/or steel, the AIS requirements do not apply. For example, the cost of a fire hydrant includes:

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

Not included in the cost are:

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

52.p *Produced in the United States* – 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.

52.q *Reinforced Precast Concrete* – Reinforced Precast Concrete structures must comply with AIS, regardless of whether it consists of at least 50 percent iron or steel. The reinforcing bar and wire must be Produced in the United States and meet the same standards as 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 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 Construction Materials and must be Produced in the United States.

52.r *Steel* – 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.

52.s *Structural Steel* – 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.

## ARTICLE 2—PRELIMINARY MATTERS

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

SC-2.01 Delete Paragraphs 2.01.B. and C. in their entirety and insert the following in their place:

- B. *Evidence of Contractor's Insurance:* When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner copies of the policies (including all endorsements, and identification of applicable self-insured retentions and deductibles) of insurance required to be provided by Contractor in this Contract. Contractor may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.
- C. *Evidence of Owner's Insurance:* After receipt from Contractor of the signed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor copies of the policies of insurance to be provided by Owner in this Contract (if any). Owner may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.

## 2.02 *Copies of Documents*

SC-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** printed 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 signed 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.

## 2.06 *Electronic Transmittals*

SC-2.06 Delete Paragraphs 2.06.B and 2.06.C in their entirety and insert the following in their place:

- B. *Electronic Documents Protocol:* The parties shall conform to the following provisions in Paragraphs 2.06.B and 2.06.C, together referred to as the Electronic Documents Protocol ("EDP" or "Protocol") for exchange of electronic transmittals.

### 1. *Basic Requirements*

- a. To the fullest extent practical, the parties agree to and will transmit and accept Electronic Documents in an electronic or digital format using the procedures described in this Protocol. Use of the Electronic Documents and any information contained therein is subject to the requirements of this Protocol and other provisions of the Contract.
- b. The contents of the information in any Electronic Document will be the responsibility of the transmitting party.
- c. Electronic Documents as exchanged by this Protocol may be used in the same manner as the printed versions of the same documents that are exchanged using non-electronic format and methods, subject to the same governing requirements, limitations, and restrictions, set forth in the Contract Documents.
- d. Except as otherwise explicitly stated herein, the terms of this Protocol will be incorporated into any other agreement or subcontract between a party and any third party for any portion of the Work on the Project, or any Project-related services, where that third party is, either directly or indirectly, required to exchange Electronic Documents with a party or with Engineer. Nothing herein will modify the

requirements of the Contract regarding communications between and among the parties and their subcontractors and consultants.

- e. When transmitting Electronic Documents, the transmitting party makes no representations as to long term compatibility, usability, or readability of the items resulting from the receiving party's use of software application packages, operating systems, or computer hardware differing from those established in this Protocol.
- f. Nothing herein negates any obligation 1) in the Contract to create, provide, or maintain an original printed record version of Drawings and Specifications, signed and sealed according to applicable Laws and Regulations; 2) to comply with any applicable Law or Regulation governing the signing and sealing of design documents or the signing and electronic transmission of any other documents; or 3) to comply with the notice requirements of Paragraph 18.01 of the General Conditions.

## 2. *System Infrastructure for Electronic Document Exchange*

- a. Each party will provide hardware, operating system(s) software, internet, e-mail, and large file transfer functions ("System Infrastructure") at its own cost and sufficient for complying with the EDP requirements. With the exception of minimum standards set forth in this EDP, and any explicit system requirements specified by attachment to this EDP, it is the obligation of each party to determine, for itself, its own System Infrastructure.
  - 1) The maximum size of an email attachment for exchange of Electronic Documents under this EDP is 36 MB. Attachments larger than that may be exchanged using large file transfer functions or physical media.
  - 2) Each Party assumes full and complete responsibility for any and all of its own costs, delays, deficiencies, and errors associated with converting, translating, updating, verifying, licensing, or otherwise enabling its System Infrastructure, including operating systems and software, for use with respect to this EDP.
- b. Each party is responsible for its own system operations, security, back-up, archiving, audits, printing resources, and other Information Technology ("IT") for maintaining operations of its System Infrastructure during the Project, including coordination with the party's individual(s) or entity responsible for managing its System Infrastructure and capable of addressing routine communications and other IT issues affecting the exchange of Electronic Documents.
- c. Each party will operate and maintain industry-standard, industry-accepted, ISO-standard, commercial-grade security software and systems that are intended to protect the other party from: software viruses and other malicious software like worms, trojans, adware; data breaches; loss of confidentiality; and other threats in the transmission to or storage of information from the other parties, including transmission of Electronic Documents by physical media such as CD/DVD/flash drive/hard drive. To the extent that a party maintains and operates such security software and systems, it shall not be liable to the other party for any breach of system security.



- d. In the case of disputes, conflicts, or modifications to the EDP required to address issues affecting System Infrastructure, the parties shall cooperatively resolve the issues; but, failing resolution, the Owner is authorized to make and require reasonable and necessary changes to the EDP to effectuate its original intent. If the changes cause additional cost or time to Contractor, not reasonably anticipated under the original EDP, Contractor may seek an adjustment in price or time under the appropriate process in the Contract.
- e. Each party is responsible for its own back-up and archive of documents sent and received during the term of the contract under this EDP, unless this EDP establishes a Project document archive, either as part of a mandatory Project website or other communications protocol, upon which the parties may rely for document archiving during the specified term of operation of such Project document archive. Further, each party remains solely responsible for its own post-Project back-up and archive of Project documents after the term of the Contract, or after termination of the Project document archive, if one is established, for as long as required by the Contract and as each party deems necessary for its own purposes.
- f. If a receiving party receives an obviously corrupted, damaged, or unreadable Electronic Document, the receiving party will advise the sending party of the incomplete transmission.
- g. The parties will bring any non-conforming Electronic Documents into compliance with the EDP. The parties will attempt to complete a successful transmission of the Electronic Document or use an alternative delivery method to complete the communication.
- h. The Owner will operate a Project information management system (also referred to in this EDP as “Project Website”) for use of Owner, Engineer and Contractor during the Project for exchange and storage of Project-related communications and information. Except as otherwise provided in this EDP or the General Conditions, use of the Project Website by the parties as described in this Paragraph will be mandatory for exchange of Project documents, communications, submittals, and other Project-related information. The following conditions and standards will govern use of the Project Website:
  - 1) Describe the period of time during which the Project Website will be operated and be available for reliance by the parties;
  - 2) Provide any minimum system infrastructure, software licensing and security standards for access to and use of the Project Website;
  - 3) Describe the types and extent of services to be provided at the Project Website (such as large file transfer, email, communication and document archives, etc.); and
  - 4) Include any other Project Website attributes that may be pertinent to Contractor’s use of the facility and pricing of such use.

C. *Software Requirements for Electronic Document Exchange; Limitations*

1. Each party will acquire the software and software licenses necessary to create and transmit Electronic Documents and to read and to use any Electronic Documents received from the other party (and if relevant from third parties), using the software formats required in this section of the EDP.
  - a. Prior to using any updated version of the software required in this section for sending Electronic Documents to the other party, the originating party will first notify and receive concurrence from the other party for use of the updated version or adjust its transmission to comply with this EDP.
2. The parties agree not to intentionally edit, reverse engineer, decrypt, remove security or encryption features, or convert to another format for modification purposes any Electronic Document or information contained therein that was transmitted in a software data format, including Portable Document Format (PDF), intended by sender not to be modified, unless the receiving party obtains the permission of the sending party or is citing or quoting excerpts of the Electronic Document for Project purposes.
3. Software and data formats for exchange of Electronic Documents will conform to the requirements set forth in Exhibit A to this EDP, including software versions, if listed.

SC-2.06 Supplement Paragraph 2.06 of the General Conditions by adding the following paragraph:

*D. Requests by Contractor for Electronic Documents in Other Formats*

1. Release of any Electronic Document versions of the Project documents in formats other than those identified in the Electronic Documents Protocol (if any) or elsewhere in the Contract will be at the sole discretion of the Owner.
2. To extent determined by Owner, in its sole discretion, to be prudent and necessary, release of Electronic Documents versions of Project documents and other Project information requested by Contractor (“Request”) in formats other than those identified in the Electronic Documents Protocol (if any) or elsewhere in the Contract will be subject to the provisions of the Owner’s response to the Request, and to the following conditions to which Contractor agrees:
  - a. The content included in the Electronic Documents created by Engineer and covered by the Request was prepared by Engineer as an internal working document for Engineer’s purposes solely, and is being provided to Contractor on an “AS IS” basis without any warranties of any kind, including, but not limited to any implied warranties of fitness for any purpose. As such, Contractor is advised and acknowledges that the content may not be suitable for Contractor’s application, or may require substantial modification and independent verification by Contractor. The content may include limited resolution of models, not-to-scale schematic representations and symbols, use of notes to convey design concepts in lieu of accurate graphics, approximations, graphical simplifications, undocumented intermediate revisions, and other devices that may affect subsequent reuse.
  - b. Electronic Documents containing text, graphics, metadata, or other types of data that are provided by Engineer to Contractor under the request are only for convenience of Contractor. Any conclusion or information obtained or derived from such data will be at the Contractor’s sole risk and the Contractor waives any

claims against Engineer or Owner arising from use of data in Electronic Documents covered by the Request.

- c. Contractor shall indemnify and hold harmless Owner and Engineer and their subconsultants from all claims, damages, losses, and expenses, including attorneys' fees and defense costs arising out of or resulting from Contractor's use, adaptation, or distribution of any Electronic Documents provided under the Request.
- d. Contractor agrees not to sell, copy, transfer, forward, give away or otherwise distribute this information (in source or modified file format) to any third party without the direct written authorization of Engineer, unless such distribution is specifically identified in the Request and is limited to Contractor's subcontractors. Contractor warrants that subsequent use by Contractor's subcontractors complies with all terms of the Contract Documents and Owner's response to Request.

### **ARTICLE 3—CONTRACT DOCUMENTS: INTENT, REQUIREMENTS, REUSE**

#### **3.01 Intent**

SC-3.01 Delete Paragraph 3.01.C in its entirety.

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

SC-4.01 Delete the last sentence of paragraph 4.01.A.

SC-4.05 Paragraph 4.05.C.5 is mandatory for WWD projects.

SC-4.05 Add the following at the end of paragraph 4.05.C.5.a:

Extreme or unusual weather that is typical for a given region, elevation, or season should not be considered abnormal weather conditions. Requests for time extensions due to abnormal weather conditions will be submitted to the Engineer within five days of the end of the abnormal weather condition event. It is the responsibility of the Contractor to provide the information listed in SC 4.05.C.5.b.

### **ARTICLE 5—SITE, SUBSURFACE AND PHYSICAL CONDITIONS, HAZARDOUS ENVIRONMENTAL CONDITIONS**

No suggested Supplementary Conditions in this Article.

### **ARTICLE 6—BONDS AND INSURANCE**

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

SC-6.01 Add the following paragraphs immediately after Paragraph 6.01.A:

1. *Required Performance Bond Form:* The performance bond that Contractor furnishes will be in the form of EJCDC® C-610, Performance Bond (2010, 2013, or 2018 edition).
2. *Required Payment Bond Form:* The payment bond that Contractor furnishes will be in the form of EJCDC® C-615, Payment Bond (2010, 2013, or 2018 edition).

6.02 *Insurance—General Provisions*

SC-6.02 Add the following paragraph immediately after Paragraph 6.02.B:

1. Contractor may obtain worker’s compensation insurance from an insurance company that has not been rated by A.M. Best, provided that such company (a) is domiciled in the state in which the Project is located, (b) is certified or authorized as a worker’s compensation insurance provider by the appropriate state agency, and (c) has been accepted to provide worker’s compensation insurance for similar projects by the state within the last 12 months.

6.03 *Contractor’s Insurance*

SC-6.03 Supplement Paragraph 6.03 with the following provisions after Paragraph 6.03.C:

- E. *Workers’ Compensation and Employer’s Liability:* Contractor shall purchase and maintain workers’ compensation and employer’s liability insurance, including, as applicable, United States Longshoreman and Harbor Workers’ Compensation Act, Jones Act, stop-gap employer’s liability coverage for monopolistic states, and foreign voluntary workers’ compensation (from available sources, notwithstanding the jurisdictional requirement of Paragraph 6.02.B of the General Conditions).

<b>Workers’ Compensation and Related Policies</b>	<b>Policy limits of not less than:</b>
<b>Workers’ Compensation</b>	
State	Statutory
Applicable Federal (e.g., Longshoreman’s)	Statutory
Foreign voluntary workers’ compensation (employer’s responsibility coverage), if applicable	Statutory
<b>Jones Act (if applicable)</b>	
Bodily injury by accident—each accident	\$ 500,000
Bodily injury by disease—aggregate	\$ 500,000
<b>Employer’s Liability</b>	
Each accident	\$ 500,000
Each employee	\$ 500,000
Policy limit	\$ 500,000
<b>Stop-gap Liability Coverage</b>	
For work performed in monopolistic states, stop-gap liability coverage must be endorsed to either the worker’s compensation or commercial general liability policy with a minimum limit of:	\$ 1,000,000

- F. *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 claims for:
  1. damages because of bodily injury, sickness or disease, or death of any person other than Contractor’s employees,
  2. damages insured by reasonably available personal injury liability coverage, and

3. damages because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom.
- G. *Commercial General Liability—Form and Content:* Contractor’s commercial liability policy must be written on a 1996 (or later) Insurance Services Organization, Inc. (ISO) commercial general liability form (occurrence form) and include the following coverages and endorsements:
1. Products and completed operations coverage.
    - a. Such insurance must 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, including but not limited to coverage of Contractor’s contractual indemnity obligations in Paragraph 7.18.
  3. Severability of interests and no insured-versus-insured or cross-liability exclusions.
  4. Underground, explosion, and collapse coverage.
  5. Personal injury coverage.
  6. 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). If Contractor demonstrates to Owner that the specified ISO endorsements are not commercially available, then Contractor may satisfy this requirement by providing equivalent endorsements.
  7. 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.
- H. *Commercial General Liability—Excluded Content:* The commercial general liability insurance policy, including its coverages, endorsements, and incorporated provisions, must not include any of the following:
1. Any modification of the standard definition of “insured contract” (except to delete the railroad protective liability exclusion if Contractor is required to indemnify a railroad or others with respect to Work within 50 feet of railroad property).
  2. Any exclusion for water intrusion or water damage.
  3. Any provisions resulting in the erosion of insurance limits by defense costs other than those already incorporated in ISO form CG 00 01.
  4. Any exclusion of coverage relating to earth subsidence or movement.
  5. Any exclusion for the insured’s vicarious liability, strict liability, or statutory liability (other than worker’s compensation).
  6. Any limitation or exclusion based on the nature of Contractor’s work.
  7. Any professional liability exclusion broader in effect than the most recent edition of ISO form CG 22 79.

I. *Commercial General Liability—Minimum Policy Limits*

<b>Commercial General Liability</b>	<b>Policy limits of not less than:</b>
General Aggregate	\$ 2,000,000
Products—Completed Operations Aggregate	\$ 1,000,000
Personal and Advertising Injury	\$ 1,000,000
Bodily Injury and Property Damage—Each Occurrence	\$ 1,000,000

- J. *Automobile Liability*: Contractor shall purchase and maintain automobile liability insurance 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 must be written on an occurrence basis.

<b>Automobile Liability</b>	<b>Policy limits of not less than:</b>
<b>Bodily Injury</b>	
Each Person	\$ 1,000,000
Each Accident	\$ 1,000,000
<b>Property Damage</b>	
Each Accident	\$ 1,000,000
<b>[or]</b>	
<b>Combined Single Limit</b>	
Combined Single Limit (Bodily Injury and Property Damage)	\$ 1,000,000

- K. *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. The coverage afforded must be at least as broad as that of each and every one of the underlying policies.

<b>Excess or Umbrella Liability</b>	<b>Policy limits of not less than:</b>
Each Occurrence	\$ 5,000,000
General Aggregate	\$ 5,000,000

- L. *Contractor’s Pollution Liability Insurance*: Contractor shall purchase and maintain a policy covering third-party injury and property damage, including cleanup costs, as a result of pollution conditions arising from Contractor’s operations and completed operations. This insurance must be maintained for no less than three years after final completion.

<b>Contractor’s Pollution Liability</b>	<b>Policy limits of not less than:</b>
Each Occurrence/Claim	\$ 1,000,000
General Aggregate	\$ 1,000,000

- M. *Other Required Insurance*: **Owner, Engineer and Houston County shall be included as additional insureds on each policy.**

## ARTICLE 7—CONTRACTOR’S RESPONSIBILITIES

### 7.03 Labor; Working Hours

- SC-7.03 Add the following new subparagraphs immediately after Paragraph 7.03.C:
1. Regular working hours will be **Monday through Friday from 7:00 am to 6:00 pm.**
  2. Owner's legal holidays are **Sundays, Thanksgiving Day, Christmas Day, Independence Day, Labor Day, and New Year’s Day.**
- SC-7.04 Add the following new paragraph immediately after Paragraph 7.04.C:
- D. All Iron and Steel products must meet American Iron and Steel requirements.
- SC-7.04 Add the following new paragraph immediately after Paragraph 7.04.D:
- E. For projects utilizing a *De Minimis* waiver, Contractor shall maintain an itemized list of non-domestically produced iron or steel incidental components and ensure that the cost is less than 5% of total materials cost for project.
- SC-7.05 Amend the third sentence of paragraph 7.05.A by striking out the following words:  
Unless the specification or description contains or is followed by words reading that no line, equivalent, or “or-equal” item is permitted,
- SC-7.05 Amend the last sentence of Paragraph 7.05.A.1.a.3 by striking out “and;” and adding a period at the end of Paragraph a.3.
- SC-7.05 Delete paragraph 7.05.A.1.a.4 in its entirety and insert “Deleted.”
- SC-7.05 Add the following at the end of paragraph 7.05.B:  
Contractor shall include a Manufacturer’s Certification letter for compliance with American Iron and Steel requirements in support data, if applicable. Refer to Manufacturer’s Certification Letter provided in these Contract Documents.
- SC-7.06 Remove “and” from the end of paragraph 7.06.A.3.a.2.
- SC-7.06 Add “; and” to the end of paragraph 706.A.3.a.3.
- SC-7.06 Add the following new paragraph immediately after Paragraph 7.06.A.3.a.3:  
4. Comply with American Iron and Steel by providing Manufacturer’s Certification letter of American Iron and Steel compliance, if applicable. Refer to Manufacturer’s Certification Letter provided in these Contract Documents.
- SC-7.07 Amend by adding the following to the end of the paragraph 7.07.A:  
The total amount of work subcontracted by the Contractor shall not exceed fifty percent of the Contract price without prior approval from the Owner, Engineer and Agency.
- SC-7.07 Delete paragraph 7.07.B in its entirety and insert “Deleted”.
- SC-7.07 Delete the second sentence of paragraph 7.07.E and insert the following in its place:  
Owner may not require that Contractor use a specific replacement.

- SC-7.12 Amend paragraph 7.12.A by adding the following after “written interpretations and clarifications,”:
- SC-7.16 Amend paragraph 7.16.A.1.c by deleting the last period and adding:  
, including Manufacturer’s Certification letter for any item in the submittal subject to American Iron and Steel requirements and include the Certificate in the submittal. Refer to Manufacturer’s Certification Letter provided in these Contract Documents.
- SC-7.16 Add new paragraph immediately after Paragraph 7.16.C.8:  
9. Engineer’s review and approval of a Shop Drawing or Sample shall include review of Manufacturer’s Certifications in order to document compliance with American Iron and Steel requirements, as applicable.
- SC-7.17 Add new paragraph immediately after Paragraph 7.17.E:  
F. Contractor shall certify upon Substantial Completion that all Work and Materials have complied with American Iron and Steel requirements as mandated by 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. Contractor shall provide said Certification to Owner. Refer to General Contractor’s Certification Letter provided in these Contract Documents.

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

No suggested Supplementary Conditions in this Article.

#### **ARTICLE 9—OWNER’S RESPONSIBILITIES**

No suggested Supplementary Conditions in this Article.

#### **ARTICLE 10—ENGINEER’S STATUS DURING CONSTRUCTION**

##### *10.03 Resident Project Representative*

- SC-10.03 Add the following new paragraphs immediately after Paragraph 10.03.B:
- C. The Resident Project Representative (RPR) will be Engineer's representative at the Site. RPR's dealings in matters pertaining to the Work in general will be with Engineer and Contractor. RPR's dealings with Subcontractors will only be through or with the full knowledge or approval of Contractor. The RPR will:
1. *Conferences and Meetings:* Attend meetings with Contractor, such as preconstruction conferences, progress meetings, job conferences, and other Project-related meetings (but not including Contractor’s safety meetings), and as appropriate prepare and circulate copies of minutes thereof.
  2. *Safety Compliance:* Comply with Site safety programs, as they apply to RPR, and if required to do so by such safety programs, receive safety training specifically related to RPR’s own personal safety while at the Site.



3. *Liaison*
    - a. Serve as Engineer's liaison with Contractor. Working principally through Contractor's authorized representative or designee, assist in providing information regarding the provisions and intent of the Contract Documents.
    - b. Assist Engineer in serving as Owner's liaison with Contractor when Contractor's operations affect Owner's on-Site operations.
    - c. Assist in obtaining from Owner additional details or information, when required for Contractor's proper execution of the Work.
  4. *Review of Work; Defective Work*
    - a. Conduct on-Site observations of the Work to assist Engineer in determining, to the extent set forth in Paragraph 10.02, if the Work is in general proceeding in accordance with the Contract Documents.
    - b. Observe whether any Work in place appears to be defective.
    - c. Observe whether any Work in place should be uncovered for observation, or requires special testing, inspection or approval.
  5. *Inspections and Tests*
    - a. Observe Contractor-arranged inspections required by Laws and Regulations, including but not limited to those performed by public or other agencies having jurisdiction over the Work.
    - b. Accompany visiting inspectors representing public or other agencies having jurisdiction over the Work.
  6. *Payment Requests: Review Applications for Payment with Contractor.*
  7. *Completion*
    - a. Participate in Engineer's visits regarding Substantial Completion.
    - b. Assist in the preparation of a punch list of items to be completed or corrected.
    - c. Participate in Engineer's visit to the Site in the company of Owner and Contractor regarding completion of the Work, and prepare a final punch list of items to be completed or corrected by Contractor.
    - d. Observe whether items on the final punch list have been completed or corrected.
- D. The RPR will not:
1. Authorize any deviation from the Contract Documents or substitution of materials or equipment (including "or-equal" items).
  2. Exceed limitations of Engineer's authority as set forth in the Contract Documents.
  3. Undertake any of the responsibilities of Contractor, Subcontractors, or Suppliers.
  4. Advise on, issue directions relative to, or assume control over any aspect of the means, methods, techniques, sequences or procedures of construction.

- 5 Advise on, issue directions regarding, or assume control over security or safety practices, precautions, and programs in connection with the activities or operations of Owner or Contractor.
6. Participate in specialized field or laboratory tests or inspections conducted off-site by others except as specifically authorized by Engineer.
7. Authorize Owner to occupy the Project in whole or in part.

#### **ARTICLE 11—CHANGES TO THE CONTRACT**

SC-11.02 Add new paragraph immediately after Paragraph 11.02.B:

- C. The Engineer or Owner shall contact the Agency for concurrence on each Change Order prior to issuance. All Contract Change Orders must be concurred on (signed) by Agency before they are effective.

SC-11.03 Add new Paragraph 11.03.A.2 immediately after Paragraph 11.03.A, which shall be renamed Paragraph 11.03.A.1:

2. The Engineer or Owner shall contact the Agency for concurrence on each Work Change Directive prior to issuance. Once authorized by Owner, a copy of each Work Change Directive shall be provided by Engineer to the Agency.

SC-11.05 Add the following at the end of paragraph 11.05.B:

For Owner-authorized changes in the Work, the Contractor will provide the Manufacturer's Certification(s) for materials subject to American Iron and Steel requirements except when sole-source is specified, in which case the Engineer will provide the Manufacturer's Certification(s).

SC-11.09 Add new paragraph immediately after Paragraph 11.09.B.2.b:

- c. Change orders involving materials subject to American Iron and Steel requirements shall include supporting data (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, as applicable.

#### **ARTICLE 12—CLAIMS**

No suggested Supplementary Conditions in this Article.

#### **ARTICLE 13—COST OF WORK; ALLOWANCES, UNIT PRICE WORK**

SC-13.02 Delete paragraph 13.02.C in its entirety and insert "Deleted".

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

SC-14.03 Add new paragraph immediately after Paragraph 14.03.F:

- G. Installation of materials that are non-compliant with American Iron and Steel requirements shall be considered defective work.

**ARTICLE 15—PAYMENTS TO CONTRACTOR, SET OFFS; COMPLETIONS; CORRECTION PERIOD**

**15.01 Progress Payments**

SC-15.01 Add the following language at the end of paragraph 15.01.B.4:

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.

SC-15.01 Add new paragraph immediately after Paragraph 15.01.B.4:

- 5. The application for Payment form to be used on this Project is EJCDC®C-620. The agency must approve all Applications for Payment before payment is made.

SC-15.01 Add new paragraph immediately after Paragraph 15.01.B.5:

- 6. By submitting an Application for Payment based in whole or in part on furnishing equipment or materials, Contractor certifies that such equipment and materials are compliant with American Iron and Steel requirements. Manufacturer's Certification letter for materials satisfy this requirement. Refer to Manufacturer's Certification letter provided in these Contract Documents.

SC-15.01 Add the following new paragraph immediately after Paragraph 15.01.C.2.c:

- d. The materials presented for payment in an Application for Payment comply with American Iron and Steel requirements.

SC-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 the 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.

SC-15.01 Add the following new Paragraph 15.01.F:

- F. For contracts in which the Contract Price is based on the Cost of Work, if Owner determines that progress payments made to date substantially exceed the actual progress of the Work (as measured by reference to the Schedule of Values), or present a potential conflict with the Guaranteed Maximum Price, then Owner may require that Contractor prepare and submit a plan for the remaining anticipated Applications for Payment that will bring payments and

progress into closer alignment and take into account the Guaranteed Maximum Price (if any), through reductions in billings, increases in retainage, or other equitable measures. Owner will review the plan, discuss any necessary modifications, and implement the plan as modified for all remaining Applications for Payment.

15.02 Amend paragraph 15.02.A by striking out the following text: “7 days after”.

### 15.03 *Substantial Completion*

SC-15.03 Modify paragraph 15.03.A by adding the following after the last sentence:

Contractor shall also submit the General (Prime) Contractor’s Certification of Compliance certifying that to the best of the Contractor’s knowledge and belief all substitutes, equals, and all Iron and Steel products proposed in the Shop Drawings, Change Orders, and Partial Payment Estimates, and those installed for the Project, are either Produced in the United States or are the subject of an approved waiver under 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.

SC-15.03 Add the following new subparagraph to Paragraph 15.03.B:

1. If some or all of the Work has been determined not to be at a point of Substantial Completion and will require re-inspection or re-testing by Engineer, the cost of such re-inspection or re-testing, including the cost of time, travel and living expenses, will be paid by Contractor to Owner. If Contractor does not pay, or the parties are unable to agree as to the amount owed, then Owner may impose a reasonable set-off against payments due under this Article 15.

## **ARTICLE 16—SUSPENSION OF WORK AND TERMINATION**

No suggested Supplementary Conditions in this Article.

## **ARTICLE 17—FINAL RESOLUTIONS OF DISPUTES**

### 17.02 *Arbitration*

SC-17.02 Add the following new paragraph immediately after Paragraph 17.01.

### 17.02 *Arbitration*

- A. All matters subject to final resolution under this Article will be settled by arbitration administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules (subject to the conditions and limitations of this Paragraph SC-17.02). Any controversy or claim in the amount of \$100,000 or less will be settled in accordance with the American Arbitration Association’s supplemental rules for Fixed Time and Cost Construction Arbitration. This agreement to arbitrate will be specifically enforceable under the prevailing law of any court having jurisdiction.
- B. The demand for arbitration will be filed in writing with the other party to the Contract and with the selected arbitration administrator, and a copy will be sent to Engineer for

information. The demand for arbitration will be made within the specific time required in Article 17, or if no specified time is applicable within a reasonable time after the matter in question has arisen, and in no event will any such demand be made after the date when institution of legal or equitable proceedings based on such matter in question would be barred by the applicable statute of limitations.

- C. The arbitrator(s) must be licensed engineers, contractors, attorneys, or construction managers. Hearings will take place pursuant to the standard procedures of the Construction Arbitration Rules that contemplate in-person hearings. The arbitrators will have no authority to award punitive or other damages not measured by the prevailing party's actual damages, except as may be required by statute or the Contract. Any award in an arbitration initiated under this clause will be limited to monetary damages and include no injunction or direction to any party other than the direction to pay a monetary amount.
- D. The Arbitrators will have the authority to allocate the costs of the arbitration process among the parties, but will only have the authority to allocate attorneys' fees if a specific Law or Regulation or this Contract permits them to do so.
- E. The award of the arbitrators must be accompanied by a reasoned written opinion and a concise breakdown of the award. The written opinion will cite the Contract provisions deemed applicable and relied on in making the award.
- F. The parties agree that failure or refusal of a party to pay its required share of the deposits for arbitrator compensation or administrative charges will constitute a waiver by that party to present evidence or cross-examine witness. In such event, the other party shall be required to present evidence and legal argument as the arbitrator(s) may require for the making of an award. Such waiver will not allow for a default judgment against the non-paying party in the absence of evidence presented as provided for above.
- G. No arbitration arising out of or relating to the Contract will include by consolidation, joinder, or in any other manner any other individual or entity (including Engineer, and Engineer's consultants and the officers, directors, partners, agents, employees or consultants of any of them) who is not a party to this Contract unless:
  - 1. the inclusion of such other individual or entity will allow complete relief to be afforded among those who are already parties to the arbitration;
  - 2. such other individual or entity is substantially involved in a question of law or fact which is common to those who are already parties to the arbitration, and which will arise in such proceedings;
  - 3. such other individual or entity is subject to arbitration under a contract with either Owner or Contractor, or consents to being joined in the arbitration; and
  - 4. the consolidation or joinder is in compliance with the arbitration administrator's procedural rules.
- H. The award will be final. Judgment may be entered upon it in any court having jurisdiction thereof, and it will not be subject to modification or appeal, subject to provisions of the Laws and Regulations relating to vacating or modifying an arbitral award.
- I. Except as may be required by Laws or Regulations, neither party nor an arbitrator may disclose the existence, content, or results of any arbitration hereunder without the prior

written consent of both parties, with the exception of any disclosure required by Laws and Regulations or the Contract. To the extent any disclosure is allowed pursuant to the exception, the disclosure must be strictly and narrowly limited to maintain confidentiality to the extent possible.

17.03 *Attorneys' Fees*

SC-17.03 Add the following new paragraph immediately after Paragraph 17.02. [Note: If there is no Paragraph 17.02, because neither arbitration nor any other dispute resolution process has been specified here in the Supplementary Conditions, then revise this to state "Add the following new Paragraph immediately after Paragraph 17.01" and revise the numbering accordingly].

17.03 *Attorneys' Fees*

- A. For any matter subject to final resolution under this Article, the prevailing party shall be entitled to an award of its attorneys' fees incurred in the final resolution proceedings, in an equitable amount to be determined in the discretion of the court, arbitrator, arbitration panel, or other arbiter of the matter subject to final resolution, taking into account the parties' initial demand or defense positions in comparison with the final result.

**ARTICLE 18—MISCELLANEOUS**

SC-18.10 Add new paragraph immediately after Paragraph 18.10:

SC-18.10 *Tribal Sovereignty*

- A. No provision of this Agreement will be considered by any of the signatories as abridging or debilitating any sovereign powers of the *[insert name of Tribe]* 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.

**ARTICLE 19 – FEDERAL AND STATE REGULATIONS AND LAWS**

19.01 *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.

19.02 *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 "Certificate of Owner's Attorney" (Exhibit G of this Bulletin) before Owner submits the executed Contract Documents to Agency for approval.
- B. Agency concurrence is required on both the Bid and the Contract before the Contract is effective.

### 19.03 *Conflict of Interest*

- A. Contractor may not knowingly contract with a Supplier or Manufacturer if the individual or entity who prepared the Drawings 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 or other interest in or tangible personal benefit from the Contractor. Owner's officers, employees, or agents shall neither solicit nor accept gratuities, favors or anything of monetary value from Contractor or Subcontractors.

### 19.04 *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.

### 19.05 *Small, Minority and Women's Businesses*

- A. If Contractor intends to let any subcontracts for a portion of the work, Contractor will take all necessary affirmative steps to assure that minority businesses, women's business enterprises, and labor surplus area firms are used when possible. Affirmative steps will include:
  - 1. Placing qualified small and minority businesses and women's business enterprises on solicitation lists;
  - 2. Assuring that small and minority businesses, and women's business enterprises are solicited whenever they are potential sources;
  - 3. Dividing total requirements, when economically feasible, into smaller tasks or quantities to permit maximum participation by small and minority businesses, and women's business enterprises;
  - 4. Establishing delivery schedules, where the requirement permits, which encourage participation by small and minority businesses, and women's business enterprises;

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Exhibit C—Geotechnical Baseline Report Supplement to the Supplementary Conditions.

EJCDC® C-800, Supplementary Conditions of the Construction Contract.

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5. Using the services and assistance, as appropriate, of such organizations as the Small Business Administration and the Minority Business Development Agency of the Department of Commerce.

19.06 *Anti-Kickback*

- A. Contractor shall comply with the Copeland Anti-Kickback Act (40 USC 3145) 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.

19.07 *Clean Air Act (42 U.S.C. 7401-7671q.) and the Federal Water Pollution Control Act (33 U.S.C. 1251-1387), as amended*

- A. Contractor to agree to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act (42 U.S.C. 7401-7671q) and the Federal Water Pollution Control Act as amended (33 U.S.C. 1251-1387). Violations must be reported to the federal awarding agency and the Regional Office of the Environmental Protection Agency (EPA).

19.08 *Equal Employment Opportunity*

- A. The Contract is considered a federally assisted construction contract. Except as otherwise provided under 41 CFR Part 60, all contracts that meet the definition of "federally assisted construction contract" in 41 CFR Part 60-1.3 must include the equal opportunity clause provided under 41 CFR 60-1.4(b), in accordance with Executive Order 11246, "Equal Employment Opportunity" (30 FR 12319, 12935, 3 CFR Part, 1964-1965 Comp., p. 3369), as amended by Executive Order 11375, "Amending Executive Order 11246 Relating to Equal Employment Opportunity," and implementing regulations at 41 CFR part 60, "Office of Federal Contract Compliance Programs, Equal Employment Opportunity, Department of Labor."

19.09 *Byrd Anti-Lobbying Amendment (31 U.S.C. 1352)*

- A. Contractors that apply or bid for an award exceeding \$100,000 must file the required certification (RD Instruction 1940-Q Exhibit A-1). The Contractor certifies to the Owner and every subcontractor certifies to the Contractor 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, officer of employee of Congress, or an employee of a member of Congress in connection with obtaining the Contract if it is covered by 31 U.S.C. 1352. The Contractor and every subcontractor must also disclose any lobbying with non-federal funds that takes place in connection with obtaining any federal award. Such disclosure forms shall be provided by Owner.

19.10 *Environmental Requirements*



- A. When constructing a Project involving trenching and/or other related earth excavations, Contractor shall comply with the following environmental conditions:
1. Wetlands – When disposing of excess, spoil, or other Construction Materials on public or private property, Contractor shall not fill in or otherwise convert wetlands.
  2. 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 (Standard Flood Hazard Area) delineated on the latest Federal Emergency Management Agency Floodplain Maps, or other appropriate maps, e.g., alluvial soils on NRCS Soil Survey Maps.
  3. Historic Preservation – Applicants shall ensure that Contractors maintain a copy of the following inadvertent discovery plan onsite for review:
    - a. If during the course of any ground disturbance related to any Project, any post review discovery, including but not limited to, any artifacts, foundations, or other indications of past human occupation of the area are uncovered, shall be protected by complying with 36 CFR § 800.13(b)(3) and (c) and shall include the following:
      - i. All Work, including vehicular traffic, shall immediately stop within a 50 ft. radius around the area of discovery. The Contractor shall ensure barriers are established to protect the area of discovery and notify the Engineer to contact the appropriate RD personnel. The Engineer shall engage a Secretary of the Interior (SOI) qualified professional archeologist to quickly assess the nature and scope of the discovery; implement interim measures to protect the discovery from looting and vandalism; and establish broader barriers if further historic and/or precontact properties, can reasonably be expected to occur.
      - ii. The RD personnel shall notify the appropriate RD environmental staff member, the Federal Preservation Officer (FPO), and State Historic Preservation Office (SHPO) immediately. Indian tribe(s) or Native Hawaiian Organization (NHOs) that have an interest in the area of discovery shall be contacted immediately. The SHPO may require additional tribes or NHOs who may have an interest in the area of discovery also be contacted. The notification shall include an assessment of the discovery provided by the SOI qualified professional archeologist.
      - iii. When the discovery contains burial sites or human remains, the Contractor shall immediately notify the appropriate RD personnel who will contact the RD environmental staff member, FPO, and the SHPO. The relevant law enforcement authorities shall be immediately contacted by onsite personnel to reduce delay times, in accordance with tribal, state, or local laws including 36 CFR Part 800.13; 43 CFR Part 10, Subpart B; and the Advisory Council on Historic Preservation’s Funerary Objects (February 23, 2007).
      - iv. When the discovery contains burial sites or human remains, all construction activities, including vehicular traffic shall stop within a 100 ft. radius of the discovery and barriers shall be established. The evaluation of human remains shall be conducted at the site of discovery by a SOI qualified professional. Remains that have been removed from their primary context and where that

context may be in question may be retained in a secure location, pending further decisions on treatment and disposition. RD may expand this radius based on the SOI professional's assessment of the discovery and establish broader barriers if further subsurface burial sites, or human remains can reasonably be expected to occur. RD, in consultation with the SHPO and interested tribes or NHOs, shall develop a plan for the treatment of native human remains.

- v. Work may continue in other areas of the undertaking where no historic properties, burial sites, or human remains are present. If the inadvertent discovery appears to be a consequence of illegal activity such as looting, the onsite personnel shall contact the appropriate legal authorities immediately if the landowner has not already done so.
  - vi. Work may not resume in the area of the discovery until a notice to proceed has been issued by RD. RD shall not issue the notice to proceed until it has determined that the appropriate local protocols and consulting parties have been consulted.
  - vii. Inadvertent discoveries on federal and tribal land shall follow the processes required by the federal or tribal entity.
4. 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.
5. Mitigation Measures – The following environmental mitigation measures are required on this Project: *[Insert mitigation measures from the Letter of Conditions here]*.

#### 19.11 *Contract Work Hours and Safety Standards Act (40 U.S.C. 3701-3708)*

- A. Where applicable, for contracts awarded by the Owner in excess of \$100,000 that involve the employment of mechanics or laborers, the Contractor will comply with 40 U.S.C. 3702 and 3704, as supplemented by Department of Labor regulations (29 CFR Part 5). Under 40 U.S.C. 3702 of the Act, the Contractor will compute the wages of every mechanic and laborer on the basis of a standard work week of 40 hours. Work in excess of the standard work week is permissible provided that the worker is compensated at a rate of not less than one and a half times the basic rate of pay for all hours worked in excess of 40 hours in the work week. The requirements of 40 U.S.C. 3704 are applicable to construction work and provide that no laborer or mechanic will be required to work in surroundings or under working conditions which are unsanitary, hazardous or dangerous. These requirements do not apply to the purchases of supplies or materials or articles ordinarily available on the open market, or contracts for transportation or transmission of intelligence.

#### 19.12 *Debarment and Suspension (Executive Orders 12549 and 12689)*

- A. A Contract award (see 2 CFR 180.220) must not be made to parties listed on the governmentwide exclusions in the System for Award Management (SAM), in accordance with the OMB guidelines at 2 CFR 180 that implement Executive Orders 12549 (3 CFR part 1986 Comp., p. 189) and 12689 (3 CFR part 1989 Comp., p. 235), “Debarment and Suspension.” SAM Exclusions contains the names of parties debarred, suspended, or otherwise excluded by agencies, as well as parties declared ineligible under statutory or regulatory authority other than Executive Order 12549.

19.13 *Procurement of recovered materials*

- A. The Contractor will comply with 2 CR Part 200.322, “Procurement of recovered materials.”

19.14 *American Iron and Steel*

- A. 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 on this project. All 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 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.
- B. The following waivers apply to this Contract:
  - 1. *De Minimis*,
  - 2. Minor Components,
  - 3. Pig iron and direct reduced iron, and

19.15 *Minimum Legal Requirements, Including Relevant ARPA Terms and Conditions*

- A. Section 13-31-9 of the Code of Alabama 1975 imposes conditions on the award of County Contracts. Contractor must agree to fully comply with the Immigration Reform and Control Act of 1986, as amended by the Immigration Act of 1990, and the Beason-Hammon Alabama Taxpayer and Citizen Protection Act. “By signing this contract, the contracting parties affirm, for the duration of the agreement, that they will not violate federal immigration law or knowingly employ, hire for employment, or continue to employ an unauthorized alien within the State of Alabama. Furthermore, a contracting party found to be in violation of this provision shall be deemed in breach of the agreement and shall be responsible for all damages resulting therefrom.
- B. Section 41-16-5 of the Code of Alabama 1975 imposes conditions on the Agreement of County contracts. The Contractor must certify that it is not currently engaged in, and will not engage in, the boycott of a person or an entity based in or doing business with a jurisdiction with which this state can enjoy open trade.

- C. In compliance with Ala. Act No. 2023-409, by signing this contract, Contractor provides written verification that Contractor, without violating controlling law or regulation, does not and will not, during the term of the contract engage in economic boycotts as the term “economic boycott” is defined in Section 1 of the Act. This requirement applies to contracts entered into on or after October 1, 2023, if Contractor employs 10 or more employees and the contract could exceed \$15,000 over the term of the contract. Under Section 2 of the Act, the written verification may be waived if the contracting governmental entity determines based on cost and quality factors that such a waiver is clearly in the best interest of the public.
- D. Contractor agrees to comply with the requirements of section 603 of the American Rescue Plan Act, Pub. L. No. 117-2 (March 11, 2021) (the “Act”), regulations adopted by Treasury pursuant to section 603(f) of the Act, codified as 31 C.F.R. Part 35, and guidance issued by Treasury regarding the foregoing.
- E. Contractor shall provide for such compliance by other parties in any agreements it enters into with other parties relating to this project.
- F. Federal regulations which may applicable to this contract may include, without limitation, the following:
  - 1. Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards, 2 C.F.R. Part 200, other than such provisions as Treasury may determine are inapplicable to this award and subject to such exceptions as may be otherwise provided by Treasury.
  - 2. OMB Guidelines to Agencies on Governmentwide Debarment and Suspension Non-procurement, 2 C.F.R. Part 180, including the requirement to include a term or condition in all lower tier covered transactions (contracts and subcontracts described in 2 C.F.R. Part 180, subpart B) that the award is subject to 2 C.F.R. Part 80 and Treasury’s implementing regulation at 31 C.F.R. Part 19.
  - 3. Recipient Integrity and Performance Matters, pursuant to which the award term set forth in 2 C.F.R. Part 200, Appendix XII to Part 200 is hereby incorporated by reference.
  - 4. Governmentwide Requirements for Drug-Free Workplace, 31 C.F.R. Part 20.
  - 5. New Restrictions on Lobbying, 31 C.F.R. Part 21. Contractor must certify that it will not, and has not, used federal appropriated funds to any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, officer or employee 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 U.S.C 1352.
  - 6. Generally applicable federal environmental laws and regulations. Contractor must comply with all applicable standards, orders, or regulations issued pursuant to the Clean Air Act (42 U.S.C. 7401-7671q) and the Federal Water Pollution Control Act as amended (33 U.S.C. 1251-1387). All violations must be reported to the County, Treasury, and the Regional Office of the Environmental Protection Agency.
- G. Statutes and regulations prohibiting discrimination applicable to this award include, without limitation, the following:

1. Title VI of the Civil Rights Act of 1964 (42 USC §§ 2000d, et seq.) and Treasury's implementing regulations at 31 C.F.R. Part 22, which prohibit discrimination on the basis of race, color, or national origin under programs or activities receiving federal financial assistance;
  2. The Fair Housing Act, Title VIII of the Civil Rights Act of 1968 (42 USC §§ 3601, et seq.), which prohibits discrimination in housing on the basis of race, color, religion, national origin, sex, familial status, or disability;
  3. Section 504 of the Rehabilitation Act of 1973, as amended (29 USC § 794), which prohibits discrimination on the basis of disability under any program or activity receiving federal financial assistance;
  4. The Age Discrimination Act of 1975, as amended (42 USC §§ 6101, et seq.), and Treasury's implementing regulations at 31 C.F.R. Part 23, which prohibit discrimination on the basis of age in programs or activities receiving federal financial assistance; and
  5. Title II of the Americans with Disabilities Act of 1990, as amended (42 USC §§ 12101, et seq.), which prohibits discrimination on the basis of disability under programs, activities, and services provided or made available by state and local governments or instrumentalities or agencies thereto.
- H. Contractor agrees to comply, as applicable, with requirements of the Hatch Act (5 USC §§ 1501-1508 and 7324-7328), which limit certain political activities of state or local government employees whose principal employment is in connection with an activity financed in whole or in part by this federal assistance.
- I. Contractor understands that making false statements or claims in connection with the use of ARPA funds is a violation of federal law and may result in criminal, civil, or administrative sanctions, including fines, imprisonment, civil damages and penalties, debarment F.R. om participating in federal awards or contracts, and/or any other remedy available by law.
- J. In accordance with 41 USC § 4712, Contractor may not discharge, demote, or otherwise discriminate against an employee in reprisal for disclosing to any of the list of persons or entities provided below, information that the employee reasonably believes is evidence of gross mismanagement of a federal contract or grant, a gross waste of federal funds, an abuse of authority relating to a federal contract or grant, a substantial and specific danger to public health or safety, or a violation of law, rule, or regulation related to a federal contract (including the competition for or negotiation of a contract) or grant.
- K. The list of persons and entities referenced in the paragraph above includes the following:
1. A member of Congress or a representative of a committee of Congress;
  2. An Inspector General;
  3. The Government Accountability Office;
  4. A Treasury employee responsible for contract or grant oversight or management;
  5. An authorized official of the Department of Justice or other law enforcement agency;
  6. A court or grand jury; or
  7. A management official or other employee of the County, Contractor, or subcontractor who has the responsibility to investigate, discover, or address misconduct.

- L. Contractors shall inform their employees in writing of the rights and remedies provided for whistleblowers in the predominant native language of the workforce.
- M. Pursuant to Executive Order 13043, 62 F.R. 19217 (Apr. 18, 1997), Contractor is encouraged to adopt and enforce on-the-job seat belt policies and programs for their employees when operating company-owned, rented, or personally owned vehicles.
- N. Pursuant to Executive Order 13513, 74 F.R. 51225 (Oct. 6, 2009), is encouraged to adopt and enforce policies that ban text messaging while driving, and Contractor should establish workplace safety policies to decrease accidents caused by distracted drivers.
- O. Contractor must use strong labor standards, including payment of a competitive and prevailing wage in the County.
- P. Contractor must adopt and follow high safety standards and provide training based upon the appropriate licensures, certifications, and industry standards.
- Q. Contractor should prioritize local hiring consistent with the racial, gender, geographic, urban, rural, and economic diversity of the County.
- R. For contracts/subcontracts over \$100,000, work performed by mechanics and laborers are subject to the provisions of the Contract Work Hours and Safety Standards Act (40 USC 3702 and 3704), as supplemented by 29 C.F.R. Part 5, including, specifically, safety standards, limitations on hours in a work week and overtime for any work spent over 40 hours, and proper documentation for all employees.
  - 1. A contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall not require or permit any laborer or mechanic, in any workweek in which the laborer or mechanic is employed on that work, to work more than 40 hours in that workweek, except as provided 40 USC Chapter 37; and
  - 2. when a violation of clause 1. occurs, the contractor and any subcontractor responsible for the violation are liable—
    - a. to the affected employee for the employee's unpaid wages; and
    - b. to the Government, the District of Columbia, or a territory for liquidated damages as provided in the contract.

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

CERTIFICATE OF OWNER'S ATTORNEY

**PROJECT NAME: WASTEWATER TREATMENT PLANT – CONTRACT 2**

---

**CONTRACTOR NAME:**

---

I, the undersigned, \_\_\_\_\_, the duly authorized and acting legal representative of TOWN OF KINSEY, 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

**ENGINEER'S CERTIFICATION OF FINAL PLANS AND SPECIFICATIONS**

PROJECT NAME: WASTEWATER TREATMENT PLANT – CONTRACT 2

The final Drawings and Specifications, other assembled Construction Contract Documents, bidding-related documents (or requests for proposals or other construction procurement documents), and any other Final Design Phase deliverables, comply with all requirements of the U.S. Department of Agriculture, Rural Utilities Service, to the best of my knowledge and professional judgment.

If the Engineers Joint Contract Documents Committee (EJCDC) documents have been used, all modifications required by RUS Bulletin 1780-26 have been made in accordance the terms of the license agreement, which states in part that the Engineer “must plainly show all changes to the Standard EJCDC Text, using ‘Track Changes’ (redline/strikeout), highlighting, or other means of clearly indicating additions and deletions.” Such other means may include attachments indicating changes (e.g. Supplementary Conditions modifying the General Conditions).

---

Engineer

Date

---

Name and Title



**CHANGE ORDER NO.: \_\_\_\_\_**

Owner:	TOWN OF KINSEY, ALABAMA	Owner's Project No.:	N/A
Engineer:	CDG, INC.	Engineer's Project No.:	R063519021
Contractor:		Contractor's Project No.:	
Project:	WASTEWATER TREATMENT PLANT – CONTRACT 2		
Contract Name:	WASTEWATER TREATMENT PLANT – CONTRACT 2		
Date Issued:		Effective Date of Change Order:	

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

Description:

Attachments:

Change in Contract Price	Change in Contract Times [State Contract Times as either a specific date or a number of days]
Original Contract Price: \$ _____	Original Contract Times: Substantial Completion: _____ Ready for final payment: _____
<b>[Increase] [Decrease]</b> from previously approved Change Orders No. 1 to No. <b>[Number of previous Change Order]</b> : \$ _____	<b>[Increase] [Decrease]</b> from previously approved Change Orders No.1 to No. <b>[Number of previous Change Order]</b> : Substantial Completion: _____ Ready for final payment: _____
Contract Price prior to this Change Order: \$ _____	Contract Times prior to this Change Order: Substantial Completion: _____ Ready for final payment: _____
<b>[Increase] [Decrease]</b> this Change Order: \$ _____	<b>[Increase] [Decrease]</b> this Change Order: Substantial Completion: _____ Ready for final payment: _____
Contract Price incorporating this Change Order: \$ _____	Contract Times with all approved Change Orders: Substantial Completion: _____ Ready for final payment: _____

Recommended by Engineer (if required)

Accepted by Contractor

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

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

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

Authorized by Owner

Approved by Funding Agency (if applicable)

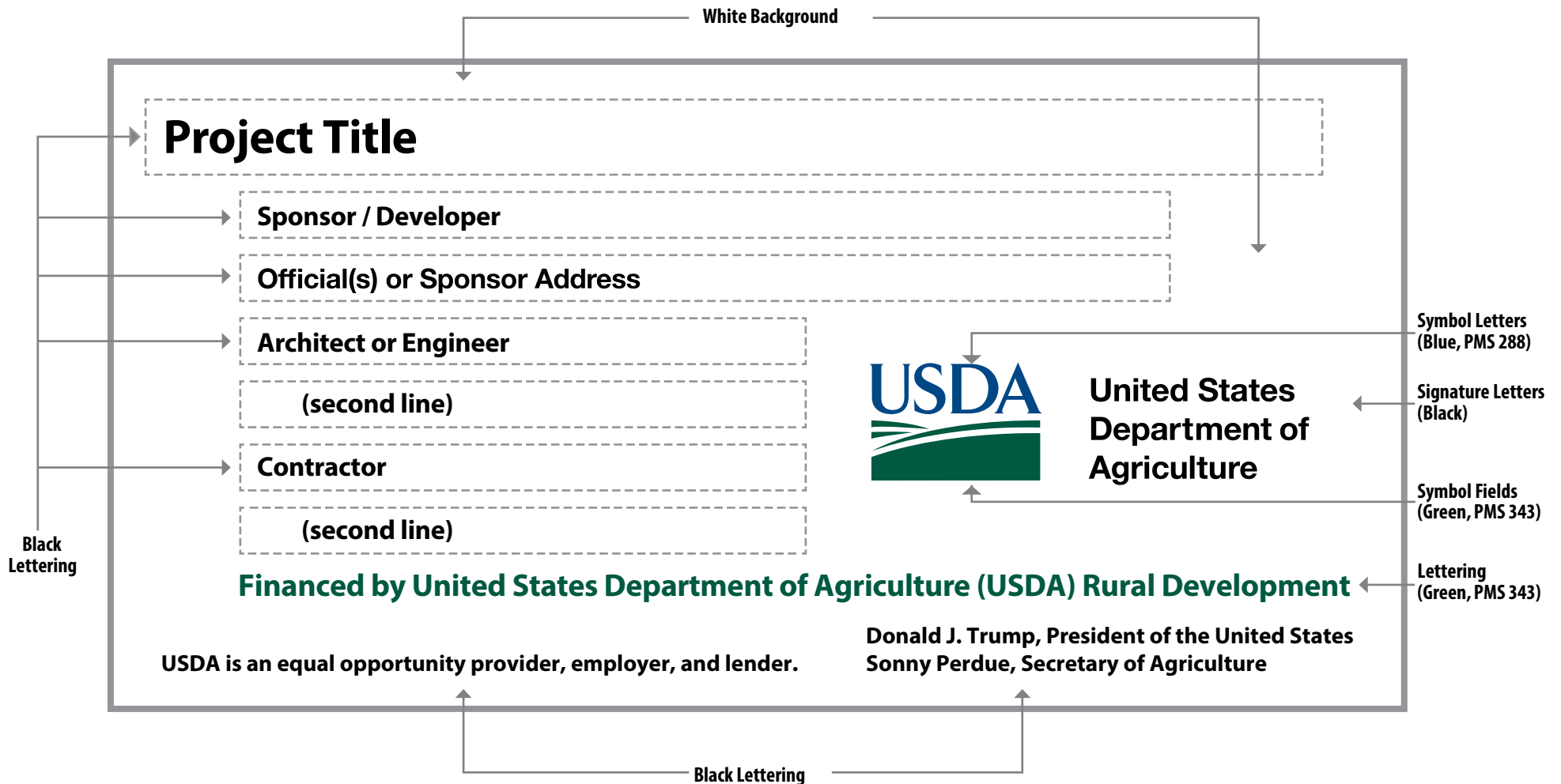
By: \_\_\_\_\_

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

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

# 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)**

UNITED STATES DEPARTMENT OF AGRICULTURE  
Rural Utilities Service  
**RUS BULLETIN 1780-35**

**SUBJECT:** Guidance for the Implementation of American Iron and Steel (AIS) Requirements with Rural Utilities Service (RUS) Financial Assistance

**TO:** Rural Development (RD) state directors, RUS program directors, and state engineers.

**EFFECTIVE DATE:** Date of approval.

**OFFICE OF PRIMARY INTEREST:** Engineering and Environmental Staff (EES), Water and Environmental Programs (WEP).

**INSTRUCTIONS:** This is a new Bulletin and does not replace any existing RUS 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. The State Office staff is familiar with the use of the documents in their States and can answer specific questions on RD requirements.

This Bulletin is available on the RUS website at <https://www.rd.usda.gov/publications/regulations-guidelines/bulletins/water-and-environmental>.

**PURPOSE:** This Bulletin assists RD staff in providing information and guidance to applicants, professional consultants, general contractors, and manufacturers regarding the AIS Requirements mandated by 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. The intended outcome of this Bulletin is to instruct and inform RD State Office staff and others on how to implement these requirements to ensure compliance with the AIS requirements.

**MODIFICATIONS:** RD State Offices may modify this guidance when appropriate to comply with state statutes and regulations in accordance with the procedures outlined at RD Instruction 2006-B (2006.55).

*for*   
SCOTT BARRINGER  
Acting Assistant Administrator  
Water and Environmental Programs

August 30, 2017  
Date

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- A AMERICAN IRON & STEEL COMPLIANCE STATEMENT
- B ENGINEER'S CERTIFICATION OF COMPLIANCE
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- D EXAMPLE OF A MANUFACTURER'S CERTIFICATION LETTER OF COMPLIANCE
- E EXAMPLES OF MUNICIPAL CASTINGS
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- H INFORMATIONAL CHECKLIST FOR PROJECT SPECIFIC WAIVER REQUEST
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**ABBREVIATIONS**

AIS – American Iron and Steel  
ANTHC – Alaska Native Tribal Health Consortium  
AWWA – American Water Works Association  
CFR – Code of Federal Regulations  
EO – Executive Order  
NIST – National Institute of Standards and Technology  
NSF – National Sanitation Foundation  
OGC – Office of General Counsel  
PL – Public Law  
PER – Preliminary Engineering Report  
RAVG – Rural Alaska Village Grant  
RD – Rural Development  
RUS – Rural Utilities Service  
USC – United States Code  
USDA – United States Department of Agriculture  
WEP – Water and Environmental Programs  
WWD – Water and Waste Disposal

## DEFINITIONS

“Assistance recipient” is the entity that receives funding assistance from programs required to comply with Section 746 Division A Title VII of the Consolidated Appropriations Act of 2017 (Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act, 2017) and subsequent statutes mandating domestic preference. This term includes owner and/or applicant.

“Certifications” means the following:

- *Manufacturers’* certification is 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 United States in accordance with American Iron and Steel (AIS) Requirements. If items are purchased via a supplier, distributor, vendor, etc. vs. 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 products.
- *Engineers’* 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 United States.

“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 United States, said product would 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 United States. This exemption only applies to coatings on the *external surface* of iron and steel components. It does not apply to coatings or linings on internal surfaces 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 the United States for the product to be compliant with AIS requirements.

“Construction materials” are those articles, materials, or supplies made primarily of iron and steel, that are permanently incorporated into the project, not including mechanical and/or electrical components, equipment and systems. Some of these products may overlap with what is also considered “structural steel”. See Exhibit F for examples.

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

“Consulting 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).

“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 such 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.

“General 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 subject to AIS requirements). This includes bidders, 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.

“Iron and steel products” are defined as 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. Only items on the above list made primarily of iron or steel, permanently incorporated into the project must be produced in the United States. 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 a 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 a 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 United States 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 requirement, and the material(s), if any, being applied as a coating are similarly not covered. Non-iron or steel components of an iron and steel product may come from non-US 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 includes components that are part of the electrical distribution system. AIS does apply to mechanical equipment.

“Minor components” are components *within* an iron and/or steel product otherwise compliant with the American Iron and Steel 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 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 or 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. See Exhibit E for examples.

“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 requirements. For the purpose of this Bulletin, this 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 the AIS requirements.

“Pass through Entities” is an entity that provides a subaward to a loan and/or grant recipient to carry out part of a Federal program. Examples are grantees utilizing the Revolving Loan Program and Household Water Well Program and Alaska Native Tribal Health Consortium (ANTHC) or the State of Alaska from the RAVG Program.

“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 Definitions). 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 a fire hydrant (e.g. bonnet, body and shoe); and
- (2) The cost to pour and cast to 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 workings 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, and 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 into separate and 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 as 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.

“Ultimate recipient” is a loan or grant recipient receiving funds from a pass-through entity. Examples include: (1) a loan recipient from the Revolving Loan Fund; (2) a loan recipient from the Household Water Well Program; and (3) a grant recipient from ANTHC or the State of Alaska from the RAVG Program.

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

## 1 BACKGROUND

- a Section 746 Division A Title VII of the Consolidated Appropriations Act of 2017 (Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act, 2017) and subsequent statutes mandating domestic preference, applies a new American Iron and Steel (AIS) requirement to the following programs:
- (1) Water and Waste Disposal Loan and Grant program;
  - (2) Guaranteed Loan Funds;
  - (3) Revolving Loan Funds;
  - (4) Emergency Community Water Assistance Grants;
  - (5) Section 306C Colonias and Tribal Set-Aside Grants;
  - (6) Rural Alaskan Native Village Grants;
  - (7) Household Water Well System Grants; and
  - (8) Rural Economic Area Partnership Zone projects.
- b 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 specifically defined and does not include every item consisting of any quantity of iron and/or steel.
- c Statutory Language: SEC. 746 Division A Title VII the Consolidated Appropriations Act of 2017.
- (a)(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, 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 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 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.

(b) Subsection (a) shall not apply in any case or category of cases in which the Secretary of Agriculture (in this section referred to as the “Secretary”) or the designee of the Secretary finds that—

- (1) applying subsection (a) 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 a satisfactory quality; or
- (3) inclusion of iron and steel products produced in the United States will increase the cost of the overall project by more than 25 percent.

(c) If the Secretary or the designee receives a request for a waiver under this section, the Secretary or the designee shall make available to the public on an informal basis a copy of the request and information available to the Secretary or the designee concerning the request, and shall allow for informal public input on the request for at least 15 days prior to making a finding based on the request. The Secretary or the designee shall make the request and accompanying information available by electronic means, including on the official public Internet Web site of the Department.

(d) This section shall be applied in a manner consistent with United States obligations under international agreements.

(e) The Secretary may retain up to 0.25 percent of the funds appropriated in this Act for “Rural Utilities Service—Rural Water and Waste Disposal Program Account” for carrying out the provisions described in subsection (a)(1) for management and oversight of the requirements of this section.

(f) Subsection (a) shall not apply with respect to a project for which the engineering plans and specifications include use of iron and steel products otherwise prohibited by such subsection if the plans and specifications have received required approvals from State agencies prior to the date of enactment of this Act.

(g) For purposes of this section, the terms “United States” and “State” shall include each of the several States, the District of Columbia, and each federally recognized Indian tribe.

- d American Iron and Steel (AIS) refers to requirements mandated by Section 746 Division A Title VII of the Consolidated Appropriations Act of 2017 (Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act, 2017) and subsequent statutes mandating domestic preference.
- e The statute refers to Section 746 Division A Title VII of the Consolidated Appropriations Act of 2017 (Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act, 2017) and subsequent statutes mandating domestic preference.

## 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 programs listed in Section 1 a of this Bulletin. Any amount of funding from these programs requires compliance with the AIS requirements. Use of funds from these programs 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 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 the Western Pacific Territories.
- d The requirements apply to any used AIS 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 obligations 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 the 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 funding.
- h The requirements do not apply to products primarily composed of iron and/or steel (composed of more than 50 percent) 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, or 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, General Contractor, Manufacturers et. al., Pass through Entities, Ultimate Recipients)
- a There are several parties involved in compliance with the AIS requirements 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; grantees under the revolving loan program, Household Water Well program, and grantees under the 306C, ECWAG programs, and RAVG programs, as well as loan recipients under the Revolving Loan and Household Water Well program.
  - c For exceptions please see Section 2.
- 4 RESPONSIBILITIES UNDER THE WATER & WASTE DISPOSAL (WWD) LOAN & GRANT PROGRAM: *AGENCY RESPONSIBILITIES*
- a State Director:
    - (1) *Approve* and set aside a sufficient budget for travel so that Area Specialists and State Engineers can perform their responsibilities under this section.

b Community Programs Director:

- (1) **Ensure** that all Grant Agreements, Letters of Conditions, Loan Resolutions and Conditional Commitments for Guarantees, include appropriate language prior to obligation of funds (see Section 17).
- (2) **Budget** for travel so that State Engineers (as applicable) can perform their responsibilities under this section.

c State Engineer:

- (1) **Ensure** that the cost estimates in the PER reflect AIS requirements.
- (2) **Ensure** that agreements for engineering services include AIS language (see Section 16).
- (3) **Ensure** that plans, specifications and bidding documents include required language (see Section 16).
- (4) **Obtain** engineer's certification letter where the consulting engineer certifies that plans, specifications, and bidding documents comply with AIS and commits that bid addenda, executed contracts and change orders will comply with AIS (see Exhibit B).
- (5) Monitoring: For each project, **perform** a site visit during active construction and complete the AIS checklist (see Exhibit J). Provide an electronic copy to National Office upon final payment.
- (6) Change orders and partial payment estimates: **Verify** the consulting engineer, general contractor and owner have signed C-941 and C-620 of EJCDC and manufacturers' certifications letters (as applicable) (see Exhibit D) are included with the submittal.
- (7) Substantial completion of project: **Obtain** a copy of the contractor's certification letter (see Exhibit C). **Obtain** a list of manufacturers from the consulting engineer for AIS products used in the project (including manufacturer name and location, product(s)) and provide an electronic copy to the National Office Engineer(s).
- (8) Special cases:
  - (a) Where owner provides their own engineering and/or construction services, **obtain** copies of engineers', contractors' (prepared by the owner), and manufacturers' certification letters (as applicable) for the Agency to insert into the Agency file.
  - (b) Where owner directly procures AIS products, **obtain** copies of manufacturers' certification letters for the Agency to insert into the Agency file.

d Area Office Specialist:

- (1) Pre-construction Conference: **Read** a statement outlining the AIS requirements (see Exhibit A) during the conference.
- (2) Guaranteed Program: **Ensure** that conditional commitments include AIS language (i.e. Section 17 a)
- (3) Partial payment estimates: **Verify** that the consulting engineer, general contractor and owner have signed C-620 of EJCDC.

## 5 OWNER RESPONSIBILITIES

- a Owners are ultimately responsible for compliance with AIS requirements.
- (1) **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.
  - (2) **Sign** agreements for engineering services, executed construction contracts and all other appropriate and necessary documents which include AIS language.
  - (3) **Acknowledge** responsibility for compliance with AIS requirements by signing change orders (i.e. C-941 of EJCDC) and partial payment estimates (i.e. C-620 of EJCDC).
  - (4) Substantial completion of project: **Obtain** the certification letters from the consulting engineer and **maintain** this documentation for the life of the loan.
  - (5) Special Cases
    - (a) Where the owner provides their own engineering and/or construction services, **provide** copies of engineers' (see Exhibit B), contractors' (see Exhibit C), and manufacturers' certification letters (see Exhibit D) (*as applicable*) to the Agency. 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 16 must be included in the Agreement for Engineering Services.
    - (b) Where the owner directly procures AIS products, the owner must:
      - (i) **Include** clauses from Section 17 a not including 17 a (1) in the procurement contracts.
      - (ii) **Obtain** manufacturers' certification letters and provide copies to consulting engineers and contractors.

## 6 CONSULTING ENGINEER RESPONSIBILITIES

- (1) **Include** costs of compliance with AIS in engineering fees (if appropriate) and in engineer's opinions of probable cost and associated revisions.
- (2) Agreements for engineering services: **Include** AIS language (see Section 16).
- (3) Plans, specifications, bidding documents and bid addenda: **Include** required AIS language (see Section 16). For any AIS products specified by brand names, **obtain** a manufacturer's certification letter (see Exhibit D) from the manufacturer to verify the products comply with AIS.
- (4) **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** a letter to the Agency prior to authorization to advertise for bids (see Exhibit B).
- (5) Award: **Provide** copies of manufacturers' certification letters to the general contractor on any specified brand name AIS products in the plans, specifications and bidding documents including any bid addenda.

- (6) Shop drawing submittal: **Review** shop drawings and change orders to ensure compliance with AIS. For shops drawings under consideration for any brand name, equal and/or substitute, and any iron and steel products subject to AIS, **obtain** a manufacturers' certification letter (see Exhibit D) from the general contractor to verify the products comply with AIS.
- (7) **Keep** all certification letters (including those from the engineer, contractor and any manufacturer providing AIS products) in the engineer's project file.
- (8) Change Order: For any change order under consideration for any AIS products, **obtain** a manufacturer's certification letter (see Exhibit D) from parties submitting the change proposal to ensure compliance with AIS.
- (9) **Acknowledge** responsibility for compliance with AIS requirements by signing change orders (i.e. C-941 of EJCDC) and partial payment estimates (i.e. C-620 of EJCDC).
- (10) Substantial completion of project: **Obtain** the contractors' certification letter (see Exhibit C) and copies of manufacturers' certification letters for all AIS products used in the project. **Provide** copies of engineer's, contractors', and manufacturers' certification letters to the owner and copy of contractor's certification letter to the Agency. **Provide** a list of manufacturers to the RD State Engineer for AIS products used in the project (including manufacturer name and location, product(s)).

## 7 CONSTRUCTION CONTRACTOR RESPONSIBILITIES

- a Construction contractors must use and install iron and steel products that are compliant with AIS as part of the permanent work.
  - (1) Bid submittal: for proposed equals and substitutes, **provide** manufacturers' certification letter (see Exhibit D) to verify the products comply with AIS.
  - (2) Award: **Obtain** copies of manufacturers' certification letters (see Exhibit D) from the consulting engineer for brand name products specified by the consulting engineer.
  - (3) Shop drawing submittal: For proposed equals, substitutes and any iron and steel product subject to AIS, **provide** manufacturers' certification letters (see Exhibit D) to verify the products comply with AIS.
  - (4) Prior to construction: **Ensure** that copies of manufacturers' certification letters including those from others (e.g. consulting engineer, owner, etc.) for any AIS products to be used in the project is in the project file on site prior to installation.
  - (5) Change Order: For any AIS products proposed in a change proposal, **provide** manufacturers' certification letter (see Exhibit D) to the consulting engineer to verify the products comply with AIS.
  - (6) **Acknowledge** responsibility for compliance with AIS requirements by signing change orders (i.e. C-941 of EJCDC) and partial payment estimates (i.e. C-620 of EJCDC).



- (7) **Keep** all manufacturer certification letters (including those from the engineer, general contractor and any manufacturer providing AIS products) on site during construction in the construction project file.
- (8) Substantial completion of the project: **Provide** the general contractor's certification (see Exhibit C) letter to the engineer that all iron and steel products installed comply with AIS. This certification is to be submitted upon substantial completion of the project to the project engineer.

## 8 MANUFACTURER, SUPPLIER, DISTRIBUTOR RESPONSIBILITIES

- (1) 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.*) manufacturers' certification letters (see Exhibit D) and make available upon request to consulting engineers, general contractors, etc.

## 9 PASS THROUGH ENTITIES (e.g. Grantees utilizing the Revolving Loan Program and Household Water Well Program)

- (1) **Sign** Grant Agreements which include AIS language (See Section 17).
- (2) **Include** AIS language in loan agreement their borrowers (See Section 17 a).
- (3) **Monitor** for compliance.
- (4) **Perform** corrective actions to ensure compliance where needed.

## 10 ULTIMATE RECIPIENT (e.g. Loan Recipients under Revolving Loan Program, Homeowners under the Household Water Well Program)

- a Loan recipients are ultimately responsible for compliance with AIS requirements.
  - (1) **Sign** loan agreements which include AIS language (see Section 17 a).
  - (2) **Include** required AIS language (see Section 17 a) in any agreements for engineering services and contracts for construction services and procurement of AIS products.
  - (3) **Obtain** manufacturers' certification letters for AIS products and include a copy in project files.
- b Homeowners are ultimately responsible for compliance with AIS requirements.
  - (1) **Sign** a loan agreement accepting responsibility to ensure AIS products used to construct, refurbish, or service individually-owned household water well systems are produced in the United States.
  - (2) **Obtain** manufacturers' certification letters (see Exhibit D) from contracted service providers (e.g. well driller) and maintain a copy on-site for the duration of the loan.

## 11 RESPONSIBILITIES UNDER THE GUARANTEED LOAN PROGRAM

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

- a Lenders are responsible to ensure that ultimate recipients comply with AIS requirements.
- b Loan recipients are ultimately responsible for compliance with AIS requirements.
- c Project specialists will ensure that conditional commitments include AIS language (i.e. Section 17 a)

## 12 ECWAG

AIS applies to projects funded by ECWAG.

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

## 13 SECTION 306C COLONIAS AND TRIBAL SET-ASIDE GRANTS

AIS applies to projects funded by Section 306 C including Colonias and Tribes.

## 14 RURAL ALASKAN NATIVE VILLAGE GRANTS

AIS applies to projects funded by Section 306 D – the Rural Alaskan Native Village Grant Program.

- a Special Cases:
  - (1) If a project is administered by Alaska RD State Office, please **follow** this Bulletin.
  - (2) If the project is administered by the State of Alaska or ANTHC:
    - (a) **Sign** grant agreements and letters of intent to meet conditions which include AIS language (See Section 17), accepting AIS requirements in those documents and in the letter of conditions.
    - (b) **Include** AIS language in grant agreement their grantees (See Section 17 a).
    - (c) **Monitor** for compliance.
    - (d) **Perform** corrective actions to ensure compliance where needed.

## 15 RURAL ECONOMIC AREA PARTNERSHIP ZONE (REAP)

AIS applies to projects funded by Section 310 B – REAP.

## 16 CONTRACT PROVISIONS

To ensure compliance with the AIS requirements specific AIS contract language must be included in each contract including agreements for engineering services, construction contract documents and purchase agreements prepared by the owner.

- a Agreement Between Owner and Engineer for Professional Services (EJCDC E-500, 2014)
- (1) (E-500, Article 5.01.A)  
*Add the following to 5.01.A:* “Opinions of Probable Cost and any revisions thereof should reflect compliance with American Iron & Steel requirements mandated by 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.”
  - (2) (E-500, Article 5.03.B)  
*Add paragraph 5.03.B:* “Opinions of Total Project Costs and any revisions thereof should reflect compliance with American Iron & Steel requirements mandated by 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.”
  - (3) (E-500, Exhibit A.1.03.A.13):  
*Add paragraph A.1.03.A.13:* “Services required to determine and certify that to the best of the Engineer’s knowledge and belief 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 United States or are the subject of an approved waiver; and 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 United States or are the subject of an approved waiver under 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. The term “iron and steel products” means 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. The de minimis and minor components waiver *{add project specific waivers as applicable}* apply to this contract.”
  - (4) (E-500, Exhibit A.1.04.A.10)  
*Add paragraph A.1.04.A.10:* “Provide copies of Manufacturers’ Certification letters to the Bidders on any brand name iron and steel products along with the 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 on site during construction."

- (5) (E-500, Exhibit A.1.04.11)  
*Add paragraph A.1.04.A.11:* "Provide copies of 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 and on site during construction."
- (6) (E-500, Exhibit A.1.05.A.17)  
*Modify A.1.05.A.17 by adding 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 American and Iron Steel requirements mandated by 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. Any iron and steel products included in any submittal by the General Contractor, must include a Manufacturers' Certification letter to verify the products were produced in the United States. Copies of Manufacturers' Certification letters must be kept in the engineer's project file and on site during construction."
- (7) (E-500, Exhibit A.1.05.A.18)  
*Add the following to A.1.05.A.18 to the end of the paragraph as amended by RUS Bulletin 1780-26:* "Prior to approval of any substitute "or equal" obtain a Manufacturers' Certification letter to verify the products were produced in the United States. Manufacturers' Certification letters must be kept in the engineer's project file and on site during construction to ensure compliance with American and Iron Steel requirements mandated by 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, if applicable."
- (8) (E-500, Exhibit A.1.05.A.19)  
*Add subparagraph A.1.05.A.19.d:* "Receive and review all Manufacturers' Certification Letters for materials required to comply with American and Iron Steel requirements mandated by 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 to verify the products were produced in the United States. Manufacturers' Certification letters must be kept in the engineer's project file and on site during construction."

- (9) (E-500, Exhibit A.1.05.A.20)  
*Add subparagraph (c) to the end of A.1.05.A.20:* “(c) Review Change Proposals to ensure compliance with American and Iron Steel requirements mandated by 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.”
- (10) (E-500, Exhibit A.1.05.A.25)  
*Add item “a” as a deliverable under paragraph A.1.05.A.25:* “(a) Obtain the Contractors’ Certification letter and copies of Manufacturers’ Certification letters for all American Iron and Steel products used in the project. Upon Substantial Completion, provide copies of Engineer’s, Contractors’, and Manufacturers’ Certification letters to the Owner and a copy of Contractor’s Certification letter to the Agency. Provide a list of manufacturers of American Iron and Steel products used in the project and include manufacturer’s name and location, and product(s) to the Agency.”
- (11) (E-500, Exhibit B.2.02)  
*Add the following language to B.2.02:* “Owners are ultimately responsible for compliance with 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 and will be responsible for the following:
- (a) **Signing** loan resolutions, grant agreements and letters of intent to meet conditions which include American Iron and Steel language, accepting American Iron and Steel requirements in those documents and in the letter of conditions.
  - (b) **Signing** change orders (i.e. C-941 of EJCDC) and partial payment estimates (i.e. C-620 of EJCDC) and thereby **acknowledging** responsibility for compliance with American Iron and Steel requirements.
  - (c) **Obtaining** the certification letters from the consulting engineer upon substantial completion of the project and **maintaining** this documentation for the life of the loan.
  - (d) Where the owner provides their own engineering and/or construction services, **providing** copies of engineers’, contractors’, and manufacturers’ certification letters (*as applicable*) to the Agency. 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 17 of RUS Bulletin 1780-35 must be included in the Agreement for Engineering Services.
  - (e) Where the owner directly procures American Iron and Steel products, **including** American Iron and Steel clauses in the procurement

contracts and **obtaining** manufacturers' certification letters and **providing** copies to consulting engineers and contractors.

(12) (E-500, Exhibit D1.01.C.11.g)

**Add sub paragraph 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 American and Iron Steel requirements mandated by 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, as applicable.”

b Bidding and Construction Contract Documents (EJCDC C-Series, 2013)

(1) 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 an 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 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. The de minimis and minor components waiver *{add project specific waivers as applicable}* apply to this contract.”

(2) Instructions to Bidders (C-200):

(a) (C-200, Article 5.01.C)

**Delete** the semicolon at the end of 5.01.C and **insert the following:**  
...including but not limited to American Iron and Steel requirements as mandated by 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 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.

(b) (C-200, Article 11.01)

**Modify paragraph 11.01, as previously amended by RUS 1780-26, 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 Manufacturer's Certification letter for compliance with 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, if applicable. Refer to Manufacturer's Certification Letter provided in these Contract Documents."

(c) (C-200, Article 24.02)

**Add paragraph to 24.02:** "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 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 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. The de minimis and minor components waiver *{add project specific waivers as applicable}* apply to this contract."

(3) Bid Form (C-410)

(a) (C-410, Article 3.01.C)

**Add language at the end of the sentence of Article 3.01.C:** "...and including all American Iron and Steel requirements."

(b) (C-410, Article 7.01)

**Add 7.01.K after 7.01.J (7.01.J added by RUS 1780-26):** K. Manufacturer's Certification letter of compliance with 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 for all equals or substitutes approved by Addenda for American Iron and Steel products as provided in these Contract Documents.

(4) Supplementary General Conditions (C-800)

(a) (C-800, Article SC 1.01.A.51)

**Add 1.01.A.51 after 1.01.A.50 (as amended by RUS 1780-26):**

"*Manufacturer's Certification letter* is documentation provided by the manufacturer, supplier, distributor, vendor, fabricator, etc. to various entities stating that the American Iron and Steel products to be used in the project are produced in the United States in accordance with American Iron and Steel requirements. Refer to Manufacturer's Certification Letter provided in these Contract Documents."

- (b) (C-800, Article SC 1.01.A.52)  
**Add 1.01.A.52 after 1.01.A.51:** “AIS - refers to requirements mandated by 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. The term “iron and steel products” means 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.”
- (c) (C-800, Article SC 7.03)  
**Add sentence 7.03.d:** “All iron and steel products must meet American Iron and Steel requirements.”
- (d) (C-800, Article SC 7.04.B.1)  
**Add 7.04.B.1:** “Contractor shall include a Manufacturer’s Certification letter for compliance with American Iron and Steel requirements in support data, if applicable. Refer to Manufacturer’s Certification Letter provided in these Contract Documents. In addition, for the Deminimis Waiver, Contractor shall maintain an itemized list of incidental components and ensure that the cost is less than 5% of total materials cost for project; for the Minor Components Waiver, the Contractor shall maintain a list of products to which the minor components waiver applies and the cost of the non-domestically produced component is less than 5% of total materials cost of that product.”
- (e) (C-800, Article SC 7.05.A.3.a.4)  
**Add 7.05.A.3.a.4:** “4) comply with American Iron and Steel by providing Manufacturer’s Certification letter of American Iron and Steel compliance, if applicable. Refer to Manufacturer’s Certification Letter provided in these Contract Documents.”
- (f) (C-800, Article SC 7.11.A)  
**Modify 7.11.A by inserting the following after “written interpretations and clarifications,”:** “Manufacturers’ Certification letter 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 United States in accordance with American Iron and Steel Requirements. Refer to Manufacturer’s Certification Letter provided in these Contract Documents.”
- (g) (C-800, Article SC 7.16.A.1.e)  
**Add 7.16.A.1.e:** “e. obtained Manufacturer’s Certification letter for any item in the submittal subject to American Iron and Steel requirements and include



the Certificate in the submittal. Refer to Manufacturer's Certification Letter provided in these Contract Documents."

- (h) (C-800, Article SC 7.16.D.9)  
**Add 7.16.D.9:** "Engineer's review and approval of Shop Drawing or Sample shall include review of compliance with American Iron and Steel requirements, as applicable."
- (i) (C-800, Article SC 7.17.E)  
**Add 7.17.E:** "Contractor shall certify upon Substantial Completion that all Work and Materials has complied with American Iron and Steel requirements as mandated by 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. Contractor shall provide said Certification to Owner. Refer to General Contractor's Certification Letter provided in these Contract Documents."
- (j) (C-800, Article SC 10.10.A)  
**Add 10.10.A American Iron & Steel:** "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 engineering analysis, the Plans, Specifications, Bidding Documents, and associated Bid Addenda requiring design revisions are either produced in the United States or are the subject of an approved waiver and 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 United States or are the subject of an approved waiver under 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).
- (k) (C-800, Article SC 11.06.A.1)  
**Modify 11.06.A.1 by inserting the following sentence after "within 15 days after the submittal of the Change Proposal.":** "Include supporting data (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, as applicable."

- (l) (C-800, Article SC 14.03.G)  
**Add 14.03.G:** “G. Installation of Materials that are non-compliant with American Iron and Steel requirements shall be considered defective work.”
- (m) (C-800, Article SC 15.01.B.4)  
**Add 15.01.B.4:** “4. By submitting Materials for payment, Contractor is certifying that the submitted Materials are compliant with American Iron and Steel requirements. Manufacturer’s Certification letter for Materials satisfy this certification. Refer to Manufacturer’s Certification Letter provided in these Contract Documents.”
- (n) (C-800, Article SC 15.01.C.2.d)  
**Add 15.01.C.2.d:** “d. the Materials presented for payment comply with American Iron and Steel.”
- (o) (C-800, Article SC 15.03.A)  
**Modify 15.03.A by adding the following after the last sentence:** “Services required to determine and certify that to the best of the Contractor’s knowledge and belief all substitutes, equals, and all iron and steel products proposed in the shop drawings, Change Orders and Partial Payment Estimates, and those installed for the project are either produced in the United States or are the subject of an approved waiver under 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.”
- (p) (C-800: Article 19, SC 19.14):  
**Add** “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 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 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. The de minimis and minor components waiver *{add project specific waivers as applicable}* apply to this contract.”
- (q) (C-800: Article 19, SC 19.15):  
**Add SC 19.15 Definitions:**  
“Assistance recipient” is the entity that receives funding assistance from programs required to comply with Section 746 Division A Title VII of the Consolidated Appropriations Act of 2017 (Agriculture, Rural Development,

Food and Drug Administration, and Related Agencies Appropriations Act, 2017) and subsequent statutes mandating domestic preference. This term includes owner and/or applicant.

“Certifications” means the following:

- *Manufacturers’* certification is 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 United States in accordance with American Iron and Steel (AIS) Requirements. If items are purchased via a supplier, distributor, vendor, etc. vs. 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 products.
- *Engineers’* 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 United States.

“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 United States, said product would 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 United States. This exemption only applies to coatings on the *external surface* of iron and steel components. It does not apply to coatings or linings on internal surfaces 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 the United States for the product to be compliant with AIS requirements.

“Construction materials” are those articles, materials, or supplies made primarily of iron and steel, that are permanently incorporated into the project, not including 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.

“Consulting 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).

“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 such 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.

“General 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 subject to AIS requirements). This includes bidders, 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.

“Iron and steel products” are defined as 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. Only items on the above list made primarily of iron or steel, permanently incorporated into the project must be produced in the United States. 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 a 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 a 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 United States 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 requirement, and the material(s), if any, being applied as a coating are similarly not covered. Non-iron or steel components of an iron and steel product may come from non-US 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 includes components that are part of the electrical distribution system. AIS does apply to mechanical equipment.

“Minor components” are components *within* an iron and/or steel product otherwise compliant with the American Iron and Steel 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 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 or 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 requirements. For the purpose of this Bulletin, this 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 the AIS requirements.

“Pass through Entities” is an entity that provides a subaward to a loan and/or grant recipient to carry out part of a Federal program. Examples are grantees utilizing the Revolving Loan Program and Household Water Well Program and Alaska Native Tribal Health Consortium (ANTHC) or the State of Alaska from the RAVG Program.

“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 Definitions). 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 a fire hydrant (e.g. bonnet, body and shoe); and
- (2) The cost to pour and cast to 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 workings 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, and 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 into separate and 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 as 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.

“Ultimate recipient” is a loan or grant recipient receiving funds from a pass-through entity. Examples include: (1) a loan recipient from the Revolving Loan Fund; (2) a loan recipient from the Household Water Well Program; and (3) a grant recipient from ANTHC or the State of Alaska from the RAVG Program.

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

c Purchase Agreements

Add award language from Section 17 a not including 17 a (1).

17 PROVISIONS OF LETTERS OF CONDITIONS, LOAN RESOLUTIONS, GRANT AGREEMENTS, AND CONDITIONAL COMMITMENTS

a Standard Award Language for WWD, ECWAG, Guaranteed Loan Program, 306C, RAVG Administered by USDA, and REAP

**Add** the following language:

“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 a new American Iron and Steel (AIS) requirement to obligations made after May 5<sup>th</sup>, 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 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 water or wastewater system unless all of the iron and steel products used in the project are produced in the United States.

(2) The term “iron and steel products” means 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.

(3) The requirement shall not apply in any case or category of cases in which the Secretary of Agriculture (in this section referred to as the “Secretary”) or the designee of the Secretary finds that—

- (a) applying the requirement would be inconsistent with the public interest;
- (b) iron and steel products are not produced in the United States in sufficient and reasonably available quantities or of a satisfactory quality; or
- (c) inclusion of iron and steel products produced in the United States will increase the cost of the overall project by more than 25 percent.”

(1) Additional Language (not to be included in purchase agreements)

**Add:** “Owners are ultimately responsible for compliance with AIS requirements and will be responsible for the following:

- (a) **Signing** 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) **Signing** change orders (i.e. C-941 of EJCDC) and partial payment estimates (i.e. C-620 of EJCDC) and thereby **acknowledging** responsibility for compliance with American and Iron Steel requirements.
- (c) **Obtaining** the certification letters from the consulting engineer upon substantial completion of the project and **maintaining** this documentation for the life of the loan.
- (d) Where the owner provides their own engineering and/or construction services, **providing** copies of engineers’, contractors’, and manufacturers’ certification letters (*as applicable*) to the Agency to insert into the Agency file. 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 17 must be included in the Agreement for Engineering Services.
- (e) 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.



b Standard Award Language for Revolving Loan Funds, RAVG Administered by ANTHC or the State of Alaska, Guaranteed Loan Program and Household Water Well Program

**Add** the following language to award agreements to ultimate recipients:  
 “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 a new American Iron and Steel requirement to obligations made after May 5<sup>th</sup>, 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 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 water or wastewater system unless all of the iron and steel products used in the project are produced in the United States.

(2) The term “iron and steel products” means 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.

(3) The requirement shall not apply in any case or category of cases in which the Secretary of Agriculture (in this section referred to as the “Secretary”) or the designee of the Secretary finds that—

- (a) applying the requirement would be inconsistent with the public interest;
- (b) iron and steel products are not produced in the United States in sufficient and reasonably available quantities or of a satisfactory quality; or
- (c) inclusion of iron and steel products produced in the United States will increase the cost of the overall project by more than 25 percent.”

18 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 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.

19 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 including the ultimate recipients 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 a satisfactory quality; or
3. Inclusion of iron and steel products produced in the United States will increase the cost of the overall 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 22).

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 de minimis incidental components and is 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 the 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 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 *condition two (quantity or quality)*, applicants and their consulting engineers must submit the information outlined in Exhibit I to the National Office (via [ESEEngineering@wdc.usda.gov](mailto:ESEEngineering@wdc.usda.gov)).

To apply for a waiver under *condition three (25 percent of project cost)*, applicants and their consulting engineers must submit the information 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 a 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 with the submission of final plans, specifications, and bidding documents for any iron and steel products of known foreign origin. All waivers requests must be approved by the Agency prior to authorization to advertise for bids. In the event that a waiver is requested post award, it must be approved by the Agency prior to construction. In the event that a waiver is requested during construction such as via a 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 approved waiver from EPA, USDA will review said waiver for the co-funded project. Applicants/owners or their representatives are required to submit the *approved* waiver to [ESEEngineering@wdc.usda.gov](mailto:ESEEngineering@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.

20 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 the National Office.

21 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 noncompliance 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 or pass through entity 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.

22 INTERNATIONAL AGREEMENTS

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

23 USE OF EXHIBITS

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

- a AMERICAN IRON & STEEL COMPLIANCE STATEMENT: Exhibit A consists of a statement to be read by the Rural Development representative during the preconstruction conference. In addition, the RD representative should read Sections 5, 6, and 7 of this Bulletin to remind the owner, consulting engineer, and general contractor of their roles and responsibilities to comply with AIS.
- 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, and 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 approval of the Advertisement for Bids and must be kept in the engineers 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 by their company and by any and all subcontractors and manufacturers their company has contracted with comply with the AIS requirements. 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 American Iron and Steel requirement. 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 to provide examples.
- 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 to provide examples.
- g **EXAMPLES OF NON-CONSTRUCTION MATERIALS:** Exhibit G provides a sample list of items that are not subject to the AIS requirements. This list is not exhaustive and is meant 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 a public interest waiver, is for informational purposes only and does not need to be included as part of a 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 a satisfactory quality; (2) The inclusion of iron and/or steel products produced in the United States will increase the cost of the overall 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:** This exhibit 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 for the project cost waiver. Note: Information in this table is subject to evaluation. Waiver requests deliberately containing false information in order to receive a project cost waiver will be rejected.
  
- j **CHECKLIST FOR STATE ENGINEERS:** This exhibit is a checklist that should be completed by the RD State Engineer for each project during active construction. It is important to note items being stored on-site for installation are compliant with AIS. Please ask the Resident Project Representative (RPR) if it is unclear whether or not the items in question are compliant with AIS (e.g. via manufacturer's certification letters). For checklists, RD field staff should take pictures of visible items subject to AIS. Pictures should include the manufacturer's label. If there is no label, please ask to be shown the manufacturer's certification for the item in question from the RPR or consulting engineer if on-site to verify that the items in question are compliant. These checklists and attached pictures are to be submitted to National Office upon final payment.

## AMERICAN IRON & 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 in this project must be produced in the United States. The term “iron and steel products” means 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.”

ENGINEER'S CERTIFICATION OF COMPLIANCE WITH PROVISIONS OF THE AMERICAN IRON AND STEEL REQUIREMENTS OF 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

DATE:

**RE: WASTEWATER TREATMENT PLANT - CONTRACT 2  
TOWN OF KINSEY**

I hereby certify that to the best of my knowledge and belief all 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 (Division A - Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act, 2017) and 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 documents 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 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 or will be the subject of a waiver approved by the Secretary of Agriculture or designee.

**CDG, INC.**

\_\_\_\_\_  
Name of Engineering Firm (PRINT)

\_\_\_\_\_  
By Authorized Representative (SIGNATURE)

\_\_\_\_\_  
Title

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



GENERAL (PRIME) CONTRACTOR'S CERTIFICATION OF COMPLIANCE WITH PROVISIONS OF THE AMERICAN IRON AND STEEL REQUIREMENTS OF 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

DATE:

**RE: WASTEWATER TREATMENT PLANT - CONTRACT 2  
TOWN OF KINSEY**

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 (Division A - Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act, 2017) and subsequent statutes mandating domestic preference or are the subject of a waiver approved by the Secretary of Agriculture or designee.

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

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Name of Construction Company (PRINT)

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By Authorized Representative (SIGNATURE)

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Title

EXAMPLE OF A MANUFACTURER'S CERTIFICATION LETTER OF COMPLIANCE WITH PROVISIONS OF THE AMERICAN IRON AND STEEL (AIS) REQUIREMENTS OF 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

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 AIS requirement as mandated by 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.

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

- 1.
- 2.

Such processes for AIS took place at the following location:

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(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).

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Authorized Company Representative Signature

(Note: *Authorized signature shall be manufacturer's representative not the material 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 and 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; and  
Valve Boxes, Covers and Risers.

EXAMPLES OF CONSTRUCTION MATERIALS (*includes 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*)

Pumps

Motors

Gear reducers

Drives (including variable frequency drives (VFDs))

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 bioreactor systems

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 ductwork)

Water heaters

Heat exchangers

Generators

Cabinetry and housings (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.

<b>Information</b>	<input type="checkbox"/>	<b>Note</b>
<p>General</p> <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>		
<p>Cost Waiver Requests</p> <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>		
<p>Availability Waiver Requests</p> <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

AIS/Non-AIS Cost Comparison Table						
Specification	Item or Description	Quantity	Unit	Unit Price	Cost if applying AIS	Cost if a waiver to AIS is applied
					\$ -	\$ -
					\$ -	\$ -
					\$ -	\$ -
					\$ -	\$ -
					\$ -	\$ -
					\$ -	\$ -
					\$ -	\$ -
					\$ -	\$ -
					\$ -	\$ -

**TOTAL COST:**

**\$0.00**

**\$0.00**

CHECKLIST FOR STATE ENGINEERS

Date \_\_\_\_\_ Project Name \_\_\_\_\_

Project Type: \_\_ Water \_\_ Wastewater \_\_ Stormwater \_\_ Solid Waste

Applicant/Owner Name:

Project % Completion (*estimated*):

Total Project Cost:

Estimated Materials Cost:

<u>Items</u>	<u>Stored</u>	<u>OR</u>	<u>Installed?</u>	<u>US Made (Y/N)/Manufacturer Name</u>
Ductile Iron Pipe	<input type="checkbox"/>		<input type="checkbox"/>	_____
Reinforced Conc. Pipe	<input type="checkbox"/>		<input type="checkbox"/>	_____
Other Steel Pipe	<input type="checkbox"/>		<input type="checkbox"/>	_____
Fittings	<input type="checkbox"/>		<input type="checkbox"/>	_____
Valve Boxes	<input type="checkbox"/>		<input type="checkbox"/>	_____
Hydrants	<input type="checkbox"/>		<input type="checkbox"/>	_____
Valves	<input type="checkbox"/>		<input type="checkbox"/>	_____
Fittings/Bends/etc.	<input type="checkbox"/>		<input type="checkbox"/>	_____
Manholes	<input type="checkbox"/>		<input type="checkbox"/>	_____
Manhole Frames/Covers	<input type="checkbox"/>		<input type="checkbox"/>	_____
Other Municipal Castings	<input type="checkbox"/>		<input type="checkbox"/>	_____
Detection Plates	<input type="checkbox"/>		<input type="checkbox"/>	_____
Grates	<input type="checkbox"/>		<input type="checkbox"/>	_____
Manholes/Precast Conc.	<input type="checkbox"/>		<input type="checkbox"/>	_____
Steel Roofing Materials	<input type="checkbox"/>		<input type="checkbox"/>	_____
Steel Doors & Frames	<input type="checkbox"/>		<input type="checkbox"/>	_____
Steel Tanks/Pressure Vessels	<input type="checkbox"/>		<input type="checkbox"/>	_____
Reinforcing Bar/Wire	<input type="checkbox"/>		<input type="checkbox"/>	_____
Steel Stairs/Catwalks/Railings	<input type="checkbox"/>		<input type="checkbox"/>	_____
Unknown Iron/Steel Item	<input type="checkbox"/>		<input type="checkbox"/>	_____

Deminimis Waiver

General contractor maintains an itemized list of incidental components and the cost is less than 5% of total materials cost for project. YES  NO

Minor Components Waiver

General contractor maintains a list of products to which the minor components waiver applies and the cost of the non-domestically produced component is less than 5% of total materials cost of that product. YES  NO

Project Specific Waiver

Is there an approved waiver for this project? Is so, please list. YES  NO   
 Inconsistent with public interest YES  NO   
 Not produced in U.S. in sufficient and reasonable available quantities or of a satisfactory quality. YES  NO   
 Cost of the overall project increased by more than 25%. YES  NO



Miscellaneous

Is there a project file that includes all manufacturers' certifications on site? If yes, please review the project file for compliance. YES  NO

This inspection form was prepared by:

\_\_\_\_\_  
(Print and sign name)

Consulting Engineer/RPR present (If yes, print name):

General Contractor present (If yes, print name):

Owner/Applicant present (If yes, print name):

Others (If yes, print name):

## SECTION 01100

### SUMMARY

#### PART 1 GENERAL

##### 1.1 SECTION INCLUDES

- A. Contract description.
- B. Work by Owner.
- C. Owner supplied products.
- D. Contractor's use of site and premises.
- E. Future work.
- F. Work sequence.
- G. Owner occupancy.
- H. Specification Conventions.

##### 1.2 CONTRACT DESCRIPTION

- A. Work of the Project is as described in Contract Drawings and Documents.
- B. Perform Work of each Contract under separate contract with Owner in accordance with Conditions of Contract.

##### 1.3 WORK BY OWNER OR OTHERS

- A. Items to be furnished and installed by Owner and/or Others are as noted in the Drawings.

##### 1.4 OWNER SUPPLIED PRODUCTS

- A. Owner's Responsibilities:
  - 1. Arrange for and deliver Engineer-reviewed Shop Drawings, Product Data, and Samples, to Contractor.
  - 2. Arrange and pay for delivery to site.
  - 3. On delivery, inspect products jointly with Contractor.
  - 4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
  - 5. Arrange for manufacturers' warranties, inspections, and service.
- B. Contractor's Responsibilities:
  - 1. Review Owner-reviewed Shop Drawings, Product Data, and Samples.

2. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
  3. Handle, store, install and finish products.
  4. Repair or replace items damaged after receipt.
- C. Products furnished to site and installed by Owner:
1. As noted on Drawings or Special Provisions
- D. Items furnished by Owner for installation by Contractor:
1. As noted on Drawings or Special Provisions

#### 1.5 CONTRACTOR'S USE OF SITE AND PREMISES

- A. Limit use of site and premises to allow:
1. Owner occupancy.
  2. Work by Others and Work by Owner.
- B. Access to Site: Limited to construction activities
- C. Construction Operations: Limited to work described in the Technical Specifications.
- D. Time Restrictions for Performing Work: Limits of the Agreement.

#### 1.6 WORK SEQUENCE

- A. Construct Work in stages to accommodate Owner's occupancy requirements during construction period. Coordinate construction schedule and operations with Owner and Engineer. Additional sequences may be indicated in the Drawings.

#### 1.7 OWNER OCCUPANCY

- A. The Owner will occupy the site during the entire period of construction for the conduct of normal operations.
- B. Cooperate with Owner to minimize conflict, and to facilitate Owner's operations.
- C. Schedule the Work to accommodate Owner occupancy.

#### 1.8 SPECIFICATION CONVENTIONS

- A. These specifications are written in imperative mood and streamlined form. This imperative language is directed to the Contractor, unless specifically noted otherwise. The words "shall be" are included by inference where a colon (:) is used within sentences or phrases.

### **PART 2 PRODUCTS**

Not Used.

**PART 3 EXECUTION**

Not Used.

END OF SECTION

## **SECTION 01200**

### **PRICE AND PAYMENT PROCEDURES**

#### **PART 1 GENERAL**

##### **1.1 SECTION INCLUDES**

- A. Schedule of values.
- B. Applications for payment.
- C. Change procedures.
- D. Defect assessment.
- E. Unit prices.
- F. Alternates.

##### **1.2 SCHEDULE OF VALUES**

- A. Submit printed schedule on Contractor's standard form or electronic media printout.
- B. Submit Schedule of Values in duplicate within 15 days after date established in Notice to Proceed.
- C. Include in each line item, amount of Allowances specified in this section. For unit cost Allowances, identify quantities taken from Contract Documents multiplied by unit cost to achieve total for each item.
- D. Revise schedule to list approved Change Orders, with each Application for Payment.

##### **1.3 APPLICATIONS FOR PAYMENT**

- A. Submit four copies of each application on Contractor's electronic media driven form.
- B. Content and Format: Utilize Schedule of Values for listing items in Application for Payment.
- C. Submit updated construction schedule with each Application for Payment.
- D. Payment Period: Contractor to submit Pay Request, with the agreed upon quantities shown, on the first working day of the month for the previous month.
- E. Submit with transmittal letter as specified for Submittals in Section 01330.

- F. Substantiating Data: When submitting Pay Request that includes a pay request for stored materials, Contractor must also submit a paid invoice for all materials listed for reimbursement.

#### 1.4 CHANGE PROCEDURES

- A. Submittals: Submit name of individual authorized to receive change documents, and be responsible for informing others in Contractor's employ or Subcontractors of changes to the Work.
- B. The Engineer will advise of minor changes in the Work not involving adjustment to Contract Sum/Price or Contract Time by issuing supplemental instructions.
- C. Contractor may propose changes by submitting a request for change to Engineer, describing proposed change and its full effect on the Work. Include a statement describing reason for the change, and effect on Contract Sum/Price and Contract Time with full documentation and a statement describing effect on Work by separate or other Contractors.
- D. Stipulated Sum/Price Change Order: Based on Proposal Request and Contractor's fixed price quotation.
- E. Unit Price Change Order: For contract unit prices and quantities, the Change Order will be executed on fixed unit price basis.
- F. Execution of Change Orders: Engineer will issue Change Orders for signatures of parties as provided in Conditions of the Contract.
- G. Correlation Of Contractor Submittals:
  - 1. Promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as separate line item and adjust Contract Sum/Price.
  - 2. Promptly revise progress schedules to reflect change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.
  - 3. Promptly enter changes in Project Record Documents.

#### 1.5 DEFECT ASSESSMENT

- A. Replace the Work, or portions of the Work, not conforming to specified requirements.
- B. If, in the opinion of the Engineer, it is not practical to remove and replace the Work, the Engineer will direct appropriate remedy or adjust payment.
- C. The defective Work may remain, but unit sum/price will be adjusted to new sum/price at discretion of Engineer.
- D. Defective Work will be partially repaired to instructions of Engineer, and unit sum/price will be adjusted to new sum/price at discretion of Engineer.

- E. Individual specification sections may modify these options or may identify specific formula or percentage sum/price reduction.
- F. Authority of Engineer to assess defects and identify payment adjustments is final.
- G. Non-Payment For Rejected Products: Payment will not be made for rejected products for any of the following:
  1. Products wasted or disposed of in a manner that is not acceptable.
  2. Products determined as unacceptable before or after placement.
  3. Products not completely unloaded from transporting vehicle.
  4. Products placed beyond lines and levels of required Work.
  5. Products remaining on hand after completion of the Work.
  6. Loading, hauling, and disposing of rejected products.

## 1.6 UNIT PRICES

- A. Authority: Measurement methods are delineated in Section 1.7 of this Specification.
- B. Measurement methods delineated in individual specification sections complement criteria of this section. In event of conflict, requirements of individual specification section govern.
- C. Take measurements and compute quantities. Engineer will verify measurements and quantities.
- D. Unit Quantities: Quantities and measurements indicated in Bid Form are for contract purposes only. Quantities and measurements supplied or placed in the Work shall determine payment.
  1. When actual Work requires more or fewer quantities than those quantities indicated, provide required quantities at unit sum/prices contracted.
- E. Payment Includes: Full compensation for required labor, products, tools, equipment, plant and facilities, transportation, services and incidentals; erection, application or installation of item of the Work; overhead and profit.
- F. Final payment for Work governed by unit prices will be made on basis of actual measurements and quantities accepted by Engineer multiplied by unit sum/price for Work incorporated in or made necessary by the Work.

## 1.7 EXPLANATION OF BID ITEMS

- A. **Bid Item No. 1 – Mobilization:** See Specification Section 02050.
- B. **Bid Item No. 2 – Erosion Control, Grassing and Restoration:** Includes, but is not limited to, all necessary labor, materials, equipment, purchase, transport, loading/unloading, installation, maintenance and removal of the erosion and sediment control plan/devices. Also includes fine grading, topsoil placement, temporary and permanent seeding, fertilization, mulching, watering, mowing and other necessary maintenance, restoration of all structures damaged or otherwise disturbed by construction to pre-construction

conditions or better. Payment shall be Lump Sum and shall include any incidentals necessary to complete the work in accordance with the plans and specifications.

- C. **Bid Item No. 3 – Duplex Packaged Lift Station:** Includes furnishing all labor and equipment to complete the installation of packaged lift station as specified within the Contract Documents. Work shall include construction of prefabricated fiberglass lift station package complete with pumps, piping, valves, electrical and controls, concrete pad, excavation, dewatering, backfilling, final grading, cleanup, grassing, temporary utilities, testing and all appurtenances necessary to create a complete working system. Payment shall be Lump Sum and shall include any incidentals necessary to complete the work in accordance with the plans and specifications.
- D. **Bid Item No. 4 – 4" PVC, SDR 21 Sewer Force Main (Open-Cut):** Includes all material, equipment associated with excavation (includes rock excavation, if required), bedding, installation of pipe at locations shown on plans, installation of detector wire and tape, thrust blocks, fittings, native soil backfill, compaction, testing, cleanup, traffic control, and all related items. Payment shall be per linear foot of force main installed.
- E. **Bid Item No. 5 – 10" PVC, SDR 26 Gravity Sewer (Open-Cut):** Includes, but not limited to, excavation, trenching, shoring, pipe installation, aggregate bedding material to 6" below pipe, backfill, compaction, testing and all related items for a complete job. Payment shall be per linear foot gravity sewer installed.
- F. **Bid Item No. 6 – 4' Diameter Precast Sewer Manhole:** Includes, but not limited to all labor, material, and equipment to install footings, manhole riser sections, steps, precast top, ring and cover, 20 LF DI pipe for drop manhole (as applicable), concrete adjustment rings, saw-cutting, topsoil stripping, excavation (including rock excavation), crushed stone bedding, backfill in non-structural areas, compaction, testing, and traffic control. Precast Concrete Manhole with Ring and Cover shall be paid for at the contract unit price for each.
- G. **Bid Item No. 7 – 0.100 MGD ADF Packaged Wastewater Treatment Plant with UV Disinfection and Related Structures/Improvements:** Includes furnishing all labor and equipment to complete the construction of the 0.100 MGD average day flow (ADF) packaged treatment system with ultraviolet disinfection as outlined in Section 11390 and on Contract Drawings, influent and effluent samplers, and all associated appurtenances, site improvements including chain link fencing and gates, pipe improvements, and support processes. Payment will be made at the contract lump sum price bid and shall include any incidentals necessary to complete the work in accordance with these plans and specifications.
- H. **Bid Item No. 8 – Tertiary Filtration Equipment:** Includes furnishing all labor, materials, and equipment necessary to install tertiary filtration equipment as outlined in Section 13200 and on Contract Drawings, backwash lift station and valve vault, metal awning, and all associated appurtenances, site improvements, pipe improvements, and support processes outlined in the Contract Documents. Payment will be made at the contract lump sum price bid and shall include any incidentals necessary to complete the work in accordance with the plans and specifications.



- I. **Bid Item No. 9 – Dewatering Equipment:** Includes furnishing all labor, materials, and equipment necessary to install dewatering equipment as outlined in Section 13500 and on Contract Drawings and all associated appurtenances, site improvements, pipe improvements, and support processes. Payment will be made at the contract lump sum price bid and shall include any incidentals necessary to complete the work in accordance with the plans and specifications.
- J. **Bid Item No. 10 – Outfall Structure:** Includes all labor, material, tools, and equipment associated with, but not limited to excavations, placing and compacting of base material, aggregate backfill, formwork, reinforcement, pouring and finishing of concrete, removal of forms, riprap stabilization, cleanup, compaction of sub-grade, and all related items. Payment is lump sum.
- K. The items in the Bid Form are intended to provide full compensation to the Contractor for providing a complete and functional project. Any major items which are found by the proposed bidders shall be called to the attention of the Engineer prior to the bid so that an Addendum can be considered. Payment for any minor items necessary to satisfactorily complete the project which are not listed in the Bid Form shall be included in the prices bid for items in the Bid Form. No additional payment will be made for these minor items.

## 1.8 ALTERNATES

- A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in Owner-Contractor Agreement.
  - 1. **Alternate No. 1 (Additive) – WWTP Standby Generator with ATS and Concrete Pad**
    - a. Includes providing all labor and furnishing all equipment to install a standby generator system with automatic transfer switch and concrete equipment pad with associated wiring and other appurtenances required to form a complete and functioning system as shown on Sheets E-103, E-104, and E-303. If elected for completion by the Owner, payment will be made at the contract lump sum price bid and shall include any incidentals necessary to complete the work in accordance with these plans and specifications.
  - 2. **Alternate No. 2 (Additive) – Lift Station Standby Generator with ATS and Concrete Pad**
    - a. Includes providing all labor and furnishing all equipment to install a standby generator system with automatic transfer switch and concrete equipment pad with associated wiring and other appurtenances required to form a complete and functioning system as shown on Sheets E-103, E-104, and E-501. If elected for completion by the Owner, payment will be made at the contract lump sum price bid and shall include any incidentals necessary to complete the work in accordance with these plans and specifications.

- B. Alternates quoted on Bid Form will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in Owner-Contractor Agreement.
- C. Coordinate related work and modify surrounding work.

**PART 2 PRODUCTS**

Not Used.

**PART 3 EXECUTION**

Not Used.

END OF SECTION

## SECTION 01300

### ADMINISTRATIVE REQUIREMENTS

#### PART 1 GENERAL

##### 1.1 SECTION INCLUDES

- A. Coordination and project conditions.
- B. Field engineering.
- C. Preconstruction meeting.
- D. Progress meetings.
- E. Pre-installation meetings.

##### 1.2 COORDINATION AND PROJECT CONDITIONS

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

##### 1.3 FIELD ENGINEERING

- A. The Contractor shall employ a Land Surveyor registered in State of Alabama for construction stakeout services. The Engineer can be employed by the Contractor to provide control points if requested.

- B. Locate and protect survey control and reference points. Promptly notify Engineer of discrepancies discovered.
- C. Control datum for survey is that shown on Drawings.
- D. Verify setbacks and easements; confirm drawing dimensions and elevations.
- E. Provide field engineering services. Establish elevations, lines, and levels, utilizing recognized engineering survey practices.
- F. Submit copy of site drawing signed by Land Surveyor certifying elevations and locations of the Work are in conformance with Contract Documents.
- G. Maintain complete and accurate log of control and survey work as Work progresses.
- H. On completion of foundation walls and major site improvements, prepare certified survey illustrating dimensions, locations, angles, and elevations of construction and site work.
- I. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- J. Promptly report to Engineer loss or destruction of reference point or relocation required because of changes in grades or other reasons.
- K. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect/Engineer.

#### 1.4 PRECONSTRUCTION MEETING

- A. Owner will schedule meeting after Notice of Award.
- B. Attendance Required: Owner, Engineer, and Contractor.
- C. Agenda:
  - 1. Execution of Owner-Contractor Agreement.
  - 2. Submission of executed bonds and insurance certificates.
  - 3. Distribution of Contract Documents.
  - 4. Submission of list of Subcontractors, list of products, schedule of values, and progress schedule.
  - 5. Designation of personnel representing parties in Contract, and Engineer.
  - 6. Procedures and processing of field decisions, submittals, and substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
  - 7. Scheduling.
  - 8. Scheduling activities of Geotechnical Engineer.
- D. Record minutes and distribute copies within five (5) days after meeting to participants, with copies to Engineer, Owner, and those affected by decisions made.

## 1.5 PROGRESS MEETINGS

- A. Schedule and administer meetings throughout progress of the Work at maximum monthly intervals.
- B. Engineer will make arrangements for meetings, prepare agenda with copies for participants, and preside at meetings.
- C. Attendance Required: Job superintendent, major subcontractors and suppliers, Owner, Engineer, as appropriate to agenda topics for each meeting.
- D. Agenda:
  - 1. Review minutes of previous meetings.
  - 2. Review of Work progress.
  - 3. Field observations, problems, and decisions.
  - 4. Identification of problems impeding planned progress.
  - 5. Review of submittals schedule and status of submittals.
  - 6. Review of off-site fabrication and delivery schedules.
  - 7. Maintenance of progress schedule.
  - 8. Corrective measures to regain projected schedules.
  - 9. Planned progress during succeeding work period.
  - 10. Coordination of projected progress.
  - 11. Maintenance of quality and work standards.
  - 12. Effect of proposed changes on progress schedule and coordination.
  - 13. Other business relating to Work.
- E. Record minutes and distribute copies within five (5) days after meeting to participants, with copies to Engineer, Owner, and those affected by decisions made.

## 1.6 PRE-INSTALLATION MEETINGS

- A. When required in individual specification sections, convene pre-installation meetings at Project site prior to commencing work of specific section.
- B. Require attendance of parties directly affecting, or affected by, Work of specific section.
- C. Prepare agenda and preside at meeting:
  - 1. Review conditions of installation, preparation and installation procedures.
  - 2. Review coordination with related work.
- D. Record minutes and distribute copies within five (5) days after meeting to participants, with copies to Engineer, Owner, and those affected by decisions made.

## PART 2 PRODUCTS

Not Used.

END OF SECTION

**SECTION 01330**  
**SUBMITTAL PROCEDURES**

**PART 1 GENERAL**

1.1 SECTION INCLUDES

- A. Submittal procedures.
- B. Construction progress schedules.
- C. Proposed products list.
- D. Product data.
- E. Shop drawings.
- F. Samples.
- G. Design data.
- H. Test reports.
- I. Certificates.
- J. Manufacturer's instructions.
- K. Manufacturer's field reports.
- L. Erection drawings.
- M. Construction photography/videography.

1.2 SUBMITTAL PROCEDURES

- A. Transmit each submittal with Engineer accepted form.
- B. Sequentially number transmittal forms. Mark revised submittals with original number and sequential alphabetic suffix.
- C. Identify Project, Contractor, subcontractor and supplier; pertinent drawing and detail number, and specification section number, appropriate to submittal.
- D. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with requirements of the Work and Contract Documents.
- E. Schedule submittals to expedite Project, and deliver to Engineer at business address. Coordinate submission of related items.

- F. Provide submittals in both hard copy and electronic media format compatible with Owner and Engineer's viewing software.
- G. For each submittal for review, allow 15 days excluding delivery time to and from Contractor.
- H. Identify variations from Contract Documents and product or system limitations, which may be detrimental to successful performance of completed Work.
- I. Allow space on submittals for Contractor and Engineer review stamps.
- J. When revised for resubmission, identify changes made since previous submission.
- K. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report inability to comply with requirements.
- L. Submittals not requested will not be recognized or processed.

### 1.3 CONSTRUCTION PROGRESS SCHEDULES

- A. Submit initial schedules within 15 days after date established in Notice to Proceed. After review, resubmit required revised data within 10 days.
- B. Submit revised Progress Schedules with each Application for Payment.
- C. Distribute copies of reviewed schedules to Project site file, subcontractors, suppliers, and other concerned parties.
- D. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.
- E. Submit computer generated horizontal bar chart with separate line for each major portion of Work or operation, identifying first work day of each week.
- F. Show complete sequence of construction by activity, identifying Work of separate stages and other logically grouped activities. Indicate early and late start, early and late finish, float dates, and duration.
- G. Indicate estimated percentage of completion for each item of Work at each submission.
- H. Submit separate schedule of submittal dates for shop drawings, product data, and samples, including Owner furnished products and products identified under Allowances, and dates reviewed submittals will be required from Engineer. Indicate decision dates for selection of finishes.
- I. Indicate delivery dates for Owner furnished products and products identified under Allowances.
- J. Revisions To Schedules:
  - 1. Indicate progress of each activity to date of submittal, and projected completion date of each activity.

2. Identify activities modified since previous submittal, major changes in scope, and other identifiable changes.
3. Prepare narrative report to define problem areas, anticipated delays, and impact on Schedule. Report corrective action taken, or proposed, and its effect.

#### 1.4 PROPOSED PRODUCTS LIST

- A. Within 15 days after date of Owner-Contractor Agreement, submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
- B. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

#### 1.5 PRODUCT DATA

- A. Product Data: Submit to Engineer for review for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents.
- B. Submit number of copies Contractor requires, plus four copies Engineer will retain.
- C. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- D. Indicate product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- E. After review, produce copies and distribute in accordance with SUBMITTAL PROCEDURES article and for record documents described in Section 01700.

#### 1.6 SHOP DRAWINGS

- A. Shop Drawings: Submit to Engineer for review for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents.
- B. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- C. Submit in form of one reproducible transparency.
- D. After review, produce copies and distribute in accordance with SUBMITTAL PROCEDURES article and for record documents described in Section 01700.

#### 1.7 SAMPLES

- A. Samples: Submit to Engineer for review for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents.
- B. Samples For Selection as Specified in Product Sections:
  1. Submit to Engineer for aesthetic, color, or finish selection.



2. Submit samples of finishes from full range of manufacturers' standard colors, textures, and patterns for Engineer selection.
- C. Submit samples to illustrate functional and aesthetic characteristics of Products, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
- D. Include identification on each sample, with full Project information.
- E. Submit number of samples specified in individual specification sections; Engineer will retain one sample.
- F. Reviewed samples which may be used in the Work are indicated in individual specification sections.
- G. Samples will not be used for testing purposes unless specifically stated in specification section.
- H. After review, produce duplicates and distribute in accordance with SUBMITTAL PROCEDURES article and for record documents purposes described in Section 01700.

#### 1.8 DESIGN DATA

- A. Submit for Engineer's knowledge as contract administrator or for Owner.
- B. Submit for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.

#### 1.9 TEST REPORTS

- A. Submit for Engineer's knowledge as contract administrator or for Owner.
- B. Submit test reports for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.

#### 1.10 CERTIFICATES

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

#### 1.11 MANUFACTURER'S INSTRUCTIONS

- A. When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, to Engineer for delivery to Owner in quantities specified for Product Data.

- B. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

#### 1.12 MANUFACTURER'S FIELD REPORTS

- A. Submit reports for Engineer's benefit as contract administrator or for Owner.
- B. Submit report within 30 days of observation to Engineer for information.
- C. Submit for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.

#### 1.13 ERECTION DRAWINGS

- A. Submit drawings for Engineer's benefit as contract administrator or for Owner.
- B. Submit for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.
- C. Data indicating inappropriate or unacceptable Work may be subject to action by Engineer or Owner.

#### 1.14 CONSTRUCTION PHOTOGRAPHY/VIDEOGRAPHY

- A. Provide digital photographs and/or video of the site prior to beginning construction and monthly throughout progress of Work.
- B. All photo and/or video files shall be saved in a format that is easily read from a Windows-based computer. Each photo/video shall be named or referenced such that their location within the project area is easily identifiable. Additional information provided shall include name of Project, project number, orientation of view, and date and time of view.
- C. All files shall be submitted via a thumb drive, a portable hard drive, or an approved cloud-based file storage transfer.

### **PART 2 PRODUCTS**

Not Used.

### **PART 3 EXECUTION**

Not Used.

END OF SECTION

**SECTION 01400**  
**QUALITY REQUIREMENTS**

**PART 1 GENERAL**

1.1 SECTION INCLUDES

- A. Quality control and control of installation.
- B. Tolerances
- C. References.
- D. Mock-up requirements.
- E. Testing and inspection services.
- F. Manufacturers' field services.
- G. Examination.
- H. Preparation.

1.2 QUALITY CONTROL AND CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.
- C. When manufacturers' instructions conflict with Contract Documents, request clarification from Engineer before proceeding.
- D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Perform Work by persons qualified to produce required and specified quality.
- F. Verify field measurements are as indicated on Shop Drawings or as instructed by manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

### 1.3 TOLERANCES

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. When manufacturers' tolerances conflict with Contract Documents, request clarification from Engineer before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

### 1.4 REFERENCES

- A. For products or workmanship specified by association, trades, or other consensus standards, comply with requirements of standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to reference standard by date of issue current on date of Contract Documents, except where specific date is established by code.
- C. Obtain copies of standards where required by product specification sections.
- D. When specified reference standards conflict with Contract Documents, request clarification from Engineer before proceeding.
- E. Neither contractual relationships, duties, nor responsibilities of parties in Contract nor those of Engineer shall be altered from Contract Documents by mention or inference otherwise in reference documents.

### 1.5 MOCK-UP REQUIREMENTS

- A. Tests will be performed under provisions identified in this section and identified in respective product specification sections.
- B. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.
- C. Accepted mock-ups shall be comparison standard for remaining Work.
- D. Where mock-up has been accepted by Engineer and is specified in product specification sections to be removed; remove mock-up and clear area when directed to do so by Engineer.

### 1.6 TESTING AND INSPECTION SERVICES

- A. Employ and pay for services of an independent testing agency or laboratory acceptable to Owner to perform specified testing.
  - 1. CDG can perform the required material testing and geotechnical evaluation for this project.
  - 2. Prior to start of Work, submit testing laboratory name, address, and telephone number if CDG is not selected.

3. Submit copy of report of laboratory facilities inspection made by Materials Reference Laboratory of National Bureau of Standards during most recent inspection, with memorandum of remedies of deficiencies reported by inspection.
- B. The independent firm will perform tests, inspections and other services specified in individual specification sections and as required by Engineer.
1. Laboratory: Authorized to operate in State of Alabama
  2. Laboratory Staff: Maintain full time registered Engineer on staff to review services.
  3. Testing Equipment: Calibrated at reasonable intervals with devices of an accuracy traceable to National Bureau of Standards or accepted values of natural physical constants.
- C. Testing, inspections and source quality control may occur on or off project site. Perform off-site testing as required by Engineer or Owner.
- D. Reports will be submitted by independent firm to Engineer and Contractor, in duplicate, indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.
- E. Cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage, safe access, and assistance by incidental labor as requested.
1. Notify Engineer and independent firm 24 hours prior to expected time for operations requiring services.
  2. Make arrangements with independent firm and pay for additional samples and tests required for Contractor's use.
- F. Testing and employment of testing agency or laboratory shall not relieve Contractor of obligation to perform Work in accordance with requirements of Contract Documents.
- G. Re-testing or re-inspection required because of non-conformance to specified requirements shall be performed by same independent firm on instructions by Engineer. Payment for re-testing or re-inspection will be charged to Contractor by deducting testing charges from Contract Price.
- H. Agency Responsibilities:
1. Test samples of mixes submitted by Contractor.
  2. Provide qualified personnel at site. Cooperate with Engineer and Contractor in performance of services.
  3. Perform specified sampling and testing of products in accordance with specified standards.
  4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
  5. Promptly notify Engineer and Contractor of observed irregularities or non-conformance of Work or products.
  6. Perform additional tests required by Engineer.
  7. Attend preconstruction meetings and progress meetings.

- I. Agency Reports: After each test, promptly submit two copies of report to Engineer and to Contractor. When requested by Engineer, provide interpretation of test results. Include the following:
  - 1. Date issued.
  - 2. Project title and number.
  - 3. Name of inspector.
  - 4. Date and time of sampling or inspection.
  - 5. Identification of product and specifications section.
  - 6. Location in Project.
  - 7. Type of inspection or test.
  - 8. Date of test.
  - 9. Results of tests.
  - 10. Conformance with Contract Documents.
  
- J. Limits On Testing Authority:
  - 1. Agency or laboratory may not release, revoke, alter, or enlarge on requirements of Contract Documents.
  - 2. Agency or laboratory may not approve or accept any portion of the Work.
  - 3. Agency or laboratory may not assume duties of Contractor.
  - 4. Agency or laboratory has no authority to stop the Work.

#### 1.7 MANUFACTURERS' FIELD SERVICES

- A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment and training as applicable, and to initiate instructions when necessary.
- B. Submit qualifications of observer to Engineer 30 days in advance of required observations.
- C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.
- D. Refer to Section 01330 - SUBMITTAL PROCEDURES, MANUFACTURERS' FIELD REPORTS article.

### **PART 2 PRODUCTS**

Not Used.

### **PART 3 EXECUTION**

#### 3.1 EXAMINATION

- A. Verify existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.

- B. Verify existing substrate is capable of structural support or attachment of new Work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Verify utility services are available, of correct characteristics, and in correct locations.

### 3.2 PREPARATION

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

END OF SECTION

**SECTION 01600**  
**PRODUCT REQUIREMENTS**

**PART 1 GENERAL**

1.1 SECTION INCLUDES

- A. Products.
- B. Product delivery requirements.
- C. Product storage and handling requirements.
- D. Product options.
- E. Product substitution procedures.

1.2 PRODUCTS

- A. Furnish products of qualified manufacturers suitable for intended use. Furnish products of each type by single manufacturer unless specified otherwise.
- B. Do not use materials and equipment removed from existing premises, except as specifically permitted by Contract Documents.
- C. Furnish interchangeable components from same manufacturer for components being replaced.

1.3 PRODUCT DELIVERY REQUIREMENTS

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

1.4 PRODUCT STORAGE AND HANDLING REQUIREMENTS

- A. Store and protect products in accordance with manufacturers' instructions.
- B. Store with seals and labels intact and legible.
- C. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.
- D. For exterior storage of fabricated products, place on sloped supports above ground.



- E. Provide off-site storage and protection when site does not permit on-site storage or protection.
- F. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- G. Store loose granular materials on solid flat surfaces in well-drained area. Prevent mixing with foreign matter.
- H. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- I. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

#### 1.5 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Any product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers: Products of one of manufacturers named and meeting specifications, no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with Provision for Substitutions: Submit request for substitution for any manufacturer not named in accordance with the following article.

#### 1.6 PRODUCT SUBSTITUTION PROCEDURES

- A. Engineer will consider requests for Substitutions only within 30 days after date established in Notice to Award and no sooner than 10 days prior to the Notice to Proceed date.
- B. Substitutions may be considered when a product becomes unavailable through no fault of Contractor.
- C. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.
- D. A request constitutes a representation that Contractor:
  1. Has investigated proposed product and determined that it meets or exceeds quality level of specified product.
  2. Will provide same warranty for Substitution as for specified product.
  3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.
  4. Waives claims for additional costs or time extension which may subsequently become apparent.
  5. Will reimburse Owner and Engineer for review or redesign services associated with re-approval by authorities having jurisdiction.

- E. Substitutions will not be considered when they are indicated or implied on Shop Drawing or Product Data submittals, without separate written request, or when acceptance will require revision to Contract Documents.
- F. Substitution Submittal Procedure:
  - 1. Submit three copies of request for Substitution for consideration. Limit each request to one proposed Substitution.
  - 2. Submit Shop Drawings, Product Data, and certified test results attesting to proposed product equivalence. Burden of proof is on proposer.
  - 3. Engineer will notify Contractor in writing of decision to accept or reject request.

## **PART 2 PRODUCTS**

Not Used

## **PART 3 EXECUTION**

Not Used.

END OF SECTION

**SECTION 01700**  
**EXECUTION REQUIREMENTS**

**PART 1 GENERAL**

1.1 SECTION INCLUDES

- A. Closeout procedures.
- B. Final cleaning.
- C. Starting of systems.
- D. Demonstration and instructions.
- E. Testing, adjusting and balancing.
- F. Protecting installed construction.
- G. Project record documents.
- H. Operation and maintenance data.
- I. Manual for materials and finishes.
- J. Manual for equipment and systems.
- K. Spare parts and maintenance products.
- L. Product warranties and product bonds.
- M. Maintenance service.

1.2 CLOSEOUT PROCEDURES

- A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Engineer's review.
- B. Provide submittals to Engineer required by authorities having jurisdiction.
- C. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.

### 1.3 FINAL CLEANING (If Applicable)

- A. Execute final cleaning prior to final project assessment.
- B. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
- C. Clean equipment and fixtures to sanitary condition with cleaning materials appropriate to surface and material being cleaned.
- D. Replace filters of operating equipment.
- E. Clean debris from roofs, gutters, downspouts, and drainage systems.
- F. Clean site; sweep paved areas, rake clean landscaped surfaces.
- G. Remove waste and surplus materials, rubbish, and construction facilities from site.

### 1.4 STARTING OF SYSTEMS

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Notify Engineer seven days prior to start-up of each item.
- C. Verify each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions which may cause damage.
- D. Verify tests, meter readings, and specified electrical characteristics agree with those required by equipment or system manufacturer.
- E. Verify wiring and support components for equipment are complete and tested.
- F. Execute start-up under supervision of applicable manufacturer's representative in accordance with manufacturers' instructions.
- G. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.
- H. Submit a written report in accordance with Section 01330 that equipment or system has been properly installed and is functioning correctly.

## 1.5 DEMONSTRATION AND INSTRUCTIONS

- A. Demonstrate operation and maintenance of products to Owner's personnel two weeks prior to date of Substantial Completion.
- B. Demonstrate Project equipment and instructed by qualified manufacturer's representative who is knowledgeable about the Project.
- C. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
- D. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.
- E. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at agreed time, at equipment location.
- F. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.
- G. Required instruction time for each item of equipment and system is specified in individual sections.

## 1.6 TESTING, ADJUSTING AND BALANCING

- A. Owner will appoint and employ services of independent firm to perform testing, adjusting, and balancing.
- B. Reports will be submitted by independent firm to Engineer indicating observations and results of tests and indicating compliance or non-compliance with requirements of Contract Documents.

## 1.7 PROTECTING INSTALLED CONSTRUCTION

- A. Protect installed Work and provide special protection where specified in individual specification sections.
- B. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- D. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

- E. Prohibit traffic or storage upon waterproofed or roofed surfaces. When traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- F. Prohibit traffic from landscaped areas.

## 1.8 PROJECT RECORD DOCUMENTS

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
  - 1. Drawings.
  - 2. Specifications.
  - 3. Addenda.
  - 4. Change Orders and other modifications to the Contract.
  - 5. Reviewed Shop Drawings, Product Data, and Samples.
  - 6. Manufacturer's instruction for assembly, installation, and adjusting.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress, not less than weekly.
- E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
  - 1. Manufacturer's name and product model and number.
  - 2. Product substitutions or alternates utilized.
  - 3. Changes made by Addenda and modifications.
- F. Record Drawings : Legibly mark each item to record actual construction including:
  - 1. Measured depths of foundations in relation to finish floor datum.
  - 2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
  - 3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
  - 4. Field changes of dimension and detail.
  - 5. Details not on original Contract drawings.
- G. Submit documents to Engineer with claim for final Application for Payment.

## 1.9 OPERATION AND MAINTENANCE DATA

- A. Submit data bound in 8-1/2 x 11 inch (A4) text pages, capacity expansion binders with durable plastic covers.
- B. Prepare binder cover with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS", title of project, and subject matter of binder when multiple binders are required.

- C. Internally subdivide binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.
- D. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- E. Contents: Prepare Table of Contents for each volume, with each product or system description identified, typed on white paper, in three parts as follows:
  - 1. Part 1: Directory, listing names, addresses, and telephone numbers of Engineer, Contractor, Subcontractors, and major equipment suppliers.
  - 2. Part 2: Operation and maintenance instructions arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
    - a. Significant design criteria.
    - b. List of equipment.
    - c. Parts list for each component.
    - d. Operating instructions.
    - e. Maintenance instructions for equipment and systems.
    - f. Maintenance instructions for finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
  - 3. Part 3: Project documents and certificates, including the following:
    - a. Shop drawings and product data.
    - b. Air and water balance reports.
    - c. Certificates.
    - d. Originals of warranties.

#### 1.10 MANUAL FOR MATERIALS AND FINISHES

- A. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Engineer will review draft and return one copy with comments.
- B. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit documents within ten days after acceptance.
- C. Submit one copy of completed volumes 15 days prior to final inspection. Draft copy be reviewed and returned after final inspection, with Engineer comments. Revise content of document sets as required prior to final submission.
- D. Submit two sets of revised final volumes in final form within 10 days after final inspection.
- E. Building Products, Applied Materials, and Finishes: Include product data, with catalog number, size, composition, and color and texture designations. Include information for re-ordering custom manufactured products.
- F. Instructions for Care and Maintenance: Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

- G. Moisture Protection and Weather Exposed Products: Include product data listing applicable reference standards, chemical composition, and details of installation. Include recommendations for inspections, maintenance, and repair.
- H. Additional Requirements: As specified in individual product specification sections.
- I. Include listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.

#### 1.11 MANUAL FOR EQUIPMENT AND SYSTEMS

- A. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Engineer will review draft and return one copy with comments.
- B. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit documents within ten days after acceptance.
- C. Submit one copy of completed volumes 15 days prior to final inspection. Draft copy be reviewed and returned after final inspection, with Engineer comments. Revise content of document sets as required prior to final submission.
- D. Submit two sets of revised final volumes in final form within 10 days after final inspection.
- E. Each Item of Equipment and Each System: Include description of unit or system, and component parts. Identify function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and model number of replaceable parts.
- F. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; by label machine.
- G. Include color coded wiring diagrams as installed.
- H. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and special operating instructions.
- I. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- J. Include servicing and lubrication schedule, and list of lubricants required.
- K. Include manufacturer's printed operation and maintenance instructions.
- L. Include sequence of operation by controls manufacturer.
- M. Include original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.



- N. Include control diagrams by controls manufacturer as installed.
- O. Include Contractor's coordination drawings, with color coded piping diagrams as installed.
- P. Include charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- Q. Include list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- R. Include test and balancing reports as specified in Section 01400.
- S. Additional Requirements: As specified in individual product specification sections.
- T. Include listing in Table of Contents for design data, with tabbed dividers and space for insertion of data.

#### 1.12 SPARE PARTS AND MAINTENANCE PRODUCTS

- A. Furnish spare parts, maintenance, and extra products in quantities specified in individual specification sections.
- B. Deliver to Project site and place in location as directed by Owner; obtain receipt prior to final payment.

#### 1.13 PRODUCT WARRANTIES AND PRODUCT BONDS

- A. Obtain warranties and bonds executed in duplicate by responsible subcontractors, suppliers, and manufacturers, within ten days after completion of applicable item of work.
- B. Execute and assemble transferable warranty documents and bonds from subcontractors, suppliers, and manufacturers.
- C. Verify documents are in proper form, contain full information, and are notarized.
- D. Co-execute submittals when required.
- E. Include Table of Contents and assemble in binder with durable plastic cover.
- F. Submit prior to final Application for Payment.
- G. Time Of Submittals:
  1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within ten days after acceptance.
  2. Make other submittals within ten days after Date of Substantial Completion, prior to final Application for Payment.

3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within ten days after acceptance, listing date of acceptance as beginning of warranty or bond period.

#### 1.14 MAINTENANCE SERVICE

- A. Furnish service and maintenance of components indicated in specification sections during warranty period.
- B. Examine system components at frequency consistent with reliable operation. Clean, adjust, and lubricate as required.
- C. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by manufacturer of original component.
- D. Do not assign or transfer maintenance service to agent or Subcontractor without prior written consent of Owner.

#### **PART 2 PRODUCTS**

Not Used.

#### **PART 3 EXECUTION**

Not Used.

END OF SECTION

**SECTION 02050**

**MOBILIZATION**

**DESCRIPTION:** Covers the preparatory Work and operations including, but not limited to, those necessary for the movement of personnel, equipment, supplies, and incidentals to and from the project site; for the establishment of all offices, buildings, and other facilities necessary for work on the project; and for all other Work and operations which must be performed or costs incurred prior to beginning work on the various items on the project site.

**UNIT PRICE - MEASUREMENT AND PAYMENT**

- A. Basis of Measurement: Lump Sum.
- B. Basis of Payment: Partial payments for mobilization are allowed based on the amount bid for mobilization and the total original contract amount for all items of work. Payment will be made at the time, and in the amounts shown in the following schedules.

<b>SCHEDULE OF PARTIAL PAYMENTS FOR MOBILIZATION WHEN BID PRICE FOR MOBILIZATION IS 10% OR LESS OF ORIGINAL CONTRACT AMOUNT</b> (Partial Payments are a % of the Contract Amount for Mobilization)		
<b>TIME OF PAYMENT</b>	<b>AMOUNT OF PAYMENT</b>	<b>ACCUMULATED PAYMENT</b>
At the First Estimate and Upon Completion of 5% of the Original Contract Amount	70% of the Bid Price for Mobilization	70% of the Bid Price for Mobilization
After the First Estimate and Upon Completion of 50% of the Original Contract Amount Including Prior Payment for Mobilization	25% of the Bid Price for Mobilization	95% of the Bid Price for Mobilization
Upon Completion and Readiness for Final Payment.	5% of the Bid Price for Mobilization	100% of the Bid Price for Mobilization

<b>SCHEDULE OF PARTIAL PAYMENTS FOR MOBILIZATION WHEN BID PRICE FOR MOBILIZATION IS GREATER THAN 10% OF ORIGINAL CONTRACT AMOUNT</b> (Partial Payments are a % of the Contract Amount, Except the Final Payment)		
<b>TIME OF PAYMENT</b>	<b>AMOUNT OF PAYMENT</b>	<b>ACCUMULATED PAYMENT</b>
At the First Estimate and Upon Completion of 5% of the Original Contract Amount	6% of the Original Contract Amount	6% of the Total Contract Amount
After the First Estimate and Upon Completion of 50% of the Original Contract Amount Including Prior Payment for Mobilization	4% of the Original Contract Amount	10% of the Total Contract Amount
Final Estimate	Remainder of Contract Amount for Mobilization	100% of Contract Amount for Mobilization

END OF SECTION

## SECTION 02060

### AGGREGATE

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Coarse aggregate materials.
  - 2. Fine aggregate materials.
- B. Related Sections:
  - 1. Plans and general provisions of the Contract including General and Supplemental General Conditions, and Technical Specifications.

##### 1.2 REFERENCES

- A. American Association of State Highway and Transportation Officials:
  - 1. AASHTO M147 - Standard Specification for Materials for Aggregate and Soil-Aggregate Subbase, Base and Surface Courses.
  - 2. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.
- B. ASTM International:
  - 1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - 2. ASTM D698 - Standard 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>)).
  - 3. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>)).
  - 4. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).
  - 5. ASTM D4318 - Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

##### 1.3 UNIT PRICE - MEASUREMENT AND PAYMENT

- A. Basis of Measurement: Cubic yard or as indicated in the Plans and/or Bid Form
- B. Basis of Payment: Includes all labor, materials and equipment for the installation of aggregate including hauling, placing, spreading, grading to the proper level, cleanup and all related items.

##### 1.4 SUBMITTALS

- A. Section 01330 - Submittal Procedures.
- B. Samples: Submit 10-gallon sample of each type of aggregate to testing laboratory.

- C. Materials Source: Submit name of imported materials suppliers.
- D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

- A. Furnish each aggregate material from single source throughout the Work.

**PART 2 PRODUCTS**

2.1 COARSE AGGREGATE MATERIALS

- A. Coarse aggregate shall consist of crushed gravel or stone having hard, strong, durable pieces, free from adherent coatings.
- B. Coarse Aggregate Type A1 (ALDOT Aggregate size No. 4) shall be graded in accordance with the following limits:

<u>Sieve Size</u>	<u>Percent Passing</u>
2 inches	100
1-1/2 inch	90 to 100
1 inch	20 to 55
3/4 inch	0 to 15
1/2 inch	----
3/8 inch	0 to 5
No. 4	----
No. 8	----
No. 16	----
No. 50	----
No. 200	----

- C. Coarse Aggregate Type A2 (ALDOT Aggregate size No. 57) shall be graded in accordance with the following limits:

<u>Sieve Size</u>	<u>Percent Passing</u>
2 inches	----
1-1/2 inch	100
1 inch	95 to 100
3/4 inch	----
1/2 inch	25 to 60
3/8 inch	----
No. 4	0 to 10
No. 8	0 to 5
No. 16	----
No. 50	----
No. 200	----

- D. Coarse Aggregate Type A3 (ALDOT Aggregate size No. 78) shall be graded in accordance with the following limits:

<u>Sieve Size</u>	<u>Percent Passing</u>
2 inches	-----
1-1/2 inch	-----
1 inch	-----
3/4 inch	100
1/2 inch	90 to 100
3/8 inch	40 to 75
No. 4	5 to 25
No. 8	0 to 10
No. 16	0 to 5

## 2.2 FINE AGGREGATE MATERIALS

- A. Fine Aggregate Type A4 (Concrete Sand): Washed sand; free of loam, friable or soluble materials, and organic matter; non-plastic; graded in accordance with ASTM C136; within the following limits:

<u>Sieve Size</u>	<u>Percent Passing</u>
3/8 inch	100
No. 4	95 to 100
No. 8	80 to 100
No. 16	50 to 90
No. 50	5 to 30
No. 100	0 to 10

- B. Fine Aggregate Type A5 (Natural Sand): Natural sand; free of loam, friable or soluble materials, and organic matter; non-plastic; graded in accordance with ASTM C136; within the following limits:

<u>Sieve Size</u>	<u>Percent Passing</u>
3/8 inch	100
No. 4	95 to 100
No. 8	-----
No. 16	50 to 80
No. 50	20 to 50
No. 100	10 to 25
No. 200	5 to 12

## 2.3 SOURCE QUALITY CONTROL

- A. Section 01400 - Quality Requirements.
- B. Coarse Aggregate Material - Testing and Analysis: Perform in accordance with ASTM D698, ASTM D1557, ASTM D4318, or ASTM C136.

- C. Fine Aggregate Material - Testing and Analysis: Perform in accordance with ASTM D698, ASTM D1557, ASTM D4318, or ASTM C136.
- D. When tests indicate materials do not meet specified requirements, change material and retest.

## **PART 3 EXECUTION**

### **3.1 EXCAVATION**

- A. Excavate aggregate materials from on-site locations as specified in Section 02300.
- B. Stockpile excavated material meeting requirements for coarse aggregate materials and fine aggregate materials.
- C. Remove excess excavated materials not intended for reuse, from site.
- D. Remove excavated materials not meeting requirements for coarse aggregate materials and fine aggregate materials from site.

### **3.2 STOCKPILING**

- A. Stockpile materials on site.
- B. Stockpile in sufficient quantities to meet Project schedule and requirements.
- C. Separate different aggregate materials with dividers or stockpile individually to prevent mixing.
- D. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.
- E. Stockpile unsuitable materials on impervious material and cover to prevent erosion and leaching, until disposed of.

### **3.3 STOCKPILE CLEANUP**

- A. Remove stockpile, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

END OF SECTION

## SECTION 02082

### PRECAST MANHOLES

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Modular precast concrete manholes with tongue-and-groove joints, flexible boots, frame, covers, anchorage, and accessories.
  - 2. Doghouse manhole connections to existing sanitary sewer lines.
  - 3. Joint seals.
  - 4. Bedding and cover materials.
  - 5. Pile support systems.
- B. Related Sections:
  - 1. Drawings and general provisions of the Contract including General and Supplemental General Conditions, and Technical Specifications.

##### 1.2 REFERENCES

- A. ASTM International:
  - 1. ASTM A48/A48M - Standard Specification for Gray Iron Castings.
  - 2. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
  - 3. ASTM C32 - Standard Specification for Sewer and Manhole Brick (Solid Masonry Units Made from Clay or Shale).
  - 4. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
  - 5. ASTM C55 - Standard Specification for Concrete Brick.
  - 6. ASTM C478 - Standard Specification for Precast Reinforced Concrete Manhole Sections.
  - 7. ASTM C497 - Standard Test Methods for Concrete Pipe, Manhole Sections, or Tile.
  - 8. ASTM C913 - Standard Specification for Precast Concrete Water and Wastewater Structures.
  - 9. ASTM C923 - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals.

##### 1.3 SUBMITTALS

- A. Section 01330 - Submittal Procedures.
- B. Shop Drawings: Indicate structure locations, elevations, piping, sizes and elevations of penetrations.
- C. Product Data: Submit manhole covers, component construction, features, configuration, and dimensions.



## 1.4 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years experience.
- B. Installer: Company specializing in performing work of this section with minimum five years documented experience.

## 1.5 DELIVERY, STORAGE AND HANDLING

- A. Section 01600 - Product Requirements.
- B. Comply with precast concrete manufacturer's instructions for unloading, storing and moving precast manholes and drainage structures.
- C. Store precast concrete manholes and drainage structures to prevent damage to Owner's property or other public or private property. Repair property damaged from materials storage.
- D. Mark each precast structure by indentation or waterproof paint showing date of manufacture, manufacturer, and identifying symbols and numbers shown on Drawings to indicate its intended use.

## PART 2 PRODUCTS

### 2.1 MANHOLES

- A. Manufacturers:
  - 1. Hanson Pipe and Precast
  - 2. Sherman-Dixie Concrete Industries.
- B. Manhole Sections: Reinforced precast concrete in accordance with ASTM C478 with gaskets in accordance with ASTM C443.
  - 1. Joints for Precast Manholes and Structures: In accordance with ASTM C913; maximum leakage of 0.025 gallons per hour per foot of joint at 3 feet of head.

### 2.2 FRAMES AND COVERS

- A. Manufacturers:
  - 1. East Jordan Iron Works
  - 2. John Bouchard and Sons Co.
  - 3. Neenah Foundry Co.
  - 4. Substitutions: Section 01600 - Product Requirements.
- B. Product Description: ASTM A48, Class 30B Cast iron construction.
  - 1. Lid: Machined flat bearing surface, removable lid, solid cover design; traffic load rated; sealing gasket (watertight model only).
  - 2. Nominal Lid Size: 24-inch diameter opening.

## 2.3 COMPONENTS

- A. Manhole Steps: Formed polypropylene rungs;  $\frac{3}{4}$ -inch diameter.
- B. Foundation Slab: Cast-in-place concrete of size shown in Drawings, leveled top surface.
- C. Casting Seal: Butyl Mastic

## 2.4 CONFIGURATION

- A. Manholes shall be manufactured with Type II, sulfide resistant concrete having a minimum 28-day compressive strength of 4,000 psi.
- B. Minimum wall thickness of the riser sections shall be as follows:  

48" I.D. – 5"	60" I.D. – 6"	72" I.D. – 7"
---------------	---------------	---------------
- C. Cone sections shall have a 5" minimum wall thickness at the bottom and an 8" thickness at the top.
- D. Joints between manhole sections will be made with offset joints with rubber gaskets or preformed butyl sealants.
- E. Two lift holes shall be cast into each manhole section.
- F. Openings shall be provided in the manhole sections at the locations and elevations shown on the Drawings.
- G. Flexible manhole sleeves, or boots, shall be used to connect each pipe to the manhole. Sleeve to be made of EPDM rubber with bands and clamps made of 304 stainless steel. Sleeve shall be as manufactured by KOR-N-SEAL or equal.
- H. Steps:  $\frac{3}{4}$  inch diameter reinforced plastic, 12 inches wide, 16 inches on center vertically, set into structure wall with a minimum embedment of 3-3/8 inches.

## 2.5 ACCESSORIES

- A. Watertight Polyethylene Manhole Insert:
  - 1. Manufacturers:
    - a. Parsons Environmental Products.
    - b. No Flow Inflow.
    - c. Substitutions: Section 01600 - Product Requirements.
- B. External Seal Wrap
  - 1. Each manhole joint shall be sealed with an external rubber sleeve made of Ethylene Propylene Diene Monomer (EPDM) rubber with a minimum thickness of 30 mils.
  - 2. The back side of each unit shall be coated with a non-hardening butyl rubber mastic with a minimum thickness of 187 mils.
  - 3. The adjustment rings and the castings shall also be sealed with an external rubber seal wrap made of EPDM rubber with a minimum thickness of 65 mils.
  - 4. Manufacturers:

- a. Sealing Systems, Inc (Infi-Shield)
- b. Canusa-CPS (Wrapidseal).
- c. Concrete Sealants, Inc. (ConSeal).
- d. Substitutions: Section 01600 - Product Requirements.

## 2.6 BEDDING AND COVER MATERIALS

- A. Bedding: Fill Type A2 as specified in Section 02060.
- B. Backfill: Fill Type A2, as specified in Section 02060.
- C. Soil Backfill from Above Pipe to Finish Grade: Soil as specified in Section 02300, Part 2.1.

## 2.7 PILE SUPPORT SYSTEMS – **Not Used**

- A. Timber Piles: Conform to Section 02643.
- B. Timber for Cradle: Southern Yellow Pine well seasoned conforming to Section 06131 and surfaced four sides with preservative treatment.
- C. Preservative Treatment for Timber: Conform to Section 02463.
- D. Concrete Cradle: Conforming to Section 03300. 4,000 psi, 28-day reinforced concrete, rough troweled finish.
- E. Concrete Reinforcement: Conform to Section 03200.

## 2.8 FINISHING - STEEL

- A. Galvanizing: ASTM A123/A123M; minimum 1.2 oz/sq ft coating thickness; galvanize after fabrication.

# **PART 3 EXECUTION**

## 3.1 EXAMINATION

- A. Section 01300 - Administrative Requirements.
- B. Verify items provided by other sections of Work are properly sized and located.
- C. Verify built-in items are in proper location, and ready for roughing into Work.
- D. Verify correct size of manhole and structure excavation.

### 3.2 PREPARATION

- A. Coordinate placement of inlet and outlet pipe or duct sleeves required by other sections.
- B. Do not install manholes and structures where site conditions induce loads exceeding structural capacity of manholes or structures.
- C. Inspect precast concrete manholes and structures immediately prior to placement in excavation to verify manholes and structures are internally clean and free from damage. Remove and replace damaged units.

### 3.3 INSTALLATION - GENERAL

- A. Excavation and Backfill:
  - 1. Excavate for manholes and structures in accordance with Section 02300 in location and to depth shown. Provide clearance around sidewalls of manhole or structure for construction operations, granular backfill [and placement of geotextile filter fabric where required.
  - 2. When groundwater is encountered, prevent accumulation of water in excavations. Place manholes or structures in dry trench.
  - 3. Where possibility exists of watertight manhole or structure becoming buoyant in flooded excavation, anchor manhole or structure to avoid flotation.
- B. Place foundation slab, trowel top surface level.
- C. Install manholes and structures supported at proper grade and alignment on crushed stone bedding as shown on Drawings.
- D. Where groundwater is encountered in excavation, install vertical pipe adjacent to manhole of sufficient diameter to allow monitoring of groundwater in trench. Place pipe above trench bottom to allow accurate groundwater level measurement. Upon completion of low pressure air testing of gravity sewer, remove pipe and backfill.
- E. Backfill excavations for manholes and structures in accordance with Section 02300.
- F. Place manhole plumb and level, to correct dimensions and elevations.
- G. Grout base section to achieve sloped bench toward invert. Trowel smooth. Contour to form continuous drainage channel as indicated on Drawings.
- H. Set cover frames and covers level without tipping, to correct elevations.

### 3.4 PRECAST CONCRETE MANHOLE AND STRUCTURE INSTALLATION

- A. Lift precast manholes and structures at lifting points designated by manufacturer.
- B. When lowering manholes and structures into excavations and joining pipe to units, take precautions to ensure interior of pipeline and manhole or structure remains clean.

- C. Set precast manholes and structures bearing firmly and fully on crushed stone bedding, compacted in accordance with provisions of Section 02300 or on other support system shown on Drawings.
- D. Assemble multi-section manholes and structures by lowering each section into excavation. Install rubber gasket joints between precast sections in accordance with manufacturer's recommendations. Lower, set level, and firmly position base section before placing additional sections.
- E. Remove foreign materials from joint surfaces and verify sealing materials are placed properly. Maintain alignment between sections by using guide devices affixed to lower section.
- F. Seal manhole joints with rubber external wrap.
- G. Verify manholes and structures installed satisfy required alignment and grade.
- H. Cut pipe to finish flush with interior of manhole or structure.
- I. All pipe connections to manhole shall be installed using watertight sleeves as per 2.4G.
- J. Grout base section to achieve sloped bench toward invert. Trowel smooth. Contour to form continuous drainage channel as indicated on Drawings.

### 3.5 DOGHOUSE MANHOLE AND STRUCTURE INSTALLATION

- A. Stake out location and burial depth of existing sewer line in area of proposed manhole or structure.
- B. Carefully excavate around existing sewer line to adequate depth for foundation slab installation. Protect existing pipe from damage. Cut out soft spots and replace with granular fill compacted to 95% dry density.
- C. Prepare crushed stone bedding or other support system shown on Drawings, to receive foundation slab as specified for precast manholes and structures.
- D. Install pre-cast concrete manhole around existing pipe in accordance with the appropriate paragraphs specified herein.
- E. Seal manhole joints with rubber external wrap.
- F. Grout pipe entrances in accordance with Section 03300.
- G. Perform connection to existing pipe between the hours of 9:00 a.m. and 4:00 p.m.
- H. Block upstream flow at existing manhole or structure with expandable plug.
- I. Use hydraulic saw to cut existing pipe at manhole or structure entrance and exit and along pipe length at a point halfway up the outside diameter on each side of the pipe. Bottom half of pipe shall remain as manhole flow channel. Saw cut to have a smooth finish with top half of pipe flush with interior of manhole or structure.

- J. Grout base section to achieve sloped bench toward invert. Trowel smooth. Contour to form continuous drainage channel as indicated on Drawings.

### 3.6 SANITARY MANHOLE DROP CONNECTIONS

- A. Construct drop connections into sanitary manholes in accordance with Drawings.
- B. Concrete encase pipe drop connection to minimum of 2 feet outside of manhole.
- C. Form channel from pipe drop to sweep into main channel at maximum angle of 30 degrees.

### 3.7 CASTINGS INSTALLATION

- A. Set frames using precast concrete or polyethylene grade rings as indicated on Drawings. Concrete brick and mortar shall not be permitted.
- B. Set frame and cover 2 inches above finished grade for manholes and other structures with covers located within unpaved areas to allow area to be graded away from cover.
- C. Bolt frame to concrete cone section or grade ring and seal with mastic or rubber wrap.

### 3.8 FIELD QUALITY CONTROL

- A. Section 01400 - Quality Requirements.
- B. Test cast-in-place concrete in accordance with Section 03300.
- C. Test concrete manhole and structure sections in accordance with ASTM C497. As a minimum, each manhole shall be field tested, from invert to casting, for infiltration using a vacuum test at ten inches (10") of mercury for sixty (60) seconds with less than a one inch reduction.
- D. Vertical Adjustment of Existing Manholes and Structures:
  - 1. Where required, adjust top elevation of existing manholes and structures to finished grades shown on Drawings.
  - 2. Reset existing frames, grates and covers, carefully removed, cleaned of mortar fragments, to required elevation in accordance with requirements specified for installation of castings.
  - 3. Remove concrete without damaging existing vertical reinforcing bars when removal of existing concrete wall is required. Clean vertical bars of concrete and bend into new concrete top slab or splice to required vertical reinforcement, as indicated on Drawings.
  - 4. Clean and apply sand-cement bonding compound on existing concrete surfaces to receive cast-in-place concrete in accordance with Section 03300.

END OF SECTION

## SECTION 02085

### VALVES FOR WATER AND SEWER SYSTEMS

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Tapping Sleeve and Valves
  - 2. Rubber Seated Butterfly Valves
  - 3. Resilient Wedge Gate Valves
  - 4. Eccentric Plug Valves
  - 5. Swing Check Valves
  - 6. Silent Check Valves
  - 7. Insertion Valves
  - 8. Air/Vacuum and Air Release Valves (Including Combination Types)
  - 9. Pilot Operated Control Valves
  - 10. Line Stopping
  - 11. Accessories
  
- B. Related Sections:
  - 1. Plans and general provisions of the Contract including General Conditions, Special Provisions and Technical Specifications.

##### 1.2 REFERENCES

- A. American Water Works Association:
  - 1. AWWA C111 / A21.11-17 – Rubber-Gasket Joints for Ductile Iron Pressure Pipe and Fittings
  - 2. AWWA C115 - ANSI Standard for Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
  - 3. AWWA C116 – Protective Fusion-Bonded Coatings for the Interior and Exterior Surfaces of Ductile Iron and Gray-Iron Fittings
  - 4. AWWA C504 – Rubber-Seated Butterfly Valves
  - 5. AWWA C508 – Swing Check Valves for Waterworks Service 2 in through 48 in
  - 6. AWWA C509 – Resilient-Seated Gate Valves for Water Supply Service
  - 7. AWWA C512 – Air Release, Air/Vacuum, and Combination Air Valves for Water and Wastewater Service.
  - 8. AWWA C515 – Reduced Wall, Resilient-Seated Gate Valves for Water-Supply Service.
  - 9. AWWA C517 – Resilient-Seated Cast Iron Eccentric Plug Valves
  - 10. AWWA C530 – Pilot-Operated Control Valves
  - 11. AWWA C541 – Hydraulic and Pneumatic Cylinder and Vane Type Actuators for Valves and Slide Gates
  - 12. AWWA C542 – Electric Motor Actuators for Valves and Slide Gates
  - 13. AWWA C550 - Protecting Epoxy Interior Coating for Valves and Hydrants.

14. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.

B. National Sanitation Foundation:

1. NSF 61 - Drinking Water System Components - Health Effects

### 1.3 UNIT PRICE – MEASUREMENT AND PAYMENT

A. Tapping Sleeve and Valve Assemblies:

1. Basis of Measurement: Each, unless otherwise noted in the Plans.

2. Basis of Payment: Includes all labor, material, and equipment associated with excavation (includes rock excavation), installation of tapping sleeve and tapping valve, tap of existing line, removal of coupon, installation of associated valve riser (valve box), concrete ring around top of valve box, valve marker, general fill, testing, cleanup and restoration, and all related items.

B. Insertion Valves:

1. Basis of Measurement: Each, unless otherwise noted in the Plans.

2. Basis of Payment: Includes all labor, material, and equipment associated with excavation (includes rock excavation), preparation of pipe at insertion site, and installation of the insertion valve assembly in accordance with the manufacturer's recommendations. Also includes installation of associated valve riser (valve box), concrete ring around top of valve box, valve marker, general fill, testing, cleanup and restoration, and all related items.

C. Water and Sewer Valves:

1. Basis of Measurement: Each, unless otherwise noted in the Plans or if a portion of an assembly.

2. Basis of Payment: Includes all labor, material, and equipment associated with excavation (including rock excavation), connection and placement of valve, joint restraints, installation of associated valve riser (valve box), concrete ring around top of valve box, valve marker, general fill, compaction, cleanup and restoration, testing, and all related items.

D. Pilot Operated Control Valve Assemblies:

1. Basis of Measurement: Per Each or Lump Sum as indicated in the Proposal.

2. Basis of Payment: Includes all labor, material, and equipment associated with excavation (including rock excavation), valve vault, pilot operated control valve, associated internal and external piping as indicated in the plans, associated isolation valves as indicated in the Plans, drain piping as indicated in the Plans, related site work, general fill, compaction, cleanup and restoration, testing, start-up and commissioning services, and all related items.

E. Air Release and Air/Vacuum Valve Assemblies:

1. Basis of Measurement: Each, unless otherwise noted in the Plans or if a portion of an assembly

2. Basis of Payment: Includes all labor, material, and equipment associated with excavation (including rock excavation), vault or manhole for access, air valve assembly, connection to main, connecting internal piping, isolation valves and



valves associated with accessories, drain piping as indicated in the Plans, fill as indicated in the plans, compaction ,cleanup and restoration, testing, and all related items.

- F. Line Stopping Assemblies:
  - 1. Basis of Measurement: Each, unless otherwise noted in the Plans or if a portion of an assembly
  - 2. Basis of Payment: Includes all labor, material, and equipment associated with excavation (including rock excavation), preparation of pipe at the location to be stopped off, and the installation of a temporary line stopping assembly in accordance with the manufacturer's recommendations. Also includes a concrete line stop support (with pipe wrapped with visqueen or polywrap) according to the manufacturer's requirements, but with minimum dimensions of 2 feet from both ends and sides of the assembly and a depth from the spring line to 2 feet below the main.

#### 1.4 SUBMITTALS

- A. Section 01330 - Submittal Procedures.
- B. Shop Drawing:
  - 1. Installation Plan: Submit description of proposed installation.
- C. Design Data: Submit manufacturer's latest published literature include illustrations, installation instructions, maintenance instructions and parts lists.
- D. Manufacturer's Certificates: Submit Statement of Compliance and supporting data, from material suppliers stating that equipment and accessories provided meet or exceed AWWA Standards, NSF 61 certification, and specification requirements.
- E. For Pilot-Operated Control Valves, provide schematic for pilot system operation.
- F. For Insertion Valves or Line Stopping Assemblies, provide proposed procedures.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Section 01700 - Execution Requirements.
- B. Project Record Documents: Record actual locations of valves and appurtenances.
- C. Provide Operation and Maintenance Data for equipment indicating materials of construction, recommended maintenance activities and intervals, procedures for adjustments and troubleshooting, and sources for procurement of replacement parts.
- D. For Pilot-Operated Control Valves, provide certification from manufacturer certifying installation of equipment in accordance with manufacturer's recommendations.
- E. Where the Plans or Special Provisions require such, provide spare parts and maintenance materials to Owner.

## 1.6 QUALITY ASSURANCE

- A. All Products for use in potable water systems shall be NSF 61 certified.

## 1.7 QUALIFICATIONS

- A. Manufacturer:
  - 1. Utilize equipment and materials from Owner's standard list of acceptable manufacturers provided in the Special Provisions. If no such list is provided, utilize equipment and materials from list of acceptable manufacturers provided in these specifications.
  - 2. Company specializing in manufacturing Products specified in this section with minimum three years documented experience.
- B. Installer: Company specializing in performing work of this section with minimum three years documented experience.

## 1.8 DELIVERY, STORAGE AND HANDLING

- A. Section 01600 - Product Requirements.
- B. Prepare valves and accessories for shipment according to AWWA Standards and seal valve ends to prevent entry of foreign matter into product body.
- C. Store products in accordance with manufacturer's written recommendations and instructions, and in areas protected from weather, moisture, or possible damage; do not store products directly on ground.
- D. Handle products in accordance with manufacturer's written recommendations and instructions, and in such a manner as to prevent damage to interior or exterior mechanisms and surfaces.

## 1.9 ENVIRONMENTAL REQUIREMENTS

- A. Section 01600 - Product Requirements.
- B. Conduct operations not to interfere with, interrupt, damage, destroy, or endanger integrity of surface or subsurface structures or utilities, and landscape in immediate or adjacent areas.

## **PART 2 PRODUCTS**

### 2.1 BASIC PROVISIONS FOR GATE, PLUG, BUTTERFLY, AND CHECK VALVES

- A. End Connections: Mechanical joint, flanged, or wafer type as indicated in the Plans. If no such indication is provided, utilize mechanical joint for buried applications and flanged joints for exposed applications. Mechanical joints shall conform to AWWA C111 and shall be provided with retainer gland devices. Flanged joints shall conform to AWWA C115

ANSI B16.1 CL 150 unless noted otherwise and shall be provided with 316 stainless steel nuts and bolts.

- B. Valve operators:
  - 1. Provide gate, plug, and butterfly valves with open-left (counterclockwise) operation.
  - 2. Provide gate valves with non-rising stems unless specifically stated otherwise in the plans.
  - 3. Provide with 2-inch square operating nut for buried applications
  - 4. Provide with handwheel operator for exposed applications with manual opening, or 2-inch square operating nut where electric or pneumatic actuator is utilized.
  - 5. Provide side-mounted right-angle gear reducer on plug and butterfly valves 6-inch and larger, and on gate valves 16 inch and larger.
  
- C. Coatings:
  - 1. Provide fusion-bonded epoxy coating conforming to AWWA C116 on all valves for buried applications.
  - 2. Provide coating in accordance with specification Section 09900 on all valves for exposed applications where this section is included. If section is not included provide bituminous coating.
  
- D. Provide flow direction arrow on all plug and check valves.

## 2.2 TAPPING SLEEVES AND VALVES

- A. Tapping Sleeves:
  - 1. Stainless steel, full circumferential gasket, flanged outlet.
  - 2. Manufacturers:
    - a. Mueller.
    - b. JCM Industries
    - c. Ford Meter Box Co.
    - d. Substitutions: Section 01600 - Product Requirements.
  - 3. Outlet Flange Dimensions and Drilling: AWWA C207 Class D, ANSI 150lb. drilling and MSS SP-60.
  
- B. Tapping Valves:
  - 1. AWWA C515, resilient wedge with non-rising stem. Epoxy coated ductile iron body. Inlet flanges shall conform to ANSI B16.1, Class 150 and MSS SP-60. Mechanical joint outlets shall conform to AWWA C111.
  - 2. Manufacturers:
    - a. Mueller
    - b. M and H
    - c. American Flow Control
    - d. Substitutions: Section 01600 - Product Requirements.

## 2.3 RUBBER SEATED BUTTERFLY VALVES

- A. Manufacturers:
  - 1. Dezurik
  - 2. Pratt
  - 3. Valmatic
  - 4. Substitutions: Section 01600 – Product Requirements
- B. Valve body and disc constructed of ASTM A 536 cast iron (Grade 65-45-12). Valve disc shall be of the solid type.
- C. Valve shaft constructed of ASTM A 276 Type 304 stainless steel.
- D. Resilient seat constructed of Buna-N mated to Type 316 stainless steel body seat ring. Resilient seat shall be located on the valve disc and shall provide a continuous, uninterrupted seating surface.
- E. All retaining hardware constructed of Type 316 stainless steel.
- F. 150 psi maximum working pressure rating unless stated otherwise in the plans.

## 2.4 RESILIENT WEDGE GATE VALVES

- A. Manufacturers:
  - 1. Mueller
  - 2. M and H Valve Co.
  - 3. American Flow Control
  - 4. Substitutions: Section 01600 - Product Requirements.
- B. Resilient Wedge Gate Valves: AWWA C515; ductile iron wedge and body.
  - 1. Resilient seats.
  - 2. Stem: Non-rising bronze stem.
  - 3. Wedge: Ductile iron, completely encapsulated with resilient material.
  - 4. All internal parts shall be accessible without removing the body from the line.
  - 5. 250 psig maximum working pressure rating standard or 350 psi maximum working pressure rating where indicated on the plans.

## 2.5 ECCENTRIC PLUG VALVES

- A. Manufacturers:
  - 1. DeZurik
  - 2. Mueller
  - 3. Pratt
  - 4. Substitutions: Section 01600 – Product Requirements
- B. Solid, one-piece plug constructed of cast iron conforming to ASTM A 126 Class B or ductile iron conforming to ASTM 536 Grade 65-45-12.

- C. Cast iron body conforming to ASTM A 126 Class B with rectangular port. Permanently lubricated sleeve-type bearings constructed of Type 316 stainless steel.
- D. Maximum working pressure rating of at least 175 psi for 12-inch and smaller valves, at least 150 psi for larger valves.

## 2.6 SWING CHECK VALVES

- A. Manufacturers:
  - 1. Dezurik
  - 2. M and H Valve
  - 3. Mueller
  - 4. Pratt
  - 5. Substitutions: Section 01600 – Product Requirements.
- B. Body, disc, and disc arm constructed of ASTM A 536 ductile iron (65-45-12).
- C. Shaft shall be a single piece, constructed of Type 304 stainless steel.
- D. Valve to be of single disc type with full flow passage.
- E. Valve supplied with lever and weight unless plans require oil or air cushioning device.
- F. Valve to have bolted removable cover for cleaning and maintenance.
- G. 200 psi maximum working pressure rating for 3-inch through 12-inch valves, 150 psi for valves larger than 12-inch, unless noted otherwise in the plans.

## 2.7 SILENT CHECK VALVES

- A. Manufacturers:
  - 1. Dezurik
  - 2. Pratt
  - 3. Val-Matic
  - 4. Substitutions: Section 01600 – Product Requirements
- B. Valve body constructed of ASTM A536 ductile iron (65-45-12).
- C. Valve to incorporate a center guided, spring loaded disc, guided at opposite ends and having a short linear stroke that generates a flow area equal to pipe size.
- D. Seat and disc to be cast bronze or aluminum bronze. Compression spring to be Type 316 stainless steel.
- E. Valve to have a replaceable guide bushing held in position by the spring. The spring shall be designed to withstand 100,000 cycles without failure and provide a cracking pressure of 0.5 psi.
- F. Valve disc to be concave to the flow direction.

- G. Leakage rate not to exceed one-half the allowable rate for metal seated valves under AWWA C508 or 0.5 oz per hour per inch of valve diameter.
- H. 250 psi maximum working pressure rating unless noted otherwise in the plans.

## 2.8 INSERTION VALVES

- A. Manufacturers:
  - 1. TEAM Industrial Services
  - 2. Advanced Valve Technologies
  - 3. Hydra-Stop
  - 4. Substitutions: Section 01600 – Product Requirements
- B. Valve body constructed of ASTM A536 ductile iron (65-45-12).
- C. Hardware: 304 Stainless Steel
- D. Seat and disc to be cast bronze or aluminum bronze. Compression spring to be Type 316 stainless steel.
- E. Valve to have a replaceable guide bushing held in position by the spring. The spring shall be designed to withstand 100,000 cycles without failure and provide a cracking pressure of 0.5 psi.
- F. Leakage rate not to exceed one-half the allowable rate for metal seated valves under AWWA C508 or 0.5 oz per hour per inch of valve diameter.
- G. 250 psi maximum working pressure rating unless noted otherwise in the plans.

## 2.9 AIR/VACUUM AND AIR RELEASE VALVES

- A. Manufacturers:
  - 1. ARI, Inc
  - 2. APCO Valve and Primer Company
  - 3. Crispin Valve
  - 4. Valmatic Valve Co.
  - 5. Substitutions: Section 01600 - Product Requirements.
- B. Air release and air/vacuum valves shall be specifically designed by the manufacturer for either clean water service (in the case of finished potable water or other non-solids bearing water systems) or sewage service (in the case of sewerage or other potentially solids bearing systems such as raw water service) as indicated in the plans.
- C. Provide air/vacuum valves, air release valves, or combination air valves having the following functionality as indicated in the plans.
  - 1. Air/Vacuum Valves shall open to exhaust large volumes of air in situations such as pipeline filling and shall also open to admit air for the purpose of relieving internal vacuum conditions in situations such as pipeline draining.

2. Air Release Valves shall open to exhaust small pockets of air while the pipeline is operating under pressure.
  3. Combination Air Valves shall have the functionality of both air/vacuum valves and air release valves and may be of either the single body or dual body configured.
- D. Design Requirements:
1. Provide Air Release and Combination Air Valves with minimum 5/16-inch orifice for exhausting small pockets of air while pipeline is operating under pressure.
  2. Provide all air valves and all related accessories with pressure ratings equal to or greater than the maximum pipeline working pressure at the location of the air valve installation.
  3. Provide all air valves with low pressure sealing capability equal to or less than 2 psi or, where specifically indicated in the plans, equal to or less than 1 psi.
- E. End Connections:
1. 2-inch and smaller valves: Threaded end connections
  2. Valves larger than 2-inch: Flanged end connections conforming to ANSI B 16.1 CL 125 unless otherwise indicated in the plans.
- F. Accessories:
1. Provide the following accessories with each assembly:
    - a. For clean water service applications:
      - 1) Provide inflow preventing device which prevents entry of external water into the pipeline system through the air inlet / outlet. Device shall allow the entry or exit of air while preventing entry of water.
      - 2) Provide shut-off valve on the inlet side of the valve which allows isolation of the air valve from the pipeline system. Valve shall have the same or greater pressure rating as the pipeline system.
        - a) Utilize bronze ball valves with end connections compatible with air valve inlet connection for 2-inch and smaller air valves.
        - b) Utilize gate valve with end connections compatible with air valve inlet connection for air valves larger than 2 inches.
    - b. For sewage service applications:
      - 1) Provide backflushing accessories as follows:
        - a) Blow-off / drain connection and shut-off valve.
        - b) Clean water supply connection and shut-off valve.
        - c) Backwash supply hose with quick disconnect.
        - d) All shut-off valves shall be bronze, full-ported ball valves.
      - 2) Provide shut-off valve on the inlet side of the valve which allows isolation of the air valve from the pipeline system. Valve shall have the same or greater pressure rating as the pipeline system.
        - a) Utilize bronze ball valves with end connections compatible with air valve inlet connection for 2-inch and smaller air valves.
        - b) Utilize gate valve with end connections compatible with air valve inlet connection for air valves larger than 2 inches.

## 2.10 PILOT OPERATED CONTROL VALVES

- A. Manufacturers:
  - 1. Bermad
  - 2. Cla-Val
  - 3. Watts
  - 4. Substitutions: Section 01600 - Product Requirements
- B. Globe or angle pattern as indicated in the plans with ductile iron body and cover conforming to ASTM A 536. Provide with NSF 61 listed fusion bonded epoxy coating and interior lining. Studs and cover nuts shall be 316 stainless steel.
- C. Stainless steel throttling components.
- D. All trim shall be stainless steel.
- E. Disc and diaphragm assembly shall contain a BUNA-N synthetic rubber seal securely retained on 3-1/2 sides by a disc retainer and disc guide.
- F. End Connections:
  - 1. For main valves larger than 2-inch, provide flanged end connections conforming to ASTM C115 ANSI B16.1 CL 125 unless otherwise indicated in the plans.
  - 2. For main valves 2-inch and smaller, threaded end connections may be utilized if approved by the Engineer.
- G. Pilot system:
  - 1. Regulators, fittings, and valves shall be constructed of stainless steel. Pilot system tubing shall be constructed of braided, flexible stainless steel tubing. All components of the pilot system shall have a working pressure rating in excess of the anticipated pressure conditions shown on the plans.
  - 2. Operation range suitable for the pressure range indicated in the plans.
  - 3. Provide with an external Y-strainer, adjustable opening and closing speed components, and ball-type isolation cock valves.
  - 4. All wetted surfaces contacted by consumable water shall contain less than 0.25% lead by weight.
  - 5. Pilot system manufactured and assembled by the same company as the main valve.
- H. Accessories:
  - 1. Provide brass or stainless steel engraved nameplate for each control valve and associated pilot securely affixed to the associated component. Nameplate shall indicate the following information as applicable:
    - a. Catalog and serial number
    - b. Function, size, material, and pressure rating
    - c. Type of pilot control system used and control adjustment range
  - 2. Where indicated in the plans, provide valve position indicating post.
  - 3. Where indicated in the plans, provide pressure gauges as follows:
    - a. 4-inch diameter, glycerin-filled stainless steel with the pressure measurement range as indicated in the plans.



- b. Provide with threaded connections and stainless steel connecting tubing and fittings.
  - c. Minimum of ½” diameter tap size or larger where indicated in the plans.
  - d. Provide with quarter-turn ball shut-off valves.
  - e. Provide with pulsation damper where indicated in the plans.
4. Where indicated in the plans, provide main-line strainer:
- a. Provide the same size as the control valve and installed immediately upstream from the control valve.
  - b. Ductile iron body with epoxy coating matching that of the control valve body.
  - c. Flanged end connections sized to match those of the associated control valve.
  - d. Incorporate stainless steel screen which is removable for replacement or maintenance without removing the strainer body.
  - e. NSF-61 certified.
  - f. Assembly rated for the same working pressure as the control valve.
5. Where indicated in the plans, provide accessories, trim, and configuration which reduces internal cavitation.
6. Where required for valve function, provide solenoids suitable for operation on 120V single-phase AC power, with NEMA IV enclosure and manual operator unless indicated otherwise in the plans.

I. Control Valve Operations and Functionality:

1. Control valves of the following types shall function through a pilot control system as follows:
- a. Pressure Reducing Valves – Automatically reduce a varying upstream pressure to an operator-adjustable constant downstream pressure set point, regardless of flow rate. A decrease in downstream pressure shall cause the main valve to increase its opening, thereby increasing the downstream pressure toward the set point. An increase in downstream pressure shall cause the main valve to decrease its opening, thereby decreasing the downstream pressure toward the set point. Where specifically indicated in the plans, provide an internal check feature which prevents flow from downstream to upstream via the pilot control system.
  - b. Pressure Relief Valves – Remain closed while upstream pressure is below an operator-adjustable set point. Open to exhaust water and relieve pressure when upstream pressure exceeds the set point.
  - c. Surge Anticipator Valves – Automatically open a pre-set amount upon upstream pressure falling below an operator adjustable set point in anticipation of oncoming surge. Automatically close upon pressure rising above set point.
  - d. Pressure Sustaining Valves – Automatically maintain upstream pressure at an operator-adjustable set point with varying downstream pressure, regardless of flow rate. A decrease in upstream pressure shall cause the main valve to decrease its opening, thereby decreasing the flow rate and increasing upstream pressure toward the set point. An increase in upstream pressure shall cause the main valve to increase its opening, thereby increasing the flow rate and decreasing the upstream pressure toward the set point.

- e. Single Acting Altitude Valves – Remain fully open until the water level in a downstream reservoir or tank reaches an operator-adjustable level setpoint, then close fully. Upon the water level in the downstream tank or reservoir falling a pre-set distance, re-open fully. This valve shall be designed for one-way flow only.
- f. Double Acting Altitude Valve – Remain fully open until the water level in a downstream reservoir or tank reaches an operator-adjustable level set point, then close fully. Upon either pressure on the upstream side falling below an operator-adjustable set point, or, the water level in the downstream reservoir or tank falling a pre-set distance, re-open fully. This valve shall be designed for two-way flow.
- g. Solenoid-Controlled Open / Close Valve – Either open or close pilot system in response to a changing electrical current to the solenoid, which in turn either opens or closes the main valve. Solenoid shall be either normally open (open upon loss of electrical signal) or normally closed (close upon loss of electrical signal) as indicated in the plans.
- h. Solenoid-Controlled Booster Pump Control Valve – Pump operation shall begin with the control valve closed. Upon pump start-up, simultaneously energize solenoid and begin opening the main valve slowly, as controlled by the opening speed control. Upon signal to shut-down pump, maintain the pump running, de-energize the solenoid, and begin slowly closing the main valve, as controlled by the closing speed control. Upon main valve reaching the fully-closed position, a limit switch shall release a valve / pump interlock, and the pump shall shut down. Where indicated in the plans an internal check feature shall be provided to prevent reverse flow.
- i. Solenoid-Controlled Deep Well Pump Control Valve – Pump operation shall begin with the valve open. Upon pump start-up, simultaneously energize solenoid and begin closing the main valve slowly, as controlled by the closing pump speed control. Upon signal to shut down the pump or upon loss of power, the solenoid is de-energized, and the main valve begins to open slowly, as controlled by the opening speed control. Upon the main valve reaching the fully open position,

## 2.11 LINE STOPPING ASSEMBLIES

- A. Manufacturers:
  - 1. JCM Industries
  - 2. Substitutions: Section 01600 – Product Requirements
- B. Blind Flange: 150 lb, ASTM A36 Carbon Steel, Epoxy Coated
- C. Blind Flange Gasket: Styrene-Butadiene Rubber (SBR) compounded for use with water
- D. Gasket: Nitrile Butadiene Rubber (NBR, Buna-N) per ASTM D2000
- E. Bolts and Hardware: Stainless Steel 18-8 Type 304
- F. Finish: Fusion applied Epoxy Coating per ANSI/AWWA C213 Standard

## 2.12 ACCESSORIES

- A. Valve Boxes for Buried Valves:
1. 12-inch diameter valves and smaller: Domestic cast iron, two-piece, screw type for height adjustment.
  2. Valves larger than 12-inch: Domestic cast iron, three-piece, screw type for height adjustment.
  3. For either size condition, provide 6-inch ductile iron pipe riser sections as required for additional height where standard is insufficient.
  4. Provide with cast iron lid marked "Water" or "Sewer" as applicable
- B. Valve Markers for Buried Valves:
1. Provide fiberglass marker (either round or flat) or concrete monument as required in the plans. If no such indication is present, provide flat fiberglass marker.
  2. For fiberglass markers, provide either blue color for potable water or green color for sewer. Provide with Owner's standard labeling information as indicated in the plans or specifications. If no such information is present, provide minimum labeling as follows:
    - a. "Warning – Water (Sewer) Pipeline Below"
    - b. Notification to contact 811 service before digging
    - c. Owner's emergency contact information.
  3. For concrete markers, provide dimensions as indicated in the plans. Provide with markings as shown in the plans. If no such information is present, provide minimum information as follows:
    - a. "Water (Sewer) Valve"
- C. Valve Operating Nut Stem Extensions:
1. For buried valves where the valve operating nut is greater than 48-inches below the top of the valve box, provide a stainless steel stem extension designed to fit snugly and securely onto operating nut and with 2-inch square top operating nut designed to fit into standard valve wrench. Provide length as required so that top of operating nut is between 12 and 36 inches below the top of the valve box.
  2. For non-buried valves, provide stainless steel stem extensions and appropriate mounting brackets / guides where indicated in the plans. For applications where electric or pneumatic actuators are utilized, extensions shall be suitably sized to withstand torque imparted by actuator.
- D. Post Type Position Indicators:
1. Manufacturers:
    - a. Mueller
    - b. M and H Valve
    - c. American Flow Control
    - d. Substitutions: Section 01600 - Product Requirements.
  2. Vertical Indicator Post designed to operate a non-rising stem gate valve with above ground visual indication of valve position (open or shut).
  3. Indicator post shall feature a telescoping stem that can be adjusted to its final position without field cutting of the stem.

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

- A. Section 01300 - Administrative Requirements.
- B. Determine exact location, configuration, features, and size of valves and accessories from the Plans; obtain clarification and directions from Engineer prior to execution of work.
- C. Verify invert elevations of existing work prior to excavation and installation.

### **3.2 PREPARATION**

- A. Identify required lines, levels, contours and datum locations.
- B. Locate, identify, and protect utilities to remain from damage.
- C. Do not interrupt existing utilities without permission and without making arrangements to provide temporary utility services.

### **3.3 INSTALLATION**

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

### **3.4 EQUIPMENT START-UP AND COMMISSIONING**

- A. For pilot-operated control valves, provide on-site services of a manufacturer-certified start-up technician to initially establish set points prior to start-up and make adjustments to equipment as necessary following initial start-up. Start-up technician shall instruct Owner's staff on operation, maintenance and adjustments of equipment. Services shall be provided for a minimum of 8 hours on-site per control valve, and additionally as necessary if there are difficulties associated with the start-up, at no additional cost to the Owner.

### **3.5 DISINFECTION OF POTABLE WATER PIPING SYSTEM**

- A. Flush and disinfect system in accordance with Section 02516.

END OF SECTION

**SECTION 02230**  
**SITE CLEARING**

**PART 1 GENERAL**

1.1 SUMMARY

- A. Section Includes:
  - 1. Removing surface debris.
  - 2. Removing designated paving, curbs, and culverts.
  - 3. Removing designated trees, shrubs, and other plant life.
  - 4. Removing abandoned utilities.
  - 5. Excavating topsoil.
- B. Related Sections:
  - 1. Drawings and general provisions of the Contract including General and Supplemental General Conditions, and Technical Specifications.

1.2 SUBMITTALS

- A. Section 01330 - Submittal Procedures.
- B. Product Data: Submit data for herbicide. Indicate compliance with applicable codes for environmental protection.

1.3 QUALITY ASSURANCE

- A. Conform to applicable codes for environmental requirements, disposal of debris, burning debris on site, use of herbicides, and disposal of sludge.

**PART 2 PRODUCTS**

Not Used.

**PART 3 EXECUTION**

3.1 EXAMINATION

- A. Section 01300 - Administrative Requirements.
- B. Verify existing plant life designated to remain is tagged or identified.

3.2 PREPARATION

- A. Call Alabama One Call service at 1-800-292-8525 or 811 not less than three working days before performing Work.

1. Request underground utilities to be located and marked within and surrounding construction areas.

### 3.3 PROTECTION

- A. Locate, identify, and protect utilities indicated to remain, from damage.
- B. Protect trees, plant growth, and features designated to remain.
- C. Protect bench marks, survey control points, and existing structures from damage or displacement.

### 3.4 CLEARING

- A. Clear areas required for access to site and execution of Work to minimum depth of 12 inches.
- B. Remove trees and shrubs within indicated areas. Remove stumps, surface rock, and fences.
- C. Clear undergrowth and deadwood, without disturbing subsoil.
- D. Apply herbicide to remaining stumps to inhibit growth.

### 3.5 REMOVAL

- A. Remove debris, rock, and extracted plant life from site.
- B. Partially remove paving, curbs, and gutters. Neatly saw cut edges at right angle to surface.
- C. Remove abandoned utilities. Indicated removal termination point for underground utilities on Record Documents.
- D. Continuously clean-up and remove waste materials from site. Do not allow materials to accumulate on site.
- E. Do not burn or bury materials on site. Leave site in clean condition.

### 3.6 TOPSOIL EXCAVATION

- A. Excavate topsoil from areas to be further excavated, relandscaped, or regraded, without mixing with foreign materials for use in finish grading.
- B. Do not excavate wet topsoil.
- C. Stockpile in area designated on site to depth not exceeding 8 feet and protect from erosion. Stockpile material on impervious material until disposal.
- D. Remove excess topsoil not intended for reuse, from site.

### 3.7 SITE RESTORATION

- A. Restore all areas disturbed by the construction activities to pre-construction conditions or better.
- B. Restore areas to satisfaction of Owner and Land Owner if work has occurred on private property.
- C. If preconstruction documentation of existing conditions has not been performed, restore areas to complete satisfaction of Owner and Land Owner at no additional cost to Owner.
- D. Restore paved or unpaved streets, roads, sidewalks, curbs, etc. disturbed by the construction activities to preconstruction conditions or better using materials and workmanship conforming to requirements of Owner, City or Alabama Department of Transportation, whichever applies.
- E. Maintain seeded areas and re-seed as needed until a stand of grass satisfactory to the Owner is established.

END OF SECTION

## SECTION 02300

### EARTHWORK

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Preparing of subgrade and grading for buildings, slabs, walks, embankments, slopes and pavements.
  - 2. Excavating and backfilling of utility trenches.
- B. Related Documents
  - 1. Drawings and general provisions of the Contract including General and Supplemental General Conditions, and Technical Specifications.

##### 1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

- A. Base Material:
  - 1. Basis of Measurement: Cubic Yard
  - 2. Basis of Payment: Includes all labor, material, and equipment associated with placing the specified base material in accordance with the requirements outlined in this Section and/or in the Plans.
- B. Aggregate:
  - 1. Basis of Measurement: Cubic Yard
  - 2. Basis of Payment: Includes all labor, material, and equipment associated with placing the specified aggregate material in accordance with the requirements outlined in this Section and/or in the Plans.
- C. Structural Fill:
  - 1. Basis of Measurement: Cubic Yard
  - 2. Basis of Payment: Includes all labor, material, and equipment associated with placing structural fill material in accordance with the requirements outlined in this Section and/or in the Plans.
- D. General Fill:
  - 1. Basis of Measurement: Cubic Yard
  - Basis of Payment: Includes all labor, material, and equipment associated with placing general fill material in accordance with the requirements outlined in this Section and/or in the Plans.

##### 1.3 REFERENCES

- A. American Association of State Highway and Transportation Officials:
  - 1. AASHTO R 18 – Establishing and Implementing a Quality System for Construction Materials Testing Laboratories.



- B. ASTM International:
1. ASTM D 698 – Standard 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>)).
  2. ASTM D 1556 – Standard Test Method for Density and Unit Weight of Soil in place by the Sand-Cone Method
  3. ASTM D 1557 – Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>)).
  4. ASTM D 2487 – Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).
  5. ASTM D 2922 – Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (shallow depth).
  6. ASTM D 2937 – Standard Test Method for Density of Soil in Place by the Drive-Cylinder Method
  7. ASTM D 3017 – Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (shallow depth).
  8. ASTM D 4318 – Standard Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils
  9. ASTM D 4959 – Standard Test Method for Determination of Water (Moisture) Content of Soil by Direct Heating.
  10. ASTM D 6913 Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis
  11. ASTM D 7830 Standard Test Method for In-Place Density and Water Content of Soil Using an Electromagnetic Soil Density Gauge

#### 1.4 DEFINITIONS

- A. Excavation: Removal of material encountered to subgrade elevations indicated and subsequent disposal of materials removed.
- B. Unauthorized excavation: Removal of materials beyond indicated subgrade elevations or dimensions without specific direction of Engineer. Unauthorized excavation, as well as remedial work directed by the Engineer, shall be at the Contractor's expense.
1. Under footings, foundation bases, or retaining walls, fill unauthorized excavation by extending indicated bottom elevation of footing or base to excavation bottom, without altering required top elevation. Lean concrete fill may be used to bring elevations to proper position, when acceptable to Engineer.
  2. In locations other than those above, backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by the Engineer.
- C. Additional Excavation: When excavation has reached required subgrade elevations, notify Engineer, who will evaluate conditions. If Engineer determines that bearing materials at required subgrade are unstable, continue excavation until suitable bearing materials are encountered and replace excavated material as directed by Engineer. The Contract Sum may be adjusted by an appropriate Contract Modification.
1. Removal of unsuitable material and its replacement as directed will be paid on basis of Conditions of the Contract relative to changes in work.
- D. Subgrade: The undisturbed soil or rock, or the compacted fill layer immediately below structures, granular base, drainage fill, or topsoil materials.

- E. Structures: Buildings, foundations, slabs, tanks, pavements, gravel drives or road, walks, curbs, cut slopes, fill embankments, utilities, or other man-made stationary features occurring above or below ground surface.
- F. Structural Areas: Those plan locations containing a structure plus a minimum of 5 feet beyond the outside edge of the structure including appurtenances or as defined elsewhere in the project documents.
- G. Structural Fill: Materials placed as fill in Structural Areas.

## 1.5 SUBMITTALS

- A. Section 01330 - Submittal Procedures.
- B. Materials Source: Submit name of imported materials source.
- C. Test Reports: All test reports must be completed under the supervision of a registered engineer, licensed in the state in which the project is located. Contractor will notify testing agency a minimum of 24 hours prior to performing work that requires testing. Submit the following test reports directly to Engineer, with copy to Contractor:
  - 1. Test reports on borrow material. (ASTM D-2487, 4318, 6913)
  - 2. Verification of each foundation bearing surface in accordance with specified requirements.
  - 3. Field reports of in-place density tests.
  - 4. One optimum moisture-maximum density curve for each type of soil encountered. (ASTM D-698 or ASTM D-1557)
  - 5. Subgrade evaluation report for all structural areas prior to fill placement and after establishing final subgrade, but prior to pavement or building slab construction.

## 1.6 QUALITY ASSURANCE

- A. Furnish each soil material from single source throughout the Work.
- B. Codes and Standards: Perform excavation work in compliance with applicable requirements of authorities having jurisdiction.
- C. Testing and Inspection Service: Contractor will employ and pay for a qualified independent geotechnical testing and inspection laboratory in accordance with Section 01200 to perform soil testing and inspection service during earthwork operations. Laboratory shall be selected by the Engineer.
- D. Testing Laboratory Qualifications: To qualify for acceptance, the geotechnical testing laboratory must demonstrate to Engineer's satisfaction, based on evaluation of laboratory submitted criteria conforming to AASHTO R18, that it has the experience and capability to conduct the required field and laboratory geotechnical testing.

## 1.7 PROJECT CONDITIONS

- A. Site Information: Data in subsurface investigation reports (if performed) was used for the basis of the design and are available to the Contractor for information only. Conditions noted in the report(s) are not intended as representations or warranties of accuracy or

continuity between soil borings. The Owner and Engineer will not be responsible for interpretations or conclusions drawn from this data by Contractor.

1. Additional test borings and other exploratory operations may be performed by Contractor, at the Contractor's option; however, no change in the Contract Sum will be authorized for such additional exploration.
- B. Existing Utilities: Locate existing underground utilities in areas of excavation work. If utilities are indicated to remain in place, provide adequate means of support and protection during earthwork operations.
1. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility owner immediately for directions. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner at no expense to the Owner.
  2. Do not interrupt existing utilities serving facilities occupied by Owner or others during occupied hours, except when permitted in writing by Engineer and then only after acceptable temporary utility services have been provided.
    - a. Provide minimum of 48-hour notice to Engineer and receive written notice to proceed before interrupting any utility.
  3. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies for shutoff of services if lines are active. Resultant excavations must be backfilled in lifts and tested in accordance with the project requirements.
- C. Use of Explosives: Use of explosives is permitted. See Section 02316.
- D. Jobsite safety and conformance to applicable codes and guidelines to protect persons and property is solely the responsibility of the contractor.
1. Excavate in accordance with OSHA guidelines. Barricade open excavations.
  2. Operate safety barriers, markings and warning lights as required to maintain a safe work environment and as recommended by authorities having jurisdiction.
  3. Protect structures, utilities, sidewalks, pavements, and other facilities to remain from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
  4. Perform excavation by hand within dripline of large trees to remain. Protect root systems from damage or dryout to the greatest extent possible. Maintain moist condition for root system and cover exposed roots with moistened burlap.

## **PART 2 PRODUCTS**

- A. Base Material: Naturally or artificially graded mixture of crushed gravel or stone, sand or select granular materials conforming to the Department of Transportation requirements for the state in which the project is located.

- B. Aggregate: Graded fine or coarse aggregates as specified in Section 02060.
- C. Structural Fill: On or off-site soil free of rock or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter. Material shall have a liquid limit of 50 or less, a plasticity index of 25 or less, less than 20% rock fragments retained on a 3/4" sieve, and a maximum dry density of at least 100 pcf. May also consist of Aggregate Type A2, Type A3 or Crushed Aggregate Base Course.
- B. General Fill: On or off-site soil and/or rock which is stable and can be compacted to the specified density. Rock fragments shall be less than 4 inches in largest dimension and blended with sufficient fines to create a dense fill mass free of visible voids.

## **PART 3 EXECUTION**

### **3.1 EXCAVATION**

- A. Excavate topsoil from areas designated. Strip topsoil to full depth of topsoil in designated areas as directed by the Engineer.
- B. Stockpile excavated material meeting requirements for satisfactory soil materials and topsoil materials.
- C. Remove excess excavated material not intended for reuse from site.
- D. Excavate to subgrade elevations or cut line as indicated, regardless of character of materials and obstructions encountered, including rock, existing structures, and utilities. Subsurface materials are unclassified.

### **3.2 STABILITY OF EXCAVATIONS**

- A. General: Comply with local codes, ordinances, and requirements of agencies having jurisdiction. Design of retaining structures must be performed, signed and sealed by a registered engineer licensed in the state in which the project is located.
- B. Slope sides of excavations to comply with local codes, ordinances, and requirements of agencies having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated. Maintain sides and slopes of excavations in safe condition until completion of backfilling.
- C. Shoring and Bracing: Provide materials for shoring and bracing, such as sheet piling, uprights, stringers, and cross braces, in good serviceable condition. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Extend shoring and bracing as excavation progresses.
  - 1. Provide permanent steel sheet piling or reinforced concrete drilled shaft walls wherever subsequent removal of retaining structure might permit lateral movement of soil under adjacent structures. Cut off tops a minimum of 2'-6" below final grade and leave permanently in place.

### 3.3 DEWATERING

- A. Prevent surface water and subsurface or ground water from flowing into excavations and from flooding project site and surrounding area.
  - 1. Do not allow water to accumulate in excavations or in foundation excavations prior to or following footing construction. Remove water to prevent softening of foundation boring soils, undercutting footings, and soil changes detrimental to stability of the subgrade and foundations. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.
  - 2. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rain water and water removed from excavations to collecting or runoff areas. Do not use trench excavations as temporary drainage ditches.
  - 3. Dewater excavations only as necessary for suitable construction. Do not continue dewatering overnight or for an extended period of time except as required.

### 3.4 STORAGE OF EXCAVATED MATERIALS

- A. Stockpile excavated materials acceptable for backfill and fill where directed. Place, grade, and shape stockpiles for proper drainage. Stabilize in accordance with ADEM and NPDES regulations.
  - 1. Locate and retain soil materials away from edge of excavations. Do not store within drip line of trees indicated to remain.
  - 2. Dispose of excess excavated soil material and materials not acceptable for reuse as backfill or fill.

### 3.5 EXCAVATION FOR STRUCTURES

- A. Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10 foot, and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, and other construction and for inspection.
  - 1. Excavations for footings and foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before concrete reinforcement is placed. Trim sides and bottom to required lines and grades. Compact with hand or remote operated equipment to leave solid base to receive other work.
  - 2. For pile foundations, stop excavations from 6 inches to 12 inches above bottom of cap before piles are placed. After piles have been placed, remove loose and displaced material. Excavate to final grade, leaving solid base to receive concrete pile caps.
  - 3. Excavations for soil supported foundations must be neat, clean and dry. Remove loose, disturbed and soft soil. Dewater only as necessary for proper construction.

### 3.6 EXCAVATION FOR PAVEMENTS

- A. Cut surface under pavements to comply with cross-sections, elevations and grades as indicated.

### 3.7 TRENCH EXCAVATION FOR PIPES AND CONDUIT

- A. Excavate trenches to uniform width, sufficiently wide to provide ample working room and a minimum of 36 inches total width.
- B. Excavate trenches and conduit to depth indicated or required to establish indicated slope and invert elevations and to support bottom of pipe or conduit on structural fill or undisturbed soil and bedding material. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.
  - 1. Where rock is encountered, refer to Section 02316 – Rock Removal. No direct payment will be made for rock removal, unless specified in other sections.
  - 2. For pipes or conduit in all other soil conditions, refer to Section 02324 – Utility Trenching.

### 3.8 COLD WEATHER PROTECTION

- A. Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees F.
- B. Do not place frozen soil fill.

### 3.9 BACKFILL AND FILL

- A. General: Place soil material in uniform, horizontal lifts as required to final subgrade elevations. Compact individual lifts uniformly to specified density prior to placing the subsequent lift. For each area classification listed below, use materials specified in Part 2 of the Section.
  - 1. In non-structural areas, use general fill. The final lift shall be the required thickness of topsoil.
  - 2. In structural areas, use structural fill or aggregate. The final lift shall be as indicated on the plans.
  - 3. Under utilities, use aggregate as indicated on the plans in areas determined by the Engineer to be unsuitable for pipe bedding. Shape excavation bottom to fit bottom 90 degrees of cylinder.
  - 4. Backfill trenches with concrete where trench excavations pass within 18 inches of column or wall footings or that are carried below bottom of such footings or that pass under wall footings. Place concrete to level of bottom of adjacent footing.
    - a. Concrete is specified in Section 03300.
    - b. Do not backfill trenches until tests and inspections have been made and backfilling is authorized by Engineer. Use care in backfilling to avoid damage or displacement of pipe systems.
  - 5. Provide 4-inch-thick concrete base slab support for piping or conduit less than 24" below surface of roadways. After installation and testing of piping or conduit, provide minimum 4-inch-thick encasement (sides and top) of concrete prior to backfilling or placement of roadway base.

- B. Backfill excavations as promptly as work permits, but not until completion of the following:
1. Acceptance of construction below finish grade including, where applicable, damp proofing, waterproofing, and perimeter insulation.
  2. Inspection, testing, approval, and recording locations of underground utilities have been performed and recorded.
  3. Removal of concrete formwork.
  4. Removal of shoring and bracing, and backfilling of voids with satisfactory materials. Cut off temporary sheet piling driven below bottom of structures and remove in manner to prevent settlement of the structure or utilities, or leave in place if required.
  5. Removal of trash and debris from excavation.
  6. Permanent or temporary horizontal bracing is in place on horizontally supported walls.

### 3.10 PLACEMENT AND COMPACTION

- A. Ground Surface Preparation: Remove vegetation, debris, topsoil, obstructions, underground structures (foundations, slabs, walls and utilities), and deleterious materials from area prior to placement of fills. Backfill disturbed areas with compacted and tested fill. Contractor shall notify Engineer to evaluate the natural ground prior to fill placement. Where access permits, Contractor shall provide pneumatic-tired equipment capable of producing the pressure equal to that produced by a fully-loaded, tri-axle dump truck for use in evaluation.
1. When existing ground exhibits instability, scarify ground surface, moisture-condition to within 2% of the optimum moisture content, and compact to the project requirements. Alternatively, remove and replace unstable soils with suitable, compacted soils or stabilize at the direction of the Engineer.
  2. Bench sloped surfaces steeper than 1 vertical to 4 horizontal so that fill material will bond with existing surface. Benches shall consist of alternating horizontal and vertical soil surfaces in the original ground with horizontal benches no more than 5 feet apart vertically.
  3. Overbuild slopes and cut back to the desired configuration to ensure the soils at the slope face are properly compacted and tested.
- B. In structural areas, place structural fill or aggregate in layers not more than 8 inches in loose thickness for material compacted by heavy compaction equipment, and not more than 4 inches in loose-thickness for material compacted by hand-operated tampers. In non-structural areas, place general fill in maximum 24" thick lifts.
- C. In structural areas, before compaction, moisten or aerate each layer of fill as necessary to provide moisture content within the fill at  $\pm 2\%$  of the optimum moisture content. Compact each layer to required percentage of maximum dry density for each area classification. Do not place structural fill on surfaces that are muddy, frozen, or contain frost or ice.
- D. Place backfill and fill materials evenly adjacent to structures, piping, or conduit to required elevations. Prevent wedging action of backfill against structures or displacement of piping

or conduit by carrying material uniformly around structure, piping, or conduit to approximately same elevation in each lift.

- E. Control soil and fill compaction, providing minimum percentage of density specified for each area classification indicated below. Correct improperly compacted areas or lifts as directed by Engineer if soil density tests indicate inadequate compaction.
1. Percentage of Maximum Standard Proctor Density Requirements:
    - a. Structural Areas: Compact each individual lift of structural fill and fine aggregate to not less than 98% of the maximum standard Proctor density in accordance with ASTM D-698. Compact each individual lift of coarse aggregate using multiple passes of a vibratory compactor or as directed by the Engineer.
    - b. Non-Structural Areas: Compact each individual lift using multiple passes of a compactor designed for the type of soils used as fill or backfill.
  2. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade or layer of soil material. Apply water in minimum quantity as necessary to prevent free water from appearing on surface during or subsequent to compaction operations.
    - a. Remove and replace, or scarify and air dry soil material that is too wet to permit compaction to specified density.
    - b. Stockpile or spread soil material that has been removed because it is too wet to permit compaction. Assist drying by discing, harrowing, or pulverizing until moisture content is reduced to a satisfactory value.

### 3.11 GRADING

- A. General: Uniformly grade areas within limits of grading under this section, including adjacent transition area. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are indicated or between such points and existing grades.
- B. Grading Outside Building Lines: Grade areas adjacent to building lines to drain away from structures and to prevent ponding. Finish surfaces free from irregular surface changes and as follows:
1. Lawn or Unpaved Areas: Finish areas to receive topsoil to within not more than 0.10 foot above or below required subgrade elevations.
  2. Walks: Shape surface of areas under walks to line, grade, and cross-section, with finish surface not more than 0.10 foot above or below required subgrade elevation.
  3. Pavements: Shape surface of areas under pavement to line, grade, and cross-section, with finish surface not more than ½ inch above or below required subgrade elevation.
- C. Grading Surface of Fill under Building Slabs: Grade smooth and even, free of voids, compacted as specified, and to required elevation. Provide final grades within a tolerance of ½ inch.
- D. Compaction: After grading, compact subgrade surfaces to the depth and indicated percentage of maximum or relative density for each area classification.



### 3.12 PAVEMENT BASE COURSE

- A. General: Base course consists of placing base material in layers of specified thickness, over subgrade surface to support a pavement base course.
  - 1. Refer to other Division 2 sections for paving specifications.
- B. Grade Control: During construction, maintain lines and grades including crown and cross-slope of base course.
- C. Shoulders: Place shoulders along edges of base course to prevent lateral movement. Construct shoulders of acceptable soil materials, placed in such quantity to compact to thickness of each base course layer. Compact and roll at least a 12-inch width of shoulder simultaneous with the compaction and rolling of each layer of base course.
- D. Placing: Place base course material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting base material during placement operations.
  - 1. When a compacted base course is indicated to be 6 inches thick or less, place material in a single layer. When indicated to be more than 6 inches thick, place material in equal layers, except no single layer more than 6 inches or less than 3 inches when compacted.
  - 2. Compact individual lifts of the base to a minimum of 100% of the ASTM D-1557 maximum dry density at  $\pm 2\%$  of the optimum moisture content.

### 3.13 BUILDING SLAB DRAINAGE COURSE

- A. General: Drainage course consists of placing aggregate in layers of indicated thickness over subgrade surface to support concrete building slabs.
- B. Placing: Place aggregate on prepared subgrade in layers of uniform thickness, conforming to the indicated cross-section and thickness. Maintain optimum moisture content for compacting material during placement operations.
  - 1. When a compacted drainage course is indicated to be 6 inches thick or less, place material in a single layer. When indicated to be more than 6 inches thick, place material in equal layers, except no single layer shall be more than 6 inches or less than 3 inches when compacted.
  - 2. Compact the individual lifts of the drainage course with a vibratory compactor as directed by the Engineer.

### 3.14 FIELD QUALITY CONTROL

- A. Quality Assurance consisting of testing and observation of a limited sampling of construction materials will be paid for using the testing allowance for acceptance purposes. Passing test results are not a warranty, guarantee, or certification by the testing agency, Engineer, or Owner that all work was performed in conformance with the plans and specifications. Therefore, the Contractor should not rely solely on test results generated by the quality assurance process as an indication of the suitability of the construction.
- B. It is entirely the Contractor's responsibility to perform quality control as necessary to construct the project in conformance with the plans and specifications. Deviations from

the plans and specifications, whether identified during construction or following the completion of construction, must be corrected by the Contractor at no cost to the Owner.

- C. Quality Control Testing During Construction: Allow testing service (to be selected by Engineer) to test each subgrade and fill layer before further backfill or construction work is performed.
1. Perform field density tests on each lift of fill in accordance with ASTM D 2937 (Drive Cylinder Method), ASTM D 2922 (Nuclear Method), ASTM D 7830 (Electromagnetic Method), or ASTM D 1556 (sand cone method).
    - a. In conjunction with each density test, the natural moisture content shall be determined in accordance with ASTM D 3017 (nuclear method), ASTM D 4959 (direct heating), ASTM D 7830 (electromagnetic method) or other method approved by the Engineer.
    - b. If field tests are performed using nuclear or electromagnetic methods, make calibration checks using alternate methods of both density and moisture results on each different type of material encountered and at intervals as directed by the Engineer.
  2. Footing Subgrade: For all soil on which footings will be placed, perform tests to verify required design bearing capacities. Engineer shall be notified to observe and approve each footing subgrade. Engineering evaluation may include the excavation of hand augers or test pits. The contractor shall provide suitable equipment to excavate test pits as directed by the Engineer.
  3. Paved Areas and Building Slab Subgrade: Perform at least one field density test per lift for every 2,500 sq. ft. of area, but in no case fewer than three tests.
  4. Foundation Wall Backfill: Perform at least two field density tests on each lift of fill placed at locations directed by the Engineer.
- D. If in opinion of Engineer, based on testing reports or Engineering judgement, subgrade or fill that have been placed are unsuitable, perform additional compaction and testing until specified density is obtained. Do not place additional fill over materials that have not been approved by the Engineer. Work to recompact and retest unsuitable areas will be at the expense of the contractor.

### 3.15 EROSION CONTROL

- A. Provide erosion control methods in accordance with requirements of authorities having jurisdiction and/or as described in the Plans.
- B. Unless otherwise specified in the Plans, the contractor is responsible to apply for and obtain any required permits in the contractor's name associated with current NPDES guidelines. Requirements for implementing and maintaining an acceptable Best Management Practices Plan shall be the responsibility of the contractor. The contractor is responsible to maintain the NPDES permit in good standing with the regulatory authority and comply with applicable NPDES regulations during construction, and terminate permit upon completion and approval at no additional cost to the owner.

### 3.16 MAINTENANCE

- A. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades in settled, eroded, and rutted areas to specified tolerances.
- C. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and compact to required density prior to further construction.
- D. Settling: Where settling is measurable or observable at excavated areas during general project warranty period, remove surface (pavement, lawn, or other finish), add backfill material, compact, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

### 3.17 DISPOSAL OF EXCESS AND WASTE MATERIALS

- A. Removal from Owner's Property: Remove waste materials, including unacceptable excavated material, trash, and debris, and dispose of it off Owner's property.
  - 1. Secure a disposal site and all necessary approvals for use.
  - 2. Remove excess excavated material, trash, debris, and waste materials and dispose of it off Owner's property.
  - 3. Excavated material in area noted on plans shall be screened by geotechnical engineer. If classified "contaminated", it shall be stockpiled and monitored by the contractor at no additional cost.

END OF SECTION

## SECTION 02324

### UTILITY TRENCHING

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Excavating trenches for utilities.
  - 2. Backfilling and compaction.
- B. Related Sections:
  - 1. Drawings and general provisions of the Contract including General and Supplemental General Conditions, and Technical Specifications.

##### 1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

- A. Basis of Measurement and Payment shall be as outlined in Sections related to the specific Utility being installed.

##### 1.3 REFERENCES

- A. American Association of State Highway and Transportation Officials:
  - 1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.
- B. ASTM International:
  - 1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - 2. ASTM D698 - Standard 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>)).
  - 3. ASTM D1556 - Standard Test Method for Density of Soil in Place by the Sand-Cone Method.
  - 4. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>)).
  - 5. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
  - 6. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
  - 7. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

##### 1.4 DEFINITIONS

- A. Utility: Any buried pipe, duct, conduit, or cable.

- B. Structures: Buildings, foundations, slabs, tanks, pavements, walks, curbs, cut slopes, fill embankments, utilities, or other man-made stationary features occurring above or below ground surface.
- C. Structural Areas: Those plan locations containing a structure plus a minimum of 5 feet beyond the outside edge of the structure including appurtenances or as defined elsewhere in the project documents.
- D. Structural Fill: Materials placed as fill in Structural Areas.

#### 1.5 SUBMITTALS

- A. Product Data: Submit data for geotextile fabric indicating fabric and construction.
- B. Materials Source: Submit name of imported fill materials suppliers.

#### 1.6 QUALIFICATIONS

- A. Prepare erosion control plan and submit to Engineer prior to start of construction.
- B. Refer to Section 02374, Erosion Control Devices.

#### 1.7 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

#### 1.8 COORDINATION

- A. Verify Work associated with lower elevation utilities is complete before placing higher elevation utilities.

### **PART 2 PRODUCTS**

#### 2.1 FILL MATERIALS

- A. General fill: As specified in Section 02300.
- B. Aggregate Fill: As specified in Section 02300, Section 02060, and the Plans.
- C. Structural Fill: As specified in Section 02300.
- D. Concrete: Structural concrete as specified in Section 03300 with compressive strength of 3,000 psi.
- E. Lean Concrete: Non-structural concrete with a compressive strength of 2,000 psi.

## **PART 3 EXECUTION**

### **3.1 LINES AND GRADES**

- A. Lay pipes to lines and grades indicated on Drawings.
  - 1. Engineer reserves right to make changes in lines, grades, and depths of utilities when changes are required for Project conditions.
- B. Use laser-beam instrument with qualified operator to establish lines and grades.
- C. Maintain proper horizontal alignment of utilities not laid on grade.

### **3.2 PREPARATION**

- A. Call Alabama One Call service at 1-800-292-8525 not less than three working days before performing Work.
  - 1. Request underground utilities to be located and marked within and surrounding construction areas.
- B. Identify required lines, levels, contours, and datum locations.
- C. Protect plant life, lawns, and other features remaining as portion of final landscaping.
- D. Protect bench marks, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.
- E. Maintain and protect above and below grade utilities indicated to remain.
- F. Establish temporary traffic control and detours when trenching is performed in public right-of-way. Relocate controls and reroute traffic as required during progress of Work.

### **3.3 TRENCHING**

- A. Erect erosion control devices prior to excavation.
- B. Excavate subsoil required for utilities to the depth indicated on the Drawings.
- C. Remove lumped subsoil, boulders, and rock up of 1/6 cubic yard, measured by volume. Remove larger material as specified in Section 02316.
- D. Perform excavation within 24 inches of existing utility in accordance with utility's requirements.
- E. Do not advance open trench more than 400 feet ahead of installed pipe.
- F. Excavate trenches to uniform width, sufficiently wide to provide ample working room and a minimum of 12 inches of clearance on each side of pipe or conduit.
- G. Remove water or materials that interfere with Work.

- H. Excavate trenches and conduit to depth indicated or required to establish indicated slope and invert elevations and to support bottom of pipe or conduit on undisturbed soil and bedding material. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.
- I. Do not interfere with 45 degree bearing splay of building foundations or roadbeds.
- J. When subsurface materials at bottom of trench are loose or soft, notify Engineer, and request instructions.
- K. Cut out soft areas of subgrade not capable of compaction in place. Backfill with Fill Type A1 and compact to density equal to or greater than requirements for subsequent backfill material.
- L. Correct over excavated areas with compacted backfill as specified for authorized excavation or replace with concrete as directed by Engineer.
- M. Remove excess subsoil not intended for reuse, from site.
- N. Maintain trench depth sufficient to provide a minimum cover of 30 inches over utility pipe unless otherwise noted in the Drawings. Maintain a minimum of 36 inches cover under highway ditches.

#### 3.4 STABILITY OF EXCAVATIONS

- A. General: Comply with local codes, ordinances, and requirements of agencies having jurisdiction. Design of retaining structures must be performed, signed and sealed by a registered engineer licensed in the state in which the project is located.
- B. Slope sides of excavations to comply with local codes, ordinances, and requirements of agencies having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated. Maintain sides and slopes of excavations in safe condition until completion of backfilling.
- C. Shoring and Bracing: Provide materials for shoring and bracing, such as sheet piling, uprights, stringers, and cross braces, in good serviceable condition. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Extend shoring and bracing as excavation progresses.
  - 1. Provide permanent steel sheet piling or reinforced concrete drilled shaft walls wherever subsequent removal of retaining structure might permit lateral movement of soil under adjacent structures. Cut off tops a minimum of 2' -6" below final grade and leave permanently in place.
- D. Repair damage caused by failure of the sheeting, shoring, or bracing and for settlement of filled excavations or adjacent soil.

- E. Repair damage to new and existing Work from settlement, water or earth pressure or other causes resulting from inadequate sheeting, shoring, or bracing.

### 3.5 BACKFILLING

- A. Backfill trenches as follows:
  - 1. In non-structural areas, use excavated material to backfill to existing contours and elevations, unless such material does not conform to the requirements of General Fill as outlined in Section 02300. In such instances, borrow material meeting those requirements shall be brought in to backfill the trench. The final lift shall be the required thickness of topsoil.
  - 2. In structural areas, use structural fill as shown on the Plans or as directed by the Engineer. Backfill to elevations reflected on the plans, or to match surrounding grade. The final lift shall be as indicated on the plans. If subgrade is unstable, prepare subgrade beneath pipe in accordance with Section 2300 prior to fill placement.
  - 3. Use aggregate as indicated on the plans in areas determined by the Engineer to be unsuitable for pipe bedding. Shape excavation bottom to fit bottom 90 degrees of cylinder.
  - 4. Backfill trenches with concrete where trench excavations pass within 18 inches of column or wall footings or that are carried below bottom of such footings or that pass under wall footings. Place concrete to level of bottom of adjacent footing.
    - a. Concrete is specified in Section 03300.
    - b. Do not backfill trenches until tests and inspections have been made and backfilling is authorized by Engineer. Use care in backfilling to avoid damage or displacement of pipe systems.
  - 5. Provide 4-inch-thick concrete base slab support for piping or conduit less than 24" below surface of roadways. After installation and testing of piping or conduit, provide minimum 4-inch-thick encasement (sides and top) of concrete prior to backfilling or placement of roadway base.
- B. Place, moisture condition, and compact fill material in accordance with Section 02300.
- C. Employ placement method that does not disturb or damage utilities in trench, or structures near the trench.
- D. Do not leave trench open at end of working day.

### 3.6 PROTECTION OF FINISHED WORK

- A. Reshape and re-compact fills subjected to vehicular traffic during construction.

END OF SECTION



## SECTION 02374

### EROSION CONTROL DEVICES

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Silt Fences.
  - 2. Diversion Channels.
  - 3. Rock Energy Dissipater.
  - 4. Paved Energy Dissipater.
  - 5. Rock Basin.
  - 6. Rock Barriers.
  - 7. Sediment Ponds.
  - 8. Sediment Traps.
  
- B. Related Sections:
  - 1. Drawings and general provisions of the Contract including General and Supplemental General Conditions, and Technical Specifications.

##### 1.2 REFERENCES

- A. American Association of State Highway and Transportation Officials:
  - 1. AASHTO T88 - Standard Specification for Particle Size Analysis of Soils.
  - 2. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.
  
- B. American Concrete Institute:
  - 1. ACI 301 - Specifications for Structural Concrete.
  
- C. ASTM International:
  - 1. ASTM C127 - Standard Test Method for Specific Gravity and Absorption of Coarse Aggregate.
  - 2. ASTM D698 - Standard 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>)).
  - 3. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>)).
  - 4. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
  - 5. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
  
- D. Precast/Prestressed Concrete Institute:
  - 1. PCI MNL-116S - Manual for Quality Control for Plants and Production of Precast and Prestressed Concrete Products.

### 1.3 SUBMITTALS

- A. Section 01330 - Submittal Procedures.
- B. Product Data: Submit data on joint filler joint sealer and geotextile.
- C. Submit Erosion Control Plan along with application for Stormwater NPDES permit to Engineer prior to placement of erosion control devices.
- D. Submit manufacturer's catalog sheets and other pertinent information on filter fabrics showing that they meet or exceed the requirements of this specification.

### 1.4 CLOSEOUT SUBMITTALS

- A. Section 01700 - Execution Requirements.

### 1.5 ENVIRONMENTAL REQUIREMENTS

- A. Section 01600 - Product Requirements.
- B. Do not place grout when air temperature is below freezing.
- C. Do not place concrete when base surface temperature is less than 40 degrees F, or surface is wet or frozen.
- D. Silt fence should not be installed across streams, ditches, waterways, or other concentrated flow areas.

## **PART 2 PRODUCTS**

### 2.1 SILT FENCE MATERIALS

- A. Geotextile fabric shall be a 36" wide, nonwoven filter fabric composed of polypropylene, polyethylene, ethylene, or polyamide material.
- B. Minimum grab strength shall be 100 lbs. in any direction.
- C. Apparent opening size shall be 30 (maximum sieve size).
- D. Flow rate shall be 25 gallons/minute/square foot.
- E. Ultraviolet ray inhibitors and stabilizers shall provide a maximum of 6 months of expected usable life.
- F. Type A silt fence shall include a 36" wide, 12-1/2 gauge galvanized wire fence reinforcement to be placed with the geotextile material. Wire fence shall have openings no larger than 6 inches by 6 inches. Type B silt fence shall be a 36" wide fabric with no wire fence reinforcement.

- G. Fence posts shall be minimum 2" x 2" oak, 60" long or steel T-post for Type B silt fence. Steel T-posts or 4" x 4" pressure treated wood posts shall be required for Type A silt fence. Minimum bury depth for wood posts is 24 inches.

## 2.2 ROCK

- A. Rock: Sound, hard and angular shape; well graded; without shale seams, structural defects and foreign substances; with width and thickness greater than one third its length. Refer to Section 02371.

## 2.3 CONCRETE MATERIALS AND REINFORCEMENT

- A. Concrete: As specified in Section 03300.
- B. Water: Clean and not detrimental to concrete.
- C. Reinforcement Steel: As specified in Section 03200.

## 2.4 BLOCK, STONE, AGGREGATE, AND SOIL MATERIALS

- A. Precast Solid Concrete Block.
- B. Soil Backfill: Soil as specified in Section 02300.

## 2.5 PLANTING MATERIALS

- A. Seeding and Soil Supplements: As specified in Section 02924.
- B. Mulch: As specified in Section 02924.

## 2.6 PIPE MATERIALS

- A. Pipe: Corrugated Plastic (HDPE).

## 2.7 SOURCE QUALITY CONTROL (AND TESTS)

- A. Section 01400 - Quality Requirements.
- B. Perform tests on cement, aggregates, and mixes to ensure conformance with specified requirements.
- C. Make rock available for inspection at producer's quarry prior to shipment. Notify Engineer at least seven days before inspection is allowed.
- D. Allow witnessing of inspections and testing at manufacturer's test facility. Notify Engineer at least seven days before inspections and tests are scheduled.

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

- A. Section 01300 - Administrative Requirements.
- B. Verify location of existing streams, drainage structures and environmentally sensitive areas prior to placing erosion control devices.
- C. Verify compacted subgrade, granular base or stabilized soil is acceptable and ready to support devices and imposed loads.
- D. Verify gradients and elevations of base or foundation for other work are correct.

### **3.2 SILT FENCE**

- A. The silt fence should be purchased in a continuous roll cut to length to avoid the use of joints. When joints are unavoidable, fabric should be spliced together at a post with a minimum 6 inch overlap.
- B. Post installation should start at the center of the low point with remaining posts spaced 10 feet apart for Type A and 7 feet apart for Type B fence.
- C. Anchor fabric by entrenching the bottom edge in a 6 inch deep trench and backfilling.
- D. Hay or straw bales shall be placed at each end of the silt fence.

### **3.3 DIVERSION CHANNELS**

- A. Windrow excavated material on low side of channel.
- B. Compact to 95 percent maximum density.
- C. On entire channel area, apply soil supplements and sow seed as specified in Section 02924.
- D. Mulch seeded areas with hay as specified in Section 02924.

### **3.4 ROCK ENERGY DISSIPATOR**

- A. Excavate to indicated depth of rock lining or nominal placement thickness as follows. Remove loose, unsuitable material below bottom of rock lining, then replace with suitable material. Thoroughly compact and finish entire foundation area to firm, even surface.

NCSA Class	Nominal Placement Thickness
R8	48 inches
R7	36 inches
R6	30 inches
R5	24 inches
R4	18 inches
R3	12 inches

- B. Lay and overlay geotextile fabric over substrate. Lay fabric parallel to flow from upstream to downstream. Overlap edges upstream over downstream and upslope over downslope. Provide a minimum overlap of 3 feet. Offset adjacent roll ends a minimum of 5 feet when lapped. Cover fabric as soon as possible and in no case leave fabric exposed more than 4 weeks.
- C. Carefully place rock on geotextile fabric to produce an even distribution of pieces, with minimum of voids and without tearing geotextile.
- D. Unless indicated otherwise, place full course thickness in one operation to prevent segregation and to avoid displacement of underlying material. Arrange individual rocks for uniform distribution.
  - 1. Saturate rock with water. Fill voids between pieces with grout, for at least top 6 inches. Sweep surface with stiff broom to remove excess grout.
  - 2. Moist cure grouted rock for at least 3 days after grouting, using water saturated burlap in accordance with Section 03300.

### 3.5 PAVED ENERGY DISSIPATER

- A. Excavate to the required paving depth. Remove loose, unsuitable material below bottom of paving, and then replace with suitable material. Thoroughly compact and finish entire foundation area to firm, even surface.
- B. Place forms and hold reinforcement firmly in position during placing of concrete.
- C. Mix, place and finish concrete, as specified in Section 03300.
- D. Embed stones or blocks 4 inches in plastic concrete at indicated separation on slopes and channel bottom.
- E. Pave in uniform 10 foot lengths or sections.
- F. Pave in shorter sections as necessary for closures or curves.
- G. Place premolded expansion joint filler, 1/2 inch thick, cut to conform to paving cross sections, at ends of curved sections at intervals of not more than 100 feet, at end of day's work, and where paving is adjacent to rigid structure. Use joint filler with depth of 1/2 inch less than paving depth and press firmly against adjacent concrete.
- H. Form intermediate joints between sections, with two thicknesses of bituminous paper cut neatly to paving cross section.

### 3.6 ROCK BASIN

- A. Construct generally in accordance with rock energy dissipator requirements to indicated shape and depth. Rock courses may be placed in several operations but minimum depth of initial course must be 3 feet or greater.

### 3.7 ROCK BARRIER

- A. Determine length required for ditch or depression slope and excavate compact and foundation area to firm, even surface.
- B. Produce an even distribution of rock pieces, with minimum voids to the indicated shape, height and slope.
- C. Construct coarse aggregate filter blanket against upstream face of rock barrier to the indicated thickness.

### 3.8 SEDIMENTATION POND

- A. Clear and grub storage area and embankment foundation area site as specified in Section 02230.
- B. Excavate key trench for full length of dam. Excavate emergency spillway in natural ground.
- C. Install pipe spillway, with anti-seep collar attached, at location indicated.
- D. Place forms and reinforcing for concrete footing at bottom of riser pipe with trash rack and anti-vortex device, as specified in Section 03200. Construction of embankment and trench prior to placing pipe is not required.
- E. Mix, place, finish, and cure concrete, as specified in Section 03300.
- F. Do not use coarse aggregate as backfill material around pipe. Backfill pipe with suitable embankment material to prevent dam leakage along pipe.
- G. Construct rock basin at outlet end of pipe, as specified in this Section. Place embankment material, as specified in Section 02300. When required, obtain borrow excavation for formation of embankment, as specified in Section 02300.
- H. On entire sedimentation pond area, apply soil supplements and sow seed as specified in Section 02924.
- I. Mulch seeded areas with hay as specified in Section 02924.

### 3.9 SEDIMENT TRAPS

- A. Clear site, as specified in Section 02230.
- B. Construct trap by excavating and forming embankments as specified in Section 02300.
- C. Place coarse aggregate or rock at outlet as indicated on Drawings.
- D. Place geotextile fabric, as specified for rock energy dissipater.
- E. When required, obtain borrow excavation for formation of embankment, as specified in Section 02300.

- F. On entire sediment trap area, apply soil supplements and sow seed as specified in Section 02924.
- G. Mulch seeded areas with hay as specified in Section 02924.

### 3.10 SITE STABILIZATION

- A. Incorporate erosion control devices indicated on the Drawings into the Project at the earliest practicable time.
- B. Construct, stabilize and activate erosion controls before site disturbance within tributary areas of those controls.
- C. Stabilize any disturbed area of affected erosion control devices on which activity has ceased and which will remain exposed for more than 20 days.
  - 1. During non-germinating periods, apply mulch at recommended rates.
  - 2. Stabilize disturbed areas which are not at finished grade and which will be disturbed within one year in accordance with Section 02924 at 90 percent of permanent application rate with no topsoil.
  - 3. Stabilize disturbed areas which are either at finished grade or will not be disturbed within one year in accordance with Section 02924 permanent seeding specifications.
- D. Stabilize diversion channels, sediment traps, and stockpiles immediately.

### 3.11 FIELD QUALITY CONTROL

- A. Inspect erosion control devices on a weekly basis and after each runoff event. Make necessary repairs to ensure erosion and sediment controls are in good working order.
- B. Sediment should be removed from behind silt fence once it has accumulated to one-half the original height of the barrier. Fabric should be replaced whenever it has deteriorated to such an extent that the effectiveness of the fabric is reduced (approximately six months).
- C. Hay bales shall be replaced every 6 months regardless of condition.
- D. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.
- E. Do not damage structure or device during cleaning operations.
- F. Do not permit sediment to erode into construction or site areas or natural waterways.
- G. Clean channels when depth of sediment reaches approximately one half channel depth.

END OF SECTION

## SECTION 02536

### FORCE MAINS

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Force mains.
  - 2. Bedding and cover materials.
- B. Related Sections:
  - 1. Drawings and general provisions of the Contract including General and Supplemental General Conditions, and Technical Specifications.

##### 1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

- A. Pipe and Fittings:
  - 1. Basis of Measurement: By linear foot.
  - 2. Basis of Payment: Includes hand trimming excavation, backfill, bedding, thrust restraints, pipe, and fittings.

##### 1.3 REFERENCES

- A. American Association of State Highway and Transportation Officials:
  - 1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.
- B. ASTM International:
  - 1. ASTM D698 - Standard 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>)).
  - 2. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>)).
  - 3. ASTM D1785 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
  - 4. ASTM D2241 - Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
  - 5. ASTM D2466 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
  - 6. ASTM D2467 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
  - 7. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
  - 8. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).



- C. American Water Works Association:
  - 1. AWWA C104 - American National Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
  - 2. AWWA C110 - American National Standard for Ductile-Iron and Grey-Iron Fittings, 3 in. through 48 in. (75 mm through 1200 mm), for Water and Other Liquids.
  - 3. AWWA C111 - American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
  - 4. AWWA C151 - American National Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water.
- D. Ductile Iron Pipe Research Association:
  - 1. DIPRA Section 1X, Thrust Restraint.

#### 1.4 SUBMITTALS

- A. Section 01330 - Submittal Procedures: Requirements for submittals.
- B. Shop Drawings: Submit shop drawings for ductile iron pipe. Indicate piece numbers and locations and restrained joint locations.
- C. Product Data: Submit data indicating pipe material used, pipe accessories, restrained joint details and materials.
- D. Design Data: Submit restrained joint design data and calculations for ductile iron pipe establishing lengths of restrained joint piping required.
- E. Manufacturer's Installation Instructions: Indicate special procedures required to install Products specified.
- F. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Section 01700 - Execution Requirements: Requirements for submittals.
- B. Project Record Documents: Record location of pipe runs, connections, and invert elevations.
- C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

#### 1.6 QUALITY ASSURANCE

- A. Design ductile iron pipe restrained joints in accordance with DIPRA Section 1X Standards.

1.7 PRE-INSTALLATION MEETINGS – **Not Required**

- A. Section 01300 - Administrative Requirements.
- B. Convene minimum one week prior to commencing work of this section.

1.8 FIELD MEASUREMENTS

- A. Verify field measurements and elevations are as indicated.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Section 01600 - Product Requirements.
- B. Do not place materials on private property without written permission of property owner.
- C. During loading, transporting and unloading, exercise care to prevent damage to materials.
- D. Do not drop pipe or fittings.
- E. Avoid shock or damage to pipe.
- F. Take measures to prevent damage to exterior surface or internal lining of pipe.
- G. Do not stack pipe higher than recommended by pipe manufacturer.
- H. Store gaskets for mechanical and push-on joints in cool, dry location out of direct sunlight and not in contact with petroleum products.

1.10 COORDINATION

- A. Section 01300 - Administrative Requirements.
- B. Coordinate the Work of connection to existing sewer force mains, manholes, or other facilities with Owner.

**PART 2 PRODUCTS**

2.1 FORCE MAIN

- A. Ductile Iron Pipe: AWWA C151; standard cement mortar lining (AWWA C104) or Ceramic Epoxy lining (Protecto 401), outside coated.
  - 1. Pipe - 3 Inches to 12 Inches: Pressure Class - 350 psi.
  - 2. Pipe - 14 Inches to 24 Inches: Pressure Class - 250 psi.
  - 3. Pipe - 30 Inches to 48 Inches: Pressure Class - 150 psi.
- B. Ductile Iron Fittings:
  - 1. AWWA C110; - 350 psi pressure rating.
  - 2. Fitting to be cement mortar or ceramic epoxy lined and outside coated as for ductile iron pipe.

- C. Joints: AWWA C111, where not specifically indicated on Drawings.
  - 1. Type: Mechanical joint or push-on joint.

- D. Rubber Gaskets, Lubricants, Glands, Bolts and Nuts: AWWA C111.

## 2.2 POLYVINYL CHLORIDE (PVC) PIPE

- A. PVC Pressure Sewer Pipe and Fittings - 12" Nominal Pipe Size and Smaller:
  - 1. ASTM D2241, PVC 1120; SDR 26.

## 2.3 UNDERGROUND PIPE MARKERS

- A. Plastic Ribbon Tape: Bright colored, continuously printed, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.
- B. Trace Wire: Magnetic detectable conductor, brightly colored plastic covering, imprinted with "Sewage Force Main" in large letters.

## 2.4 BEDDING AND COVER MATERIALS

- A. Bedding: Fill Type A2 as specified in Section 02060.
- B. Cover: As specified in Section 02300.
- C. Soil Backfill from Above Pipe to Finish Grade: As specified in Section 02300.

## 2.5 CONCRETE

- A. Concrete in accordance with Section 03300.

# **PART 3 EXECUTION**

## 3.1 EXAMINATION

- A. Section 01300 - Administrative Requirements.
- B. Verify project is ready to receive work and excavations, dimensions, and elevations are as indicated on Drawings.

## 3.2 PREPARATION

- A. Correct over excavation with coarse aggregate.
- B. Remove large stones or other hard matter capable of damaging pipe or impeding consistent backfilling or compaction.

## 3.3 BEDDING

- A. Excavate pipe trench in accordance with Section 02300.

- B. Place bedding material at trench bottom, level materials in continuous layer not exceeding 6 inches.

### 3.4 INSTALLATION - PIPE

- A. Install pipe, fittings, and accessories in accordance with Drawings.
- B. Route piping in straight line.
- C. Refer to Section 02300 for backfilling and compacting requirements. Do not displace or damage pipe when compacting.
- D. Connect to municipal sewer system as shown on the Drawings.
- E. Install detectable underground utility marking tape continuous over top of pipe.

### 3.5 INSTALLATION - THRUST RESTRAINT

- A. Provide pressure pipeline with restrained joints or concrete thrust blocking at bends, tees, and changes in direction; construct concrete thrust blocking in accordance with Drawings.

### 3.6 INSTALLATION - CRADLES AND ENCASEMENT

- A. Provide concrete cradles and encasement for pipeline where indicated on Drawings as specified in Section 03300.

### 3.7 FIELD QUALITY CONTROL

- A. Section 01400 - Quality Requirements, 01700 - Execution Requirements.
- B. Pressure test system to the greater of 1.25 times the working pressure at the highest point in the test segment or 1.5 times the working pressure at the point of testing, not to exceed the pipeline or valve pressure rating in the test segment. Repair leaks and re-test.
  1. After completion of pipeline installation, including backfill, but prior to final connection to existing system, conduct, in presence of Engineer, concurrent hydrostatic pressure and leakage tests in accordance with AWWA C600.
  2. Provide all equipment required to perform leakage and hydrostatic pressure tests including water storage means, acceptable water volume measurement means, pumps, piping, calibrated pressure gauges, and chart recorder. Upon request of Engineer, provide certification of calibration of equipment acceptable to Engineer.
  3. Test Pressure: The greater of 1.25 times the working pressure at the highest point in the test segment or 1.5 times the working pressure at the point of testing, not to exceed the pipeline or valve pressure rating in the test segment. Obtain working pressure from Engineer.
  4. Conduct hydrostatic test for at least six-hour duration.
  5. Before applying test pressure, completely expel air from section of piping under test. Provide corporation cocks so air can be expelled as pipeline is filled with water. After air has been expelled, apply test pressure. At conclusion of tests, close and permanently seal resulting piping openings.

6. Slowly bring piping to test pressure and allow system to stabilize prior to conducting leakage test. Do not open or close valves at differential pressures above rated pressure.
7. Examine exposed piping, fittings, valves, hydrants, and joints carefully during hydrostatic pressure test. Repair or replace damage or defective pipe, fittings, valves, hydrants, or joints discovered, following pressure test.
8. Maintain test pressure within +/- 5 psi of specified test by pumping additional water in to the test segment. Accurately record test segment pressure continuously on chart recorder and volume of additional water supplied to test segment. Additional water supplied shall be designated as the leakage.
9. No pipeline installation will be approved when leakage is greater than that determined by the following formula:  

$$L = \frac{SD\sqrt{P}}{C}$$
  - L = allowable, in gallons per hour
  - S = length of pipe tested, in feet
  - D = nominal diameter of pipe, in inches
  - p = average test pressure during leakage test, in pounds per square inch gauge
  - C = 133,200
10. When leakage exceeds specified acceptable rate, locate source and make repairs. Repeat test until specified leakage requirements are met.

- C. Request inspection prior to and immediately after placing bedding.
- D. When tests indicate Work does not meet specified requirements, remove work, replace and retest.

### 3.8 PROTECTION OF FINISHED WORK

- A. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.

END OF SECTION

## SECTION 02539

### SANITARY SEWER SYSTEMS

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Sanitary sewer pipe and fittings.
  - 2. Connection to existing manholes.
  - 3. Manholes.
  - 4. Wye branches and tees.
  - 5. Sanitary Laterals.
  
- B. Related Sections:
  - 1. Drawings and general provisions of the Contract including General and Supplemental General Conditions, and Technical Specifications.

##### 1.2 REFERENCES

- A. American Association of State Highway and Transportation Officials:
  - 1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.
  
- B. ASTM International:
  - 1. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings.
  - 2. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
  - 3. ASTM A746 - Standard Specification for Ductile Iron Gravity Sewer Pipe.
  - 4. ASTM C14 - Standard Specification for Concrete Sewer, Storm Drain, and Culvert Pipe.
  - 5. ASTM C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
  - 6. ASTM C443 - Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
  - 7. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
  - 8. ASTM D698 - Standard 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>)).
  - 9. ASTM C923 - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals.
  - 10. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>)).
  - 11. ASTM D1785 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
  - 12. ASTM D2235 - Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.

13. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
14. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
15. ASTM D2564 - Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.
16. ASTM D2729 - Standard Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
17. ASTM D2751 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.
18. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
19. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
20. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
21. ASTM D3034 - Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
22. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

C. American Water Works Association:

1. AWWA C104 - American National Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
2. AWWA C105 - American National Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems.
3. AWWA C110 - American National Standard for Ductile-Iron and Grey-Iron Fittings, 3 in. through 48 in. (75 mm through 1200 mm), for Water and Other Liquids.
4. AWWA C111 - American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
5. AWWA C150 - ANSI Standard for the Thickness Design of Ductile Iron Pipe.
6. AWWA C151 - American National Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water.
7. AWWA C153 - American National Standard for Ductile-Iron Compact Fittings for Water Service.

### 1.3 SUBMITTALS

- A. Section 01330 - Submittal Procedures.
- B. Product Data: Submit catalog cuts and other pertinent data indicating proposed materials, accessories, details, and construction information.
- C. Submit reports indicating field tests made and results obtained.
- D. Manufacturer's Installation Instructions:
  1. Indicate special procedures required to install Products specified.
  2. Submit detailed description of procedures for directional drilling installation.

1.4 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record location of pipe runs, connections, manholes, cleanouts, and invert elevations.
- B. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with Alabama Department of Environmental Management standard.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.
- B. Installer: Company specializing in performing work of this section with minimum years documented experience.

1.7 PRE-INSTALLATION MEETINGS – **Not Required**

- A. Section 01300 - Administrative Requirements.
- B. Convene minimum one week prior to commencing work of this section.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Section 01600 - Product Requirements.
- B. Deliver and store valves in shipping containers with labeling in place.
- C. Block individual and stockpiled pipe lengths to prevent moving.

1.9 FIELD MEASUREMENTS

- A. Verify field measurements and elevations are as indicated.

1.10 COORDINATION

- A. Section 01300 - Administrative Requirements.
- B. Coordinate the Work with Owner and Public Works Department.
- C. Notify affected utility companies minimum of 72 hours prior to construction.



## PART 2 PRODUCTS

### 2.1 SANITARY SEWER PIPE AND FITTINGS

- A. Ductile Iron Pipe: AWWA C150, AWWA C151 and ASTM A746, Class 50 or above, bell and spigot ends.
  - 1. Manufacturers:
    - a. U.S. Pipe and Foundry.
    - b. American Cast Iron Pipe Company.
    - c. McWane, Inc.
    - d. Substitutions: Section 01600 - Product Requirements.
  - 2. Outside Coating: AWWA C151, asphaltic coating, 1 mil uniform thickness.
  - 3. Lining: Cement mortar lined in accordance with AWWA C104 or Ceramic Epoxy Lining (Protecto 401).
  - 4. Polyethylene encasement: AWWA C105. **(Not Used)**
  - 5. Fittings: AWWA C153 or AWWA C110, ductile iron, Class 50 or above, cement mortar lined in accordance with AWWA C104.
  - 6. Mechanical Joints: AWWA C111, rubber gasket joint devices.
- B. Plastic Pipe: ASTM D3034, Type PSM, Poly (Vinyl Chloride) (PVC) material; bell and spigot style rubber ring sealed gasket joint.
  - 1. Standard Dimension Ratio: 26
  - 2. Fittings: ASTM D-2321, PVC.
  - 3. Joints: ASTM F477, elastomeric gaskets.
- C. High Density Polyethylene Pipe: ASTM D3350
  - 1. Manufactured from materials conforming to the requirements of PE 3408 meeting cell classification 345464E for striped pipe.
  - 2. Sizes 1-1/4" – 3": AWWA C901-96 and ASTM D3035.
  - 3. Sizes 4" IPS and larger: ASTM F714 and AWWA 906-99.
  - 4. Fittings: ASTM D 3261 and AWWA 906-99.
  - 5. All polyethylene pipe and fittings shall be DR 11 (Pressure class 160 PVC equivalent).
  - 6. All pipes shall be black in color with a green stripe indicating sanitary sewer pipe.
- D. Ribbed Plastic Pipe: ASTM F794, bell and spigot style joint.
  - 1. Interior: Smooth.
  - 2. Exterior Ribs: Perpendicular to pipe axis
  - 3. Pipe Stiffness: 60 psi for 8"-12" pipe  
46 psi for 15"-30" pipe.

### 2.2 MANHOLES

- A. Manholes: As specified in Section 02082; precast concrete, 48 inch diameter, eccentric conical top, cast iron frames and covers, cover inscribed with "SANITARY SEWER."

### 2.3 BEDDING AND COVER MATERIALS

- A. Bedding: Fill Type A2, as specified in Section 02060.

- B. Cover: Fill to top of pipe with Type A2 aggregate, as specified in Section 02060.
- C. Soil Backfill from top of pipe to Finish Grade: Soil with no rocks over 6 inches in diameter, frozen earth or foreign matter. See Section 02300.
- D. If pipe is under a paved surface, it is to be backfilled entirely with Type A2 aggregate.

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

- A. Section 01300 - Administrative Requirements.
- B. Verify trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on drawings.

### **3.2 PREPARATION**

- A. Correct over excavation with coarse aggregate.
- B. Remove large stones or other hard matter capable of damaging pipe or impeding consistent backfilling or compaction.
- C. Protect and support existing sewer lines, utilities and appurtenances.
- D. Maintain profiles of utilities. Coordinate with other utilities to eliminate interference. Notify Engineer where crossing conflicts occur.

### **3.3 BEDDING**

- A. Excavate pipe trench in accordance with Section 02324.
- B. Excavate to lines and grades shown on Drawings or required to accommodate installation of encasement.
- C. Dewater excavations to maintain dry conditions and preserve final grades at bottom of excavation.
- D. Provide sheeting and shoring in accordance with Section 02324.
- E. Place bedding material at trench bottom, level materials in continuous layer not exceeding 8 inches compacted depth; compact to 90 percent.

### **3.4 INSTALLATION - PIPE**

- A. Install pipe, fittings, and accessories in accordance with ASTM D2321. Seal joints watertight.
- B. Lay pipe to slope gradients noted on drawings; with maximum variation from indicated slope of 1/8 inch in 20 feet. Begin at downstream end and progress upstream.

- C. Assemble and handle pipe in accordance with manufacturer's instructions except as modified on the Drawings or by Engineer.
- D. Keep pipe and fittings clean until work is completed and accepted by Engineer. Cap open ends during periods of work stoppage.
- E. Lay bell and spigot pipe with bells upstream.
- F. Polyethylene Pipe Encasement: AWWA C105.

### 3.5 INSTALLATION - CONNECTION TO EXISTING MANHOLE

- A. Core drill existing manhole to clean opening. Using pneumatic hammers, chipping guns, sledge hammers, is not permitted.
- B. Install watertight Link-Seal type gasket and seal with non-shrink concrete grout.
- C. Prevent construction debris from entering existing sewer line when making connection.

### 3.6 INSTALLATION - MANHOLES

- A. Install manholes in accordance with Section 02082.

### 3.7 INSTALLATION - WYE BRANCHES AND TEES

- A. Install wye branches or pipe tees at locations indicated on Drawings concurrent with pipe laying operations. Use standard fittings of same material and joint type as sewer main.
- B. Maintain minimum 5 feet separation distance between wye connection and manhole.
- C. Use saddle wye or tee with stainless steel clamps for taps into existing piping. Mount saddles with solvent cement or gasket and secure with metal bands. Layout holes with template and cut holes with mechanical cutter.

### 3.8 INSTALLATION - SANITARY LATERALS

- A. Construct laterals from wye branch to terminal point at right-of-way.
- B. Where depth of main pipeline warrants, construct riser type laterals from wye branch.
- C. Maintain 2 feet minimum depth of cover over pipe.
- D. Maintain minimum 5 feet separation distance between laterals.
- E. Install cleanout and watertight plug, braced to withstand pipeline test pressure thrust, at termination of lateral. Install temporary marker stake extending from end of lateral to 12 inches above finished grade. Paint top 6 inches of stake with fluorescent orange paint.

### 3.9 BACKFILLING

- A. Backfill around sides and to top of pipe in accordance with Section 02300.

- B. Maintain optimum moisture content of bedding material to attain required compaction density.

### 3.10 FIELD QUALITY CONTROL

- A. Section 01400 - Quality Requirements.
- B. Pressure Test: Test in accordance with Section 02952.
- C. Infiltration Test: Test in accordance with Section 02952.
- D. Deflection Test: Test in accordance with Section 02952.
- E. Request inspection prior to placing bedding.
- F. When tests indicate Work does not meet specified requirements, remove work, replace and retest.

### 3.11 PROTECTION OF FINISHED WORK

- A. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.

END OF SECTION

## SECTION 02821

### CHAIN LINK FENCES AND GATES

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Fence framework, fabric, and accessories.
  - 2. Excavation for post bases.
  - 3. Concrete foundation for posts.
  - 4. Manual gates and related hardware.
  - 5. Privacy slats.
  - 6. Twisted strand barbed wire.
  - 7. Electric operator.
- B. Related Sections:
  - 1. Drawings and general provisions of the Contract including General and Supplemental General Conditions, and Technical Specifications.

##### 1.2 UNIT PRICE – MEASUREMENT AND PAYMENT

- A. Chain Link Fencing:
  - 1. Basis of Measurement: Linear feet of fence at ground level.
  - 2. Basis of Payment: Includes all labor, equipment and materials associated with the installation of chain link fencing at the locations indicated on the plans. Includes grading, excavation for post footings, concrete, posts, backfill, chain link fence fabric, ties, wire, bracing, barbed wire, privacy slats, and all related appurtenances.
- B. Gates:
  - 1. Basis of Measurement: Linear feet of gate from post to post at ground level for each type of gate.
  - 2. Basis of Payment: Includes all labor, equipment and materials associated with the installation of gates at the size and locations indicated on the plans. Includes grading, excavation for post footings, concrete, posts, backfill, chain link fence fabric, ties, wire, bracing, barbed wire, privacy slats, drop retainer rod, rollers, wheels, hinges, hasps, electric operators, keypads, key pad post, remote openers and all related appurtenances.

##### 1.3 REFERENCES

- A. ASTM International:
  - 1. ASTM A121 - Standard Specification for Zinc-Coated (Galvanized) Steel Barbed Wire.
  - 2. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
  - 3. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

4. ASTM A392 - Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric.
5. ASTM A491 - Standard Specification for Aluminum-Coated Steel Chain-Link Fence Fabric.
6. ASTM A585 - Standard Specification for Aluminum-Coated Steel Barbed Wire.
7. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
8. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
9. ASTM B429 - Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
10. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
11. ASTM F567 - Standard Practice for Installation of Chain-Link Fence.
12. ASTM F668 - Standard Specification for Poly (Vinyl Chloride) (PVC)-Coated Steel Chain Link Fence Fabric.
13. ASTM F900 - Standard Specification for Industrial and Commercial Swing Gates.
14. ASTM F934 - Standard Specification for Standard Colors for Polymer-Coated Chain Link Fence Materials.
15. ASTM F1043 - Standard Specification for Strength and Protective Coatings on Metal Industrial Chain Link Fence Framework.
16. ASTM F1083 - Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures.
17. ASTM F1184 - Standard Specification for Industrial and Commercial Horizontal Slide Gates.

- B. Chain Link Fence Manufacturers Institute:
1. CLFMI - Product Manual.

#### 1.4 SYSTEM DESCRIPTION

- A. Fence Height: As indicated on Drawings.
- B. Line Post Spacing: At intervals not exceeding 10 feet on straight sections and 8 feet on curved sections.

#### 1.5 SUBMITTALS

- A. Section 01330 - Submittal Procedures.
- B. Shop Drawings: Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, gates, and schedule of components.
- C. Product Data: Submit data on fabric, posts, accessories, fittings and hardware.

#### 1.6 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Accurately record actual locations of property perimeter posts relative to property lines and easements.

- B. Operation and Maintenance Data: Procedures for submittals.

#### 1.7 QUALITY ASSURANCE

- A. Supply material in accordance with CLFMI - Product Manual.
- B. Perform installation in accordance with ASTM F567.

#### 1.8 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum five years documented experience.
- B. Installer: Company specializing in performing work of this section with minimum three years documented experience.

#### 1.9 DELIVERY, STORAGE AND HANDLING

- A. Section 01600 - Product Requirements.
- B. Deliver fence fabric and accessories in packed cartons or firmly tied rolls.
- C. Identify each package with manufacturer's name.
- D. Store fence fabric and accessories in secure and dry place.

### **PART 2 PRODUCTS**

#### 2.1 MATERIALS

- A. Framing (Steel): ASTM F1083 Schedule 40 galvanized steel pipe, welded construction, minimum yield strength of 25 ksi; coating conforming to ASTM F1043 Type A on pipe exterior and interior.
- B. Fabric Wire (Steel): ASTM A392 zinc coated wire fabric.
- C. Barbed Wire: ASTM A121 galvanized steel with galvanized steel barbs; 12 gauge thick wire, 3 strands, 4 points at 3-inch oc.
- D. Concrete: Type specified in Section 03300.

#### 2.2 COMPONENTS

- A. Line Posts: 2.375 inch outside diameter, commercial quality.
- B. Corner and Terminal Posts: 3.0 inch outside diameter, commercial quality.
- C. Gate Posts: 4.0 inch outside diameter, commercial quality for all gates with an opening greater than 6 feet. Openings less than 6 feet shall require 3.0 inch outside diameter posts.

- D. Top and Brace Rail: 1.625-inch diameter, plain end, sleeve coupled.
- E. Gate Frame: 1.625-inch diameter for welded fabrication.
- F. Fabric: 2 inch diamond mesh interwoven wire, 11gauge thick, top salvage knuckle end closed, bottom selvage knuckle end closed.
- G. Tension Wire: 7 gauge thick steel, single strand.
- H. Tie Wire: Aluminum alloy steel wire.

### 2.3 ACCESSORIES

- A. Caps: Cast steel galvanized; sized to post diameter, set screw retainer.
- B. Fittings: Sleeves, bands, clips, rail ends, tension bars, fasteners and fittings; aluminum.
- C. Extension Arms: Cast steel galvanized, to accommodate 3 strands of barbed wire, single arm, sloped to 45 degrees.
- D. Gate Hardware: Fork latch with gravity drop; Center gate stop and drop rod; Mechanical keepers; two 180-degree gate hinges for each leaf and hardware for padlock.

### 2.4 GATES

- A. General:
  1. Gate Types, Opening Widths and Directions of Operation: As indicated on Drawings.
  2. Factory assemble gates.
  3. Design gates for operation by one person.
- B. Swing Gates:
  1. Fabricate gates to permit 180-degree swing.
  2. Gates Construction: ASTM F900 with welded corners. Use of corner fittings is not permitted.
- C. Sliding Gates:
  1. Framing and Posts: ASTM F1184, Class 2 for internal rollers.
  2. Rollers for overhead and cantilever sliding gates: Bearing type. Furnish non-sealed bearings with grease fitting for periodic maintenance.
  3. Secure rollers to post or frame without welding.
- D. Cantilever Sliding Gates:
  1. Fabricate gate leaf frames and tracks of aluminum conforming to ASTM B429 alloy 6063-T6 or as required to meet performance requirements of ASTM F1184.
  2. Frame Members: Minimum 2 inches 0.91 lb/ft aluminum tubing welded assembly forming rigid, one-piece unit.
  3. Install fabric securely stretched and held in center of tubing.



4. Brace cantilever overhang frames with 3/8-inch brace rods. For gate leaf sizes greater than 23 feet, fabricate with additional lateral support rail welded adjacent to top and bottom horizontal rails.
5. Provide minimum overhang for each leaf opening size as follows:

<u>Opening</u>	<u>Overhang</u>
Up to 10'-0"	6'-6"
10'-0" - 14'-0"	7'-6"
14'-1" - 22'-0"	10'-0"
22'-1" - 30'-0"	12'-0"

6. Track: Combined, integral track and rail.
7. Rail: Aluminum extrusion; minimum total weight of 3.72 lb/ft; designed to withstand reaction load of 2,000 lbs.
8. Roller Track Assembly: Two swivel type, zinc, die cast trucks having four, sealed lubricant ball bearing wheels minimum 2 inches diameter by 9/16 inches width designed for same reaction load as rail. Provide two side-rolling wheels for each gate leaf to maintain alignment of truck in track.
9. Fasten trucks to post brackets by minimum 7/8-inch diameter, 1/2-inch shank ball bolts.
10. Provide galvanized steel guide wheel assemblies consisting of two rubber wheels of minimum 4-inch diameter with oil-impregnated bearings for each supporting post.
11. Attach guide wheel assembly to post so bottom horizontal member rolls between wheels and permitting adjustment to maintain plumb gate frames and proper alignment.

## 2.5 PRIVACY SLATS

- A. Privacy Slats: Vinyl strips, flat configuration, sized to fit fence fabric, color as selected.

## 2.6 FINISHES

- A. Components and Fabric: Galvanized to ASTM A123/A123M for components; ASTM A153/A153M for hardware; ASTM A392 for fabric; 1.2 oz/sq ft coating.
- B. Components and Fabric: Vinyl coating, color in accordance with ASTM F934 as selected.
- C. Vinyl Components: color to match fabric as selected.
- D. Hardware: Galvanized to ASTM A153/A153M, 1.8 oz/sq ft coating.
- E. Accessories: Same finish as fabric.

## 2.7 ELECTRIC OPERATOR

- A. Heavy duty, weather resistant, all welded enclosure with powder coat finish. Post mount.
- B. 1/2 horsepower, 208 volt, 3-phase motor with adjustable limit switches, adjustable torque limiter and manual disconnect.

- C. Operator shall have magnetic reversing starter, delay on reversal and warning beeper.
- D. Operator shall be easily convertible from right hand to left hand operation.
- E. Operator shall be fully compatible with card readers, loop detectors, radio controls and automatic closing devices.
- F. Opening control shall be by post mounted keypad or by remote control. Closing control shall be by loop detector. Provide a minimum of three (3) loop detectors (one automatic exit loop and two safety loops). Provide a minimum of six (6) RF wireless remote controls (fully integrated/programmed with associated gate).
- G. Provide IR beam safety system to prevent closing of gate when obstructions are present.

## 2.8 KEYPAD

- A. Keypad shall have stainless steel plate and painted metal housing rated for outdoor/wet locations. Keys to be metal with lighted numerals.
- B. Keypad shall be mounted to gooseneck post on concrete base and shall be capable of 100 separate codes.

## PART 3 EXECUTION

### 3.1 INSTALLATION

- A. Install framework, fabric, accessories and gates in accordance with ASTM F567.
- B. Set intermediate, terminal, gate, and all other posts plumb, in concrete footings with top of footing 2 inches above finish grade. Slope top of concrete for water runoff.
- C. Line Post Footing Depth Below Finish Grade: ASTM F567, 2.0 feet.
- D. Corner, Gate and Terminal Post Footing Depth Below Finish Grade: ASTM F567, 3.0 feet.
- E. Brace each gate and corner post to adjacent line post with horizontal center brace rail and diagonal truss rods. Install brace rail one bay from end and gate posts.
- F. Install top rail through line post tops and splice with 6-inch-long rail sleeves.
- G. Install center and bottom brace rail on corner gate leaves.
- H. Place fabric on outside of posts and rails.
- I. Do not stretch fabric until concrete foundation has cured 7 days.
- J. Stretch fabric between terminal posts or at intervals of 100 feet maximum, whichever is less.
- K. Position bottom of fabric 2 inches above finished grade.

- L. Fasten fabric to top rail, line posts, braces, and bottom tension wire with tie wire at maximum 15 inches on centers.
- M. Attach fabric to end, corner, and gate posts with tension bars and tension bar clips.
- N. Install bottom tension wire stretched taut between terminal posts.
- O. Install support arms sloped outward and attach barbed wire; tension and secure.
- P. Support gates from gate posts. Do not attach hinged side of gate from building wall.
- Q. Install gate with fabric and barbed wire overhang to match fence. Install three hinges on each gate leaf, latch, catches, drop bolt.
- R. Provide concrete center drop to footing depth and drop rod retainers at center of double gate openings.
- S. Connect to existing fence at existing terminal post.
- T. Install posts with 6 inches maximum clear opening from end posts to buildings, fences and other structures.
- U. Excavate holes for posts to diameter and spacing indicated on Drawings without disturbing underlying materials.
- V. Center and align posts. Place concrete around posts and vibrate or tamp for consolidation. Verify vertical and top alignment of posts and make necessary corrections.
- W. Locate keypad approximately 10 feet from the gate and facing the incoming traffic lane. Install on concrete pedestal.

### 3.2 PRIVACY SLATS

- A. Install slat inserts in diagonal pattern woven through fence fabric.
- B. Fasten slats according to manufacturer's instructions.

### 3.3 ERECTION TOLERANCES

- A. Section 01400 - Quality Requirements.
- B. Maximum Variation from Plumb: 1/4 inch.
- C. Maximum Offset from Indicated Position: 1 inch.
- D. Minimum distance from property line: 12 inches.

END OF SECTION

**SECTION 02923**  
**LANDSCAPE GRADING**

**PART 1 GENERAL**

1.1 SUMMARY

- A. Section Includes:
  - 1. Final grade topsoil for finish landscaping.
- B. Related Sections:
  - 1. Drawings and general provisions of the Contract including General and Supplemental General Conditions, and Technical Specifications.

1.2 SUBMITTALS

- A. Section 01330 - Submittal Procedures.
- B. Samples: When requested by the Engineer, submit, in air-tight containers, 5 lb sample of each type of fill to testing laboratory.
- C. Materials Source: Submit name of imported materials source.

1.3 QUALITY ASSURANCE

- A. Furnish each topsoil material from single source throughout the Work.

**PART 2 PRODUCTS**

2.1 MATERIAL

- A. Topsoil: Fill type as specified in Section 02300.

**PART 3 EXECUTION**

3.1 EXAMINATION

- A. Section 01300 - Administrative Requirements.
- B. Verify building and trench backfilling have been inspected.
- C. Verify substrate base has been contoured and compacted.

3.2 PREPARATION

- A. Protect landscaping and other features remaining as final Work.

- B. Protect existing structures, fences, sidewalks, utilities, paving, and curbs.

### 3.3 SUBSTRATE PREPARATION

- A. Eliminate uneven areas and low spots.
- B. Remove debris, roots, branches, stones, in excess of 1/2 inch in size. Remove contaminated subsoil.
- C. Scarify surface to depth of 3 inches where topsoil is scheduled. Scarify in areas where equipment used for hauling and spreading topsoil has compacted subsoil.

### 3.4 PLACING TOPSOIL

- A. Place topsoil in areas where seeding, sodding, and planting, is required to nominal depth of 4 inches. Place topsoil during dry weather.
- B. Fine grade topsoil to eliminate rough or low areas. Maintain profiles and contour of subgrade.
- C. Remove roots, weeds, rocks, and foreign material while spreading.
- D. Manually spread topsoil close to plant material, building, and trees to prevent damage.
- E. Remove surplus subsoil and topsoil from site.
- F. Leave stockpile area and site clean and raked, ready to receive landscaping.

### 3.5 TOLERANCES

- A. Section 01400 - Quality Requirements: Tolerances.
- B. Top of Topsoil: Plus or minus 1/2 inch.

### 3.6 PROTECTION OF INSTALLED WORK

- A. Section 01700 - Execution Requirements.
- B. Prohibit construction traffic over topsoil.

END OF SECTION

## SECTION 02926

### SEEDING AND SODDING

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Preparation of subsoil
  - 2. Placing topsoil
  - 3. Fertilizing
  - 4. Seeding
  - 5. Laying Sod
  - 6. Hydroseeding
  - 7. Mulching
  - 8. Soil testing and fertilizer
  - 9. Maintenance
  
- B. Related Sections:
  - 1. Plans and general provisions of the Contract including General Conditions and Technical Specifications.

##### 1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

- A. Grassing and Restoration:
  - 1. Basis of Measurement: Lump Sum or Per Acre.
  - 2. Basis of Payment: Includes all labor, material, and equipment required to finish grading to smooth surface, applying topsoil in 4" minimum thickness, either saved from initial stripping operations, or provided from offsite locations, applying fertilizer, seeding of all areas disturbed by the construction activities, applying mulch to seeded areas, watering, and maintenance of disturbed areas until stand of grass acceptable to Engineer and/or Owner is established.
  
- B. Solid Sodding:
  - 1. Basis of Measurement: Square Yard.
  - 2. Basis of Payment: Includes all labor, material, and equipment required to finish grading to smooth surface, applying topsoil in 4" minimum thickness, either saved from initial stripping operations, or provided from offsite locations, placing solid sodding in locations reflected on the Plans or as directed by the Owner or Engineer, soil amendments, rolling, watering, and maintenance of sod until its rooting is acceptable to Engineer and/or Owner.

##### 1.3 REFERENCES

- A. ASTM International:
  - 1. ASTM C602 - Standard Specification for Agricultural Liming Materials.

- B. Turfgrass Producers International:
  1. TPI - Guideline Specifications to Turfgrass Sodding.
- C. Alabama Department of Transportation (ALDOT) Standard Specifications for Highway Construction (SSHC), Latest Edition:
  1. Section 652 - Ground Preparation, Vegetation Establishment and Mowing
  2. Section 654 – Solid Sodding
  3. Section 860 - Roadside Improvement Materials

#### 1.4 DEFINITIONS

- A. Weeds: Include Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

#### 1.5 SUBMITTALS

- A. Section 01330 - Submittal Procedures.
- B. Product Data:
  1. Submit data for seed mix, fertilizer, mulch, and other accessories.
  2. Submit data for sod grass species, fertilizer, mulch, and other accessories.

#### 1.6 CLOSEOUT SUBMITTALS

- A. Section 01700 - Execution Requirements.
- B. Operation and Maintenance Data: Include maintenance instructions, cutting method and maximum grass height; types, application frequency, and recommended coverage of fertilizer.

#### 1.7 QUALITY ASSURANCE

- A. Provide seed mixture in containers showing percentage of seed mix, germination percentage, inert matter percentage, weed percentage, year of production, net weight, date of packaging, and location of packaging.
- B. Provide sod capable of supporting its own weight without tearing when suspended vertically by holding upper two corners. Sod must be alive or dormant when placed.

#### 1.8 QUALIFICATIONS

- A. Seed Supplier: Company specializing in manufacturing Products specified in this section with minimum five years of experience.
- B. Sod Producer: Company specializing in manufacturing Products specified in this section with minimum five years of experience.

- C. Installer: Company specializing in performing work of this section with minimum three years documented experience.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Section 01600 - Product Requirements.
- B. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable.
- C. Deliver sod on pallets. Protect roots from dehydration.
- D. Do not deliver more sod than can be laid within 48 hours.
- E. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

1.10 COORDINATION

- A. Section 01300 - Administrative Requirements.
- B. Coordinate with installation of underground sprinkler system piping and watering heads.

1.11 MAINTENANCE SERVICE

- A. Section 01700 - Execution Requirements.
- B. Maintain seeded and/or sodded areas immediately after placement until grass is well established and exhibits vigorous growing condition.

**PART 2 PRODUCTS**

2.1 SEED PLANTING SCHEDULE

- A. Established lawns and residential areas shall utilize the following schedule:

RATE – (LB/ACRE)	FROM	TO	SEED
30	March 1	May 1	Kentucky 31
20	April 1	August 1	Common Bermuda
30	August 1	November 1	Kentucky 31 Fescue and Unhulled Bermuda
20	November 1	March 1	Annual Rye



B. Unimproved areas may utilize the following schedule:

Planting Dates	March 1 to May 15	May 16 to August 1	March 1 to May 15	Sept. 1 to Nov. 15
Hulled Bermuda Grass	15	20	10	-
Unhulled Bermuda	10	-	10	-
Tall Fescue	-	-	50	50
Annual Lespedeza	-	30	-	-
Reseed Crimson Clover	-	-	30	-

2.2 SOD

A. Reference Section 654 of the ALDOT SSHC, Latest Edition.

2.3 SOIL MATERIALS

A. Topsoil: Fertile, agricultural soil, typical for locality, capable of sustaining vigorous plant growth, taken from drained site; free of subsoil, clay or impurities, plants, weeds and roots; pH value of minimum 5.4 and maximum 7.0. May be excavated from site or from offsite locations.

2.4 ACCESSORIES

A. Mulching Material: Oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry. Hay or chopped cornstalks are not acceptable.

B. Fertilizer: Commercial grade; recommended for type of grass used; of proportion necessary to eliminate deficiencies of topsoil to the following proportions: Nitrogen 13 percent, phosphoric acid 13 percent, soluble potash 13 percent.

C. Water: Clean, fresh and free of substances or matter capable of inhibiting vigorous growth of grass.

D. Erosion Fabric: SC150 BN by North American Green or Equal,  
 1. 70% straw, 30% coconut fiber mat.  
 2. Longevity: up to 18 months.  
 3. Blanket covered top and bottom with 100% biodegradable woven natural fiber netting.  
 4. Shall meet type 3.8 Specification of Erosion Control Technology Council (ECTC) and Federal Highway Administration's (FHWA) FP-03 Section 713.17.

E. Stakes/Pegs: Softwood lumber, chisel pointed. Of sufficient size and length to anchor sod on slopes.

F. String: Inorganic fiber.

G. Plastic Mesh: Interwoven hexagonal plastic mesh of 2-inch size.

H. Edging: Painted steel.

## 2.5 HARVESTING SOD

A. Reference Section 654 of the ALDOT SSHC, Latest Edition.

## 2.6 SOURCE QUALITY CONTROL

A. Section 01400 – Quality Requirements

B. Analyze to ascertain percentage of nitrogen, phosphorus, potash, soluble salt content, organic matter content, and pH values.

C. Provide recommendation for fertilizer and lime application rates for specified seed or sod species.

D. Testing is not required when recent tests are available for imported topsoil. Submit these test results to testing laboratory. Indicate, by test results, information necessary to determine suitability.

## **PART 3 EXECUTION**

### 3.1 EXAMINATION

A. Section 01300 - Administrative Requirements.

B. Verify prepared soil base is ready to receive the Work of this section.

### 3.2 PREPARATION OF SUBSOIL

A. Prepare sub-soil to eliminate uneven areas and low spots.

B. Maintain lines, levels, profiles and contours. Make changes in grade gradual. Blend slopes into level areas.

C. Remove foreign materials, weeds and undesirable plants and their roots.

D. Remove contaminated subsoil.

E. Scarify subsoil to depth of 4 inches where topsoil is to be placed.

F. Repeat cultivation in areas where equipment, used for hauling and spreading topsoil, has compacted sub-soil.

### 3.3 PLACING TOPSOIL

A. Spread topsoil to minimum depth of 4 inches over area to be seeded. Rake until smooth.

- B. Place topsoil during dry weather and on dry unfrozen subgrade.
- C. Remove vegetable matter and foreign non-organic material from topsoil while spreading.
- D. Grade topsoil to eliminate rough, low or soft areas, and to ensure positive drainage.
- E. Install edging at periphery of seeded and/or sodded areas in straight lines to consistent depth.

#### 3.4 FERTILIZING

- A. Apply fertilizer at application rate recommended by soil analysis.
- B. Apply after smooth raking of topsoil and prior to roller compaction.
- C. Do not apply fertilizer at same time or with same machine used to apply seed.
- D. Mix fertilizer thoroughly into upper 2 inches of topsoil.
- E. Lightly water soil to aid dissipation of fertilizer. Irrigate top level of soil uniformly.

#### 3.5 SEEDING

- A. Apply seed at rate of 5.5 lbs per 1000 sq ft evenly in two intersecting directions. Rake in lightly.
- B. Do not seed areas in excess of that which can be mulched on same day.
- C. Do not sow immediately following rain, when ground is too dry, or when winds are over 12 mph.
- D. Immediately following seeding, apply mulch to thickness of 1/4 inches. Maintain clear of shrubs and trees.
- E. Apply water with fine spray immediately after each area has been mulched. Saturate top 4 inches of soil.

#### 3.6 LAYING SOD

- A. Moisten prepared surface immediately prior to laying sod.
- B. Lay sod within 48 hours after harvesting to prevent deterioration.
- C. Lay sod tight with no open joints and no overlapping. Stagger end joints 12 inches minimum. Do not stretch or overlap sod pieces.
- D. Lay smooth. Align with adjoining grass areas.
- E. Place top elevation of sod ½ inch below adjoining paving and/or curbs.

- F. On slopes 6 inches per foot and steeper, lay sod perpendicular to slope and secure every row with wooded pegs at a maximum 3 feet on center. When using “big roll”, lay sod parallel to slope. Drive pegs flush with soil portion of sod.
- G. Do not place sod when temperature is lower than 40 degrees F.
- H. Prior to placing sod, on slopes exceeding 8 inches per foot or where indicated on Drawings, place mesh over topsoil. Securely anchor wire mesh in place with wood pegs sunk firmly into ground.
- I. Water sodded areas immediately after installation. Saturate sod to 4 inches of soil.
- J. After sod and soil have dried, roll sodded areas to bond sod to soil and to remove minor depressions and irregularities.

### 3.7 MAINTENANCE OF SOD

- A. Mow grass at regular intervals to maintain a maximum height of 2-1/2 inches. Do not cut more than 1/3 of grass blade at each mowing.
- B. Neatly trim edges and hand clip where necessary.
- C. Immediately remove clippings after mowing and trimming.
- D. Water to prevent grass and soil from drying out.
- E. Roll surface of sod to prevent irregularities.
- F. Control growth of weeds. Apply herbicides. Remedy damage resulting from improper use of herbicides.
- G. Immediately replace sod or re-seed areas showing deterioration or bare spots.
- H. Protect sodded areas with warning signs or tape during maintenance period.

### 3.8 HYDROSEEDING

- A. Apply fertilizer, mulch and seeded slurry with hydraulic seeder at rate established by manufacturer.
- B. After application, apply water with fine spray immediately after each area has been hydroseeded. Saturate to 4 inches of soil and maintain moisture levels two to four inches.

### 3.9 SEED PROTECTION

- A. Cover seeded slopes where grade is 3:1 or greater with erosion fabric. Roll fabric onto slopes without stretching or pulling.

- B. Lay fabric smoothly on surface, bury top end of each section in 6-inch-deep excavated topsoil trench. Overlap edges and ends of adjacent rolls minimum 12 inches. Backfill trench and rake smooth, level with adjacent soil.
- C. Secure outside edges and overlaps at 36-inch intervals with stakes.
- D. Lightly dress slopes with topsoil to ensure close contact between fabric and soil.
- E. At sides of ditches, lay fabric laps in direction of water flow. Lap ends and edges minimum 6 inches.

END OF SECTION

## SECTION 02952

### SEWER AND MANHOLE TESTING

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Testing Manholes:
    - a. Vacuum Test.
  - 2. Testing Gravity Sewer Piping:
    - a. Low-pressure Air Test.
    - b. Infiltration Test.
  - 3. Hydrostatic Testing Pressure Piping.
  - 4. Deflection Testing Plastic Piping.
- B. Related Sections:
  - 1. Drawings and general provisions of the Contract including General and Supplemental General Conditions, and Technical Specifications.

##### 1.2 REFERENCES

- A. ASTM International:
  - 1. ASTM C1244 - Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test.
  - 2. ASTM D2122 - Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings.

##### 1.3 SUBMITTALS

- A. Section 01330 - Submittal Procedures.
- B. Submit the following prior to start of testing:
  - 1. Testing procedures.
  - 2. List of test equipment.
  - 3. Testing sequence schedule.
  - 4. Provisions for disposal of flushing and test water.
  - 5. Certification of test gauge calibration.
  - 6. Deflection mandrel drawings and calculations.
- C. Test Reports: Indicate results of manhole and piping tests.

#### PART 2 PRODUCTS

##### 2.1 VACUUM TESTING EQUIPMENT

- A. Vacuum pump.

- B. Vacuum line.
- C. Vacuum tester base with compression band seal and outlet port.
- D. Shut-off valve.
- E. Stop watch.
- F. Plugs.
- G. Vacuum gauge, calibrated to 0.1 inch Hg

## 2.2 AIR TEST EQUIPMENT

- A. Air compressor.
- B. Air supply line.
- C. Shut-off valves.
- D. Pressure regulator.
- E. Pressure relief valve.
- F. Stop watch.
- G. Plugs.
- H. Pressure gauge, calibrated to 0.1 psi.

## 2.3 INFILTRATION TEST EQUIPMENT

- A. Weirs.

## 2.4 HYDROSTATIC TEST EQUIPMENT

- A. Hydro pump.
- B. Pressure hose.
- C. Water meter.
- D. Test connections.
- E. Pressure relief valve.
- F. Pressure gauge, calibrated to 0.1 psi.

## 2.5 DEFLECTION TEST EQUIPMENT

- A. Go, No-Go mandrels.

- B. Pull/retrieval ropes.

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

- A. Section 01300 - Administrative Requirements.
- B. Verify manholes and piping are ready for testing.
- C. Verify trenches are backfilled.
- D. Verify pressure piping concrete reaction support blocking or mechanical restraint system is installed.

### **3.2 PIPING PREPARATION**

- A. Lamping:
  - 1. Lamp gravity piping after flushing and cleaning.
  - 2. Perform lamping operation by shining light at one end of each pipe section between manholes; observe light at other end; reject pipe not installed with uniform line and grade; remove and reinstall rejected pipe sections; re-clean and lamp until pipe section achieves uniform line and grade.
- B. Plug outlets, wye-branches and laterals; brace plugs to resist test pressures.

### **3.3 FIELD QUALITY CONTROL**

- A. Section 01400 - Quality Requirements.
- B. Testing Gravity Sewer Piping:
  - 1. Low-pressure Air Test:
    - a. Test each section of gravity sewer piping between manholes.
    - b. Introduce air pressure slowly to approximately 4 psig.
      - 1) Determine ground water elevation above spring line of pipe for every foot of ground water above spring line of pipe, increase starting air test pressure by 0.43 psig; do not increase pressure above 10 psig.
    - c. Allow pressure to stabilize for at least five minutes. Adjust pressure to 3.5 psig or increased test pressure as determined above when ground water is present. Start test.
    - d. Test:
      - 1) Determine test duration for sewer section with single pipe size from the following table. Do not make allowance for laterals.



## AIR TEST TABLE

### Minimum Test Time for Various Pipe Sizes

<u>Pipe Dia.</u> <u>(inches)</u>	<u>T(time),</u> <u>min/ 100 feet</u>
3	0.2
4	0.3
6	0.7
8	1.2
10	1.5
12	1.8
15	2.1
18	2.4
21	3.0
24	3.6
27	4.2
30	4.8
36	6.0

- 2) Record drop in pressure during test period; when air pressure has dropped more than 1.0 psig during test period, piping has failed; when 1.0 psig air pressure drop has not occurred during test period, discontinue test and piping is accepted.
  - 3) When piping fails, determine source of air leakage, make corrections and retest; test section in incremental stages until leaks are isolated; after leaks are repaired, retest entire section between manholes.
2. Test pipe larger than 36 inches diameter with exfiltration test not exceeding 100 gallons for each inch of pipe diameter for each mile per day for each section under test. Perform test with minimum positive head of 2 feet.
  3. Infiltration Test:
    - a. Use only when gravity piping is submerged in ground water minimum of 4 feet above crown of pipe for entire length being tested.
    - b. Maximum Allowable Infiltration: 100 gallons per inch of pipe diameter for each mile per day for section under test, include allowances for leakage from manholes. Perform test with minimum positive head of 2 feet.
- C. Testing Pressure Sewer Piping:
1. Hydrostatic Leakage Test:
    - a. Hydrostatically test each portion of pressure piping, including valve section, at 1.5 times working pressure of piping based on elevation of lowest point in piping corrected to elevation of test gauge.
    - b. Fill section to be tested with water slowly, expel air from piping at high points. Install corporation cocks at high points. Close air vents and corporation cocks after air is expelled and raise pressure to specified test pressure.

- c. Observe joints, fittings and valves under test. Remove and renew cracked pipe, joints, fittings, and valves showing visible leakage. Retest.
- d. Correct visible deficiencies and continue testing at same test pressure for additional 2 hours to determine leakage rate. Maintain pressure within plus or minus 5.0 psig of test pressure. Leakage is defined as quantity of water supplied to piping necessary to maintain test pressure during period of test.
- e. Compute maximum allowable leakage by the following formula:

$$L = \frac{SD\sqrt{P}}{C}$$

L = allowable, in gallons per hour

S = length of pipe tested, in feet

D = nominal diameter of pipe, in inches

p = average test pressure during leakage test, in psig

C = 133,200

When pipe under test contains sections of various diameters, calculate allowable leakage from sum of computed leakage for each size.

- f. When test of pipe indicates leakage greater than allowed, locate source of leakage, make corrections and retest until leakage is within allowable limits. Correct visible leaks regardless of quantity of leakage.

D. Deflection Testing of Plastic Sewer Pipe:

- 1. Perform vertical ring deflection testing on PVC and ABS sewer piping, after backfilling has been in place for at least 30 days but not longer than 12 months.
- 2. Allowable maximum deflection for installed plastic sewer pipe limited to 5 percent of original vertical internal diameter.
- 3. Perform deflection testing using properly sized rigid ball or 'Go, No-Go' mandrel.
- 4. Furnish rigid ball or mandrel with diameter not less than 95 percent of base or average inside diameter of pipe as determined by ASTM standard to which pipe is manufactured. Measure pipe in compliance with ASTM D2122.
- 5. Perform test without mechanical pulling devices.
- 6. Locate, excavate, replace and retest pipe exceeding allowable deflection.

E. Testing Manholes:

- 1. General: Test using air whenever possible prior to backfilling to assist in locating leaks. Make joint repairs on both outside and inside of joint to ensure permanent seal. Test manholes with manhole frame set in place.
- 2. Vacuum test in accordance with ASTM C1244 and as follows:
  - a. Plug pipe openings; securely brace plugs and pipe.
  - b. Inflate compression band to effect seal between vacuum base and structure; connect vacuum pump to outlet port with valve open; draw vacuum to 10 inches of Hg; close valve; start test.
  - c. Test:
    - 1) Determine test duration for manhole from the following table:

VACUUM TEST TABLE

Manhole Diameter

Test Period

4 feet

60 seconds

5 feet

75 seconds

6 feet

90 seconds

- 2) Record vacuum drop during test period; when vacuum drop is greater than 1 inch of Hg during test period, repair and retest manhole; when vacuum drop of 1 inch of Hg does not occur during test period, discontinue test and accept manhole.
- 3) When vacuum test fails to meet 1 inch Hg drop in specified time after repair, repair and retest manhole.

END OF SECTION

**SECTION 03200**  
**CONCRETE REINFORCEMENT**

**PART 1 GENERAL**

1.1 SUMMARY

- A. Section Includes:
  - 1. Reinforcing bars.
  - 2. Welded wire fabric.
  - 3. Reinforcement accessories.
  
- B. Related Sections:
  - 1. Drawings and general provisions of the Contract including General and Supplemental General Conditions, and Technical Specifications.

1.2 REFERENCES

- A. American Concrete Institute:
  - 1. ACI 301 - Specifications for Structural Concrete.
  - 2. ACI 318 - Building Code Requirements for Structural Concrete.
  - 3. ACI SP-66 - ACI Detailing Manual.
  
- B. ASTM International:
  - 1. ASTM A82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
  - 2. ASTM A184/A184M - Standard Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement.
  - 3. ASTM A497 - Standard Specification for Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement.
  - 4. ASTM A615/A615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
  - 5. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
  - 6. ASTM A704/A704M - Standard Specification for Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement.
  - 7. ASTM A706/A706M - Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
  - 8. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.
  - 9. ASTM A775/A775M - Standard Specification for Epoxy-Coated Reinforcing Steel Bars.
  - 10. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Fabric for Reinforcement.
  - 11. ASTM A934/A934M - Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars.
  - 12. ASTM A996/A996M - Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement.

13. ASTM D3963/D3963M - Standard Specification for Fabrication and Jobsite Handling of Epoxy-Coated Reinforcing Steel Bars.
  - C. American Welding Society:
    1. AWS D1.4 - Structural Welding Code - Reinforcing Steel.
  - D. Concrete Reinforcing Steel Institute:
    1. CRSI - Manual of Standard Practice.
    2. CRSI - Placing Reinforcing Bars.
- 1.3 SUBMITTALS
- A. Section 01330 - Submittal Procedures.
  - B. Shop Drawings: Indicate bar sizes, spacings, locations, and quantities of reinforcing steel and welded wire fabric, bending and cutting schedules.
  - C. Certificates: Submit AWS qualification certificate for welders employed on the Work.
  - D. Submit certified copies of mill test report of reinforcement materials analysis.
- 1.4 QUALITY ASSURANCE
- A. Perform Work in accordance with CRSI - Manual of Standard Practice and ACI 301.
- 1.5 QUALIFICATIONS
- A. Welders: AWS qualified within previous 12 months.
- 1.6 COORDINATION
- A. Section 01300 - Administrative Requirements.
  - B. Coordinate with placement of formwork, formed openings and other Work.

## **PART 2 PRODUCTS**

### **2.1 REINFORCEMENT**

- A. Reinforcing Steel: ASTM A615/A615M, 60 ksi yield grade; deformed billet steel bars, unfinished.
- B. Reinforcing Steel Plain Bar and Rod Mats: ASTM A704/A704M, ASTM A615/A615M, Grade 60; steel bars or rods, unfinished.
- C. Stirrups Steel: ASTM A82, unfinished.
- D. Welded Steel Wire Fabric: ASTM A497 Deformed Type; in flat sheets or coiled rolls; galvanized finish.

## 2.2 ACCESSORY MATERIALS

- A. Tie Wire: Minimum 16 gage annealed type.
- B. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions including load bearing pad on bottom to prevent vapor retarder puncture.
- C. Special Chairs, Bolsters, Bar Supports, Spacers Adjacent to Weather Exposed Concrete Surfaces: Plastic tipped steel type; size and shape to meet Project conditions.
- D. Reinforcing Splicing Devices: Exothermic welding type; full tension and compression; sized to fit joined reinforcing.

## 2.3 FABRICATION

- A. Fabricate concrete reinforcement in accordance with CRSI Manual of Practice.

## PART 3 EXECUTION

### 3.1 PLACEMENT

- A. Place, support and secure reinforcement against displacement. Do not deviate from required position.
- B. Do not displace or damage vapor retarder.
- C. Accommodate placement of formed openings.
- D. Maintain concrete cover around reinforcement as follows:

<u>Item</u>	<u>Coverage</u>
Concrete in contact with soil	3 inches
Exterior concrete	
Bars larger than No. 5	2 inches
No. 5 bars and smaller	1-1/2 inches
Interior concrete	
Bars larger than No. 11	1-1/2 inches
No. 11 bars and smaller	3/4 inch
Stirrups	1-1/2 inches

- E. Conform to applicable code for all other conditions.
- F. Splice reinforcing in accordance with splicing device manufacturer's instructions.

G. Lap length shall be as follows unless otherwise noted on the Drawings:

<u>Bar Size</u>	<u>Lap Length</u>
No. 3	12 inches
No. 4	12 inches
No. 5	15 inches
No. 6	18 inches
No. 7	24 inches
No. 8	30 inches

3.2 FIELD QUALITY CONTROL

A. Section 01400 - Quality Requirements; Section 01700 - Execution Requirements.

END OF SECTION

## SECTION 03300

### CAST-IN-PLACE CONCRETE

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Section includes:
  - 1. Cast-in-place concrete.
  - 2. Formwork.
  - 3. Reinforcing.
  - 4. Mix Design.
  - 5. Control, expansion and contraction joint devices.
  - 6. Placement procedures.
  - 7. Finishes.
  - 8. Testing requirements.
- B. Related Documents:
  - 1. Drawings and general provisions of the Contract including General and Supplemental General Conditions, and Technical Specifications.

##### 1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

- A. Cast-in-Place Structures:
  - 1. Basis of Measurement: Cubic Yard or Lump Sum.
  - 2. Basis of Payment: Includes all labor, material, and equipment required to construct the concrete structures shown on the Plans and/or reflected in the Bid Form. Includes placing and compacting of base material, formwork, underground piping, drains, conduit, reinforcement, pouring and finishing of concrete, removal of forms, water stops, water proofing, expansion and control joints, cleanup and all related items.
- B. Concrete Driveway Replacement:
  - 1. Basis of Measurement: Square Yard or Cubic Yard.
  - 2. Basis of Payment: Includes all labor, materials, and equipment required to place concrete surface at the thickness and cured strength shown in the Plans and/or reflected in the Bid Form. Includes saw cutting and removal of existing surface, backfill materials per the Plans, wire mesh, pouring and finishing concrete drive, cleanup and all related work. Also, shall include coordination with any residents to provide an alternate entrance to their driveway while concrete is curing. The maximum width for payment shall be as noted on the Plans.
- C. Minor Concrete Structures:
  - 1. Basis of Measurement: Cubic Yard.
  - 2. Basis of Payment: Includes all labor, material, and equipment required to replace or construct any minor or miscellaneous structures as indicated in the Plans, directed by the Engineer, and/or reflected in the Bid Form. Items could include curb and gutters, sidewalks, and small slabs.

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### 1.3 REFERENCES

- A. American Concrete Institute:
  - 1. ACI 301 - Specifications for Structural Concrete.
  - 2. ACI 305 - Hot Weather Concreting.
  - 3. ACI 306.1 - Standard Specification for Cold Weather Concreting.
  - 4. ACI 318 - Building Code Requirements for Structural Concrete.
  
- B. ASTM International:
  - 1. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
  - 2. ASTM C33 - Standard Specification for Concrete Aggregates.
  - 3. ASTM C94 - Standard Specification for Ready-Mixed Concrete.
  - 4. ASTM C150 - Standard Specification for Portland Cement.
  - 5. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
  - 6. ASTM C330 - Standard Specification for Lightweight Aggregates for Structural Concrete.
  - 7. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete.
  - 8. ASTM C595 - Standard Specification for Blended Hydraulic Cements.
  - 9. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete.
  - 10. ASTM C1017 - Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
  - 11. ASTM C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
  - 12. ASTM C1116 - Standard Specification for Fiber-Reinforced Concrete and Shotcrete.
  - 13. ASTM D994 - Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).
  - 14. ASTM D1190 - Standard Specification for Concrete Joint Sealer, Hot-Applied Elastic Type.
  - 15. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
  - 16. ASTM D1752 - Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
  - 17. ASTM E1643 - Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill under Concrete Slabs.
  - 18. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.

### 1.4 SUBMITTALS

- A. Section 01330 - Submittal Procedures.
  
- B. Product Data: Submit data on joint devices, attachment accessories, and admixtures.
  
- C. Design Data:
  - 1. Submit concrete mix design for each concrete strength. Submit separate mix designs when admixtures are required for the following:

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- a. Hot and cold weather concrete work.
- b. Air entrained concrete work.
- 2. Identify mix ingredients and proportions, including admixtures.
- D. Manufacturer's Installation Instructions: Submit installation procedures and interface required with adjacent Work.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Section 01700 - Execution Requirements.
- B. Project Record Documents: Accurately record actual locations of embedded utilities and components concealed from view in finished construction.

#### 1.6 QUALITY CONTROL / QUALITY ASSURANCE

- A. Perform Work in accordance with ACI 301.
- B. Maintain one copy of each document on site.
- C. Acquire cement and aggregate from one source for Work.
- D. Conform to ACI 305 when concreting during hot weather.
- E. Conform to ACI 306.1 when concreting during cold weather.
- F. Concrete Testing Service: Contractor shall employ CDG to provide quality assurance testing during construction. Contractor is responsible to provide suitable quality control of materials, procedures, and of the mix design process to ensure the concrete conforms to the project plans and specifications. Submit quality control plan and proposed concrete mix designs to Engineer prior to concrete placement.

#### 1.7 COORDINATION

- A. Section 01300 - Administrative Requirements.
- B. Coordinate placement of joint devices with erection of concrete formwork and placement of form accessories.

### **PART 2 PRODUCTS**

#### 2.1 FORM MATERIALS

- A. Forms for Exposed Finish Concrete: Plywood, metal, metal-framed plywood faced, or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces.
  - 1. Use overlaid plywood complying with U.S. Product Standard PS-1 "A-C or B-B High Density Overlaid Concrete Form", Class 1.

2. Use plywood complying with U.S. Product Standard PS-1 “B-B (Concrete Form) Plywood”, Class 1, Exterior Grade or better, mill-oiled and edge sealed, with each piece bearing legible inspection trademark.
- B. Forms for Unexposed Finish Concrete: Plywood, lumber, metal, or other acceptable material. Provide lumber dressed on at least 2 edges and one side for a tight fit.
  - C. Form Coatings: Provide commercial formulation form coating compounds with a maximum VOC of 350 mg/l that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
  - D. Form Ties: Factory fabricated, adjustable length, removable or snap-off metal form ties, designed to prevent form deflection and to prevent spalling concrete upon removal.

## 2.2 REINFORCING MATERIALS

- A. Reinforcing Bars: ASTM A615, Grade 60, deformed.
- B. Welded Wire Fabric: ASTM A185 welded steel wire fabric.
- C. Supports for Reinforcement: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Use wire-bar type supports complying with CRSI specifications.
  1. For slabs-on-grade use supports with sand plates or horizontal runners where base material will not support chair legs.
  2. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs that are plastic protected (CRSI, class 1) or stainless steel protected (CRSI, class 2).
  3. For sand blasted or intentionally roughened concrete surfaces, provide supports of stainless steel (CRSI, class 2).
- D. Reinforcing Bars to be Welded: ASTM A706, “Specifications for Low Alloy Steel Deformed Bars for Concrete Reinforcement”.
- E. Bar and Rod Mats: ASTM A184 “Specifications for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement”.
- F. Threaded Dowels: Continuous Threaded high-strength steel bars. Provide inserts compatible with dowels, designed for ultimate pull-out force indicated on the Drawings.
- G. Mechanical Splices: Equal to “Cadmold Rebar Splices”, as manufactured by Erico Products, Inc., “C” Series, for developing 125% of minimum ASTM specified yield strengths, unless otherwise noted on Drawings.
- H. Steel Shapes, Plates and Rods: Conform to ASTM A36 “Specifications for Structural Steel”.
- I. Do not weld reinforcing steel unless specifically noted on Drawings. If welding is shown, conform to latest revision of AWS D12.1, “Reinforcing Steel Welding Code of the

American Welding Society”. Perform all welding with certified welders qualified per AWS.

## 2.3 CONCRETE MATERIALS

- A. Cement: ASTM C150, Type I – Normal, Portland type for all applications other than structures used in conjunction with wastewater projects. All wastewater related structures shall use Type V – Sulfate Resistant, Portland Cement.
- B. Fly Ash: ASTM C618, Type C or Type F.
  - 1. Limit use of fly ash to not exceed 20 percent of cement content by weight.
- C. Normal Weight Aggregate: ASTM C33 and as herein specified. Provide aggregates from a single source for exposed concrete.
  - 1. For exterior exposed surfaces, do not use fine or coarse aggregates containing spalling-causing deleterious substances.
- D. Water: Clean, potable.
- E. Admixtures, General: Provide admixtures for concrete that contain not more than 0.1 percent chloride ions.
- F. Air-Entraining Admixtures: ASTM C260, certified by manufacturer to be compatible with other required admixtures.
- G. Water Reducing Admixtures: ASTM C494, Type A.
- H. High Range Water Reducing Admixtures (Super Plasticizer): ASTM C494, Type F or Type G.
- I. Water Reducing, Non-Chloride Accelerating Admixture: ASTM C494, Type E.
- J. Water Reducing, Retarding Admixture: ASTM C494, Type D.
- K. All admixtures shall be supplied by the same manufacturer.

## 2.4 ACCESSORIES

- A. Vapor Retarder: ASTM E1745 Class A; 6 mil thick fabric-reinforced plastic film, 0.03 perms; rated for below grade application. Furnish joint tape recommended by manufacturer.
- B. Non-Shrink Grout: ASTM C1107, premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 2,400 psi in 48 hours and 7,000 psi in 28 days.
- C. Concrete Reinforcing Fibers: ASTM C1116, high strength industrial-grade fibers specifically engineered for secondary reinforcement of concrete. Tensile strength 130 ksi; toughness 15 ksi; 3/4 inch long fibers, 34 million/lb fiber count.

- D. Waterstops: Provide flat, dumbbell-type or centerbulb-type waterstops at construction joints and other joints as shown on the Drawings.
- E. Granular Base: Evenly graded mixture of fine and course aggregates to provide, when compacted, a smooth and even surface below slabs on grade.
- F. Sand Cushion: Clean, manufactured or natural sand.
- G. Nonslip Aggregate Finish: Provide fused aluminum oxide granules or crushed emery as abrasive aggregate for nonslip finish. Material shall be factory graded, rustproof, non-glazing, and is unaffected by freezing, moisture, and cleaning materials.
- H. Colored Wear Resistant Finish: Packaged, dry, combination of materials consisting of Portland cement, graded quartz aggregate, coloring pigments, and plasticizing admixture. Use coloring pigments that are finely ground, nonfading mineral oxides, interground with cement. Color as selected by Engineer.
- I. Bonding Compound: Polyvinyl acetate or acrylic base.
- J. Epoxy Adhesive: ASTM C881, two-component material suitable on dry or damp surfaces. Provide material type, grade and class to suit project requirements.

## 2.5 JOINT DEVICES AND FILLER MATERIALS

- A. Joint Filler Type A: ASTM D994; Asphalt impregnated fiberboard or felt, thickness as indicated on the drawings; tongue and groove profile.
- B. Joint Filler Type B: ASTM D1751; cellular bonded fiber material, non-extruding, resiliency recovery of 70 percent if not compressed more than 50 percent of original thickness.
- C. Construction Joint Devices: Integral galvanized steel, formed to tongue and groove profile, with removable top strip exposing sealant trough, knockout holes spaced at 6 inches, ribbed steel spikes with tongue to fit top screed edge.
- D. Expansion and Contraction Joint Devices: ASTM B221 alloy, extruded aluminum; resilient neoprene filler strip with Shore A hardness of 35 to permit plus or minus 25 percent joint movement with full recovery; extruded aluminum of longest manufactured length at each location, flush mounted.
- E. Joint Sealant: ASTM C920, Type S; single component, self leveling, premium grade polyurethane sealant, equal to Sikaflex-1C SL.

## 2.6 CONCRETE MIX

- A. Mix concrete in accordance with ACI 301. Deliver concrete in accordance with ASTM C94.
- B. Select proportions for normal weight concrete in accordance with ACI 301 trial mixtures.

C. Provide concrete to the following criteria:

Unit	Measurement
Compressive Strength ( $f'_c$ at 28 day)	As Indicated in Plans
Aggregate Size (maximum)	1 inch
Air Entrainment	4 to 6 percent
Slump	3 to 5 inches

D. Prepare design mixes for each type and strength of concrete by either laboratory trial mixture or field experience methods as specified in ACI 318-89 Section 5.3.

E. Mix design based on historical performances in accordance with ACI 318-89 Section 5.3, may be provided by a qualified concrete supplier or precast concrete manufacturer for concrete designs. Mix design shall be certified by an independent testing laboratory.

F. All concrete mix designs shall include the following information:

1. Proportions of cement, fine and coarse aggregates and water.
2. Water/cement ratio, design strength, slump and air content.
3. Type and source of cement and aggregates.
4. Type and dosage of all admixtures.
5. Any special characteristics of the mix which require precautions in the mixing, placing or finishing techniques to achieve the finished product specified.

G. Engineer to review and approve mix designs prior to start of concrete production.

H. Design mixes to provide normal weight concrete.

I. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, as accepted by Engineer.

J. All mix design information and data shall not be older than 18 months from the date of the submittal.

## 2.7 ADMIXTURES

A. Use water reducing admixture or high range water reducing admixture (superplasticizer) in concrete as required for placement and workability.

B. Use high range water reducing admixture in pumped concrete, concrete required to be watertight, and concrete with water/cement ratio below 0.50.

C. Use nonchloride accelerating admixture in concrete slabs placed at ambient temperatures below 50 degrees F.

D. Use air-entraining admixture in concrete unless otherwise indicated. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete having an air content of 4% to 6% at the point of placement.

- E. Use admixtures for water reduction and set control in strict compliance with manufacturer's directions.
- F. Temperature Limit: Do not place concrete if the concrete temperature exceeds 90°F or the ambient temperature is 40°F or less and falling.
- G. Slump Limit: Proportion and design mixes to result in concrete slump of 3 to 5 inches at point of placement.

## 2.8 CONCRETE MIXING

- A. Provide batch ticket for each batch used on the project. Batch ticket must indicate project name, contractor's name, date, mix type, mix time, batch time, quantity, and amount of water introduced.
- B. Ready-Mix Concrete: Comply with requirements of ASTM C94, and as specified.
  - 1. Addition of water to batch for material with insufficient slump will be permitted in accordance with ACI 301.
  - 2. When air temperature is between 85 degrees F. and 90 degrees F., reduce mixing and delivery time from 1-1/2 hours to 75 minutes. When air temperature exceeds 90 degrees F. reduce mixing and delivery time to 60 minutes.
  - 3. Concrete shall only be placed when the air temperature is above 40 degrees F. and rising.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Section 01300 - Administrative Requirements.
- B. Verify requirements for concrete cover over reinforcement.
- C. Verify anchors, seats, plates, reinforcement, and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with placing concrete.

### 3.2 FORMS

- A. General: Design, erect, support, brace, and maintain formwork to support vertical and lateral, static and dynamic loads that might be applied until concrete structure can support such loads.
- B. Maintain formwork construction tolerances complying with ACI 301 Table 4.3.1.
- C. Construct forms to sizes, shapes, lines, and dimensions shown and to obtain accurate alignment, location, grades, level, and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, chamfers, blocking, bulkheads, anchorages, and other features required in work.

- D. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces.
- E. Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placement of concrete. Securely brace temporary openings and set tightly to forms to prevent loss of concrete mortar.
- F. Chamfer exposed edges and corners as indicated using wood, metal, PVC, or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.
- G. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items.
- H. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before concrete is placed.

### 3.3 VAPOR BARRIER

- A. General: Following leveling and tamping of granular base for slabs-on-grade, place vapor barrier sheeting with longest dimension parallel with direction of pour.
- B. Lap joints 6 inches and seal vapor barrier joints with manufacturer's recommended mastic and pressure-sensitive tape.
- C. After placement of vapor barrier, cover with sand cushion and compact to depth as shown on Drawings.

### 3.4 PLACING REINFORCEMENT

- A. General: Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars," for details and methods of reinforcement placement and supports and as herein specified.
  - 1. Avoiding cutting or puncturing vapor retarder during reinforcement placement and concreting operations.
- B. Clean reinforcement of loose rust and mill scale, earth ice, and other materials that reduce or destroy bond with concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as required.
- D. Place reinforcement to obtain at least minimum coverages for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.



- E. Install welded wire fabric in as long lengths as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

### 3.5 JOINTS

- A. Construction Joints: Locate and install construction joints as indicated or, if not indicated, locate so as not to impair strength and appearance of the structure.
- B. Provide keyways at least 1-1/2 inches deep in construction joints in walls, slabs, beams and between walls and footings.
- C. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints except as otherwise indicated.
- D. Use bonding agent on existing concrete surfaces that will be joined with fresh concrete.
- E. Waterstops: Provide waterstops in construction joints as indicated. Install waterstops to form continuous diaphragm in each joint. Make provisions to support and protect exposed waterstops during progress of work. Field-fabricate joints in waterstops according to manufacturer's printed instructions.
- F. Isolation Joints in Slabs-on-Ground: Construct isolation joints in slabs-on-ground at points of contact between slabs-on-ground and vertical surfaces, such as column pedestals, foundation walls, grade beams, and elsewhere as indicated.
- G. Contraction (Control) Joints in Slabs-On-Grade: Construct contraction joints in slabs-on-ground to form panels of patterns as shown. Use saw cuts 1/8 inch wide by 1/4 slab depth or approved inserts, unless otherwise indicated. Make saw cuts as soon as possible after slab finishing as may be safely done without dislodging aggregates.
  - 1. With prior approval from Engineer contraction joints may be formed by inserting premolded plastic, hardboard, or fiberboard strip into fresh concrete until top surface of strip is flush with slab surface. Tool slab edges round on each side of insert. After concrete has cured, remove inserts and clean groove of loose debris.
  - 2. Refer to drawings for scoring pattern as shown. If joint pattern not shown, provide joints not exceeding 15 feet in either direction and located to conform to bay spacing wherever possible.

### 3.6 PREPARATION OF FORM SURFACES

- A. Clean re-used forms of concrete matrix residue, repair and patch as required to return forms to acceptable surface condition.
- B. Coat contact surfaces of forms with an approved, noresidual, low-VOC, form-coating compound before reinforcement is placed. Do not allow excess form-coating material to accumulate in forms or to come into contact with in-place concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.
- C. Coat steel forms with a nonstaining, rust-preventative material. Rust-stained steel formwork is not acceptable.

### 3.7 CONCRETE PLACEMENT

- A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in.
- B. General: Comply with ACI 304, "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete."
- C. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete that has hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete to avoid segregation at its final location.
- D. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers not deeper than 24 inches and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.
- E. Consolidate full depth of placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures for consolidation of concrete in accordance with ACI 309.
- F. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine. Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion, limit duration of vibration time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix.
- G. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until the placing of a panel or section is completed.
  - 1. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.
  - 2. Bring slab surfaces to correct level with straightedge and strike off. Use bull floats or derbies to smooth surface, free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations
  - 3. Maintain reinforcing in proper position during concrete placement.
- H. Cold-Weather Placing: Comply with provisions of ACI 306 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
  - 1. When placing concrete in cold weather, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
  - 2. Concrete shall only be placed when the air temperature is above 40 degrees F. and rising.
  - 3. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
  - 4. Do not use calcium chloride, salt, and other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.

- I. Hot-Weather Placing: When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI305 and as herein specified.
  1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 deg F (32 deg C). Mixing water may be chilled, or chopped ice may be used to control temperature provided water equivalent of ice is calculated to total amount of mixing water. Use of liquid nitrogen to cool concrete is Contractor's option.
  2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.
  3. Fog spray forms, reinforcing steel, and subgrade just before concrete is placed.
  4. Use water-reducing retarding admixture when required by high temperatures, low humidity, or other adverse placing conditions, when acceptable to Engineer.

### 3.8 FINISH OF FORMED SURFACES

- A. Rough Form Finish: For formed concrete surfaces not exposed to view in the finish work or concealed by other construction. This is the concrete surface having texture imparted by form-facing material used, with tie holes and defective areas repaired and patched. Fins and other projections exceeding 1/4 inch in height shall be rubbed down or chipped off.
- B. Smooth Form Finish: For formed concrete surfaces exposed to view or to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, painting, or other similar system. This is an as-cast concrete surface obtained with selected form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch defective areas with fins and other projections completely removed and smoothed.
- C. Smooth Rubbed Finish: Provide smooth rubbed finish to scheduled concrete surfaced, which have received smooth form finish treatment, not later than one day after form removal.
  1. Moisten concrete surfaces and rub with carborundum brick or other abrasive until a uniform color and texture is produced. Do not apply cement grout other than that created by the rubbing process.
- D. Grout-Cleaned Finish: Provide grout-cleaned finish to scheduled concrete surfaces that have received smooth form finish treatment.
  1. Combine one part Portland cement to 1-1/2 parts fine sand by volume, and a 50:50 mixture of acrylic or styrene butadiene-based bonding admixture and water to consistency of thick paint. Blend standard Portland cement and white Portland cement, amount determined by trial patches, so that final color of dry grout will match adjacent surfaces.
  2. Thoroughly wet concrete surfaces apply grout to coat surfaces, and fill small holes. Remove excess grout by scraping and rubbing with clean burlap. Keep damp by fog spray for at least 36 hours after rubbing.
- E. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces, strike-off smooth and finish with a texture

matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

- F. Unless otherwise noted on the Drawings, all exposed surfaces shall receive a smooth rubbed finish.

### 3.9 SLAB FINISHES

- A. After placing slabs, plane surface to tolerances for floor flatness (Ff) of 15 and floor levelness (Fl) of 13. Slope surfaces uniformly to drains where required. After leveling, roughen surface before final set with stiff brushed, brooms, or rakes, as required.
- B. Float Finish: Apply float finish to slab surfaces to receive trowel finish and other finishes as hereinafter specified; slab surfaces to be covered with membrane or elastic waterproofing, membrane or elastic roofing, or sand-bed terrazzo; and as otherwise indicated.
  - 1. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating, using float blades or float shoes only, when surface water has disappeared, when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats or by hand floating if area is small or inaccessibly to power units. Check and level surface plane to tolerances of Ff 18-Fl 15. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.
- C. Trowel Finish: Apply trowel finish to slab surfaces to be exposed to view and slab surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile, paint, or other thin film finish coating system.
  - 1. After floating, begin first trowel finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and with surface leveled to tolerances of Ff 20-Fl 17. Grind smooth surface defects that would telegraph through applied floor covering system.
- D. Nonslip Broom Finish: Apply nonslip broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.
  - 1. Immediately after float finishing, slightly roughen concrete surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Engineer before application.
- E. Nonslip Aggregate Finish: Apply nonslip aggregate finish to concrete stair treads, platforms, ramps, sloped walks, and elsewhere as indicated.
- F. After completion of float finishing and before starting trowel finish, uniformly spread 25 lbs. of dampened nonslip aggregate per 100 sq. ft. of surface. Tamp aggregate flush with surface using a steel trowel, but do not force below surface. After broadcasting and tamping, apply trowel finishing as herein specified.

- G. After curing, lightly work surface with a steel wire brush, or an abrasive stone, and water to expose nonslip aggregate.

### 3.10 CONCRETE CURING AND PROTECTION

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. In hot, dry, and windy weather, protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control material. Apply in accordance with manufacturer's instructions after screeding and bull floating, but before power floating and troweling.
- B. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting; keep continuously moist for not less than 7 days.
- C. Curing Methods: Perform curing of concrete by curing and sealing compound, b moist curing, by moisture-retaining cover curing, and by combinations thereof, as herein specified.
- D. Provide moisture curing by following methods.
  - 1. Keep concrete surface continuously wet by covering with water.
  - 2. Use continuous water-fog spray.
  - 3. Cover concrete surface with specified absorptive cover, thoroughly saturate cover with water, and keep continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4-inch lap over adjacent absorptive covers.

### 3.11 REMOVAL OF FORMS

- A. General: Formwork not supporting weight of concrete, such as sides of beams, walls columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form-removal operations, and provided curing and protection operations are maintained.
- B. Formwork supporting weight of concrete, such as beam soffits, joists, slabs, and other structural elements, may not be removed until approved by the structural engineer.
- C. Form-facing material may be removed 4 days after placement only if shores and other vertical supports have been arranged to permit removal of form-facing material without loosening or disturbing shores and supports.

### 3.12 CONCRETE SURFACE REPAIRS

- A. General: No surface shall be patched or repaired until the Engineer had reviewed the defective condition and approved the Contractor's submitted repair and/or patching materials and procedures.
- B. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removal of forms, when acceptable to Engineer.
  - 1. Cut of honeycomb, rock pockets, and voids over 1/4 inch in any dimension, and holes left by tie rods and bolts, down to solid concrete but in no case to a depth of

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- less than 1 inch. Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water, and brush-coat the area to be patched with specified bonding agent. Place patching mortar before bonding compound has dried.
2. For exposed-to-view surfaces, blend white portland cement and standard portland cement so that, when dry, patching mortar will match color surrounding. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.
- C. Repair of Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Engineer. Surface defects, as such, include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets, fins and other projections on surface, and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes, fill with dry-pack mortar, or precast cement cone plugs secured in place with bonding agent.
1. Repair concealed formed surfaces, where possible, that contain defects that affect the durability of concrete. If defects cannot be repaired, remove and replace concrete.
- D. Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface plane to tolerances specified for each surface and finish. Correct low and high areas as herein specified. Test unformed surfaces sloped to drain for trueness of slope and smoothness by using a template having required slope.
1. Repair finished unformed surfaces that contain defects that affect durability of concrete. Surface defects, as such, include crazing and cracks in excess of 0.01 in wide or that penetrate to reinforcement or completely through nonreinforced sections regardless of width, spalling, popouts, honeycomb, rock pockets, and other objectionable conditions.
  2. Correct high areas in unformed surfaces by grinding after concrete has cured at least 14 days.
  3. Correct low areas in unformed surfaces during or immediately after completion of surface finishing operations by cutting out low areas and replacing with patching compound. Finish repaired areas to blend into adjacent concrete. Proprietary underlayment compounds may be used when acceptable to Engineer.
  4. Repair defective areas, except random cracks and single holes not exceeding 1 inch in diameter, when acceptable to Engineer by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding compound. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
- E. Repair isolated random cracks and single holes not over 1 inch in diameter by dry-pack method when acceptable to Engineer. Groove top of cracks and cut out holes to sound concrete and clean of dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Mix dry-pack, consisting of one part Portland cement to 2-1/2

parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing.

- F. Perform structural repairs with prior approval of Structural Engineer for method and procedure, using specified epoxy adhesive and mortar.
- G. Repair methods not specified above may be used, subject to acceptance of Engineer.

### 3.13 FIELD QUALITY ASSURANCE, CONTROL AND TESTING DURING CONSTRUCTION

- A. General: The Owner may employ the Engineer or another professional firm to perform quality assurance testing during construction. The Contractor will notify the Engineer at least 24 hours prior to requiring tests. The Contractor is responsible to provide equipment to allow sampling and testing of the concrete at the point of placement.
- B. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94. Perform the following tests.
  - 1. Slump: ASTM C 143; one test at point of placement for each set of compression test specimens; additional tests when concrete properties appear to have changed.
  - 2. Air Content: ASTM C 173 (volumetric method for lightweight or normal weight concrete) or ASTM C 231 (pressure method for normal weight concrete); one test at point of placement for each set of compression test specimens; additional tests when concrete properties appear to have changed.
  - 3. Concrete Temperature: ASTM C 1064; test hourly when air temperature is 40°F and below or 80°F and above, and each time a set of compression test specimens is made.
  - 4. Compression Test Specimen: ASTM C 31; one set of 4 cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory-cured test specimens except when field-cure test specimens are required.
  - 5. Compressive Strength Tests: ASTM C 39; one set for each 50 cubic yards or fraction thereof for each concrete class placed in any one day. One specimen tested at 7 days, two specimens tested at 28 days, and one specimen retained in reserve for later testing, if required.
  - 6. When frequency of testing will provide fewer than 5 strength tests for a given class of concrete, conduct testing from at least 5 randomly selected batches or from each batch if fewer than 5 are used.
- C. Test results will be reported in writing to Engineer, Ready-Mix Producer, and Contractor within 24 hours after tests. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete supplier and testing agency, concrete type and class, location of concrete placed in structure, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-day tests and 28-day tests.
- D. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted but **shall not** be used as the sole basis for acceptance or rejection.
- E. Additional Tests: The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been

attained in the structure, as directed by Engineer. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed. Contractor shall pay for such tests when unacceptable concrete is verified.

- F. Quality Assurance consisting of testing and observation of a limited sampling of construction materials will be provided by the Owner for acceptance purposes. Passing test results are not a warranty, guarantee, or certification by the testing agency, Engineer, or Owner that all work was performed in conformance with the plans and specifications. Therefore, the Contractor should not rely solely on test results generated by the quality assurance process as an indication of the suitability of the construction.
- G. It is entirely the Contractor's responsibility to perform quality control as necessary to construct the project in conformance with the plans and specifications. Deviations from the plans and specifications, whether identified during construction or following the completion of construction, must be corrected by the Contractor at no cost to the Owner.

#### 3.14 DEFECTIVE CONCRETE

- A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.
- B. Repair or replacement of defective concrete will be determined by Engineer.
- C. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Engineer for each individual area.

END OF SECTION



## SECTION 03600

### GROUTING

#### PART 1 - GENERAL

##### 1.1 DESCRIPTION

- A. Scope of Work: This Section specifies the grouting of the annular space between the host pipe and the new liner and the grouting of the space left void in the abandonment of the existing pipelines and structures. The Work consists of furnishing all labor, equipment and materials, and performing all Work connected with the placement of the cementaceous grout to fill the void.

##### 1.2 QUALITY ASSURANCE

- A. Grouting shall be performed by a crew under the direct supervision of a superintendent that has experience in grouting of this nature.
- B. Storage, mixing, handling and placement shall be in accordance with manufacturer's instructions and specifications.

##### 1.3 SHOP DRAWINGS AND SUBMITTALS

- A. Submittals shall be submitted to the County for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals."
- B. In addition, the following shall be submitted to the County for review and acceptance prior to construction.
  - 1. A detailed description of equipment and operational procedures to accomplish the grouting operation.
  - 2. Grout mixture design data, grout mixer type, grout samples, and test data.
  - 3. A detailed description of the grouting time schedule.

#### PART 2 - PRODUCTS

##### 2.1 GENERAL

##### 2.2 GROUT MATERIAL

- A. The grout shall be a "flowable fill" consisting of a mixture of Type 1 Portland Cement, Type "F" Flyash (ASTM 618), sand and water.

The following is a suggested trial grout mixture for a 1-cubic yard yield:

Cement:	500-pounds
Fly Ash:	500-pounds

Water: 350-pounds (42-gallons)  
Sand: 2,248-pounds  
Darex (W.R. Grace): 3-ounces (Air Entrainment Additive or equivalent)

The actual grout mixture to be used shall meet the minimum requirements specified below.

- B. The mixture shall contain a minimum of 500-pounds cement and minimum of 400-pounds flyash per cubic yard of grout.
- C. Samples of the grout mixture when set aside in a standard concrete test mold shall show less than 1% of the mixture height of free water on the surface after standing not less than 12-hours.
- D. One (1) set of 3 (three) 3-inch by 6-inch sample test cubes shall be made for each mix preparation. The minimum 28-day strength shall be no less than 1,000-psi. The minimum required slump is 5-inches. The maximum allowable slump is 9-inches. Slump should be as low as practical to maintain viscosity, proper flow, and still retain the ability to pump.

## 2.3 EQUIPMENT

- A. All grout shall be mixed with a high shear, high-energy colloidal type mixer to achieve the best uniform density.
- B. The grout shall be pumped with a non-pulsating centrifugal or tri-plex pump.
- C. The mixer shall be capable of continuous mixing. Batch mixing shall not be permitted.

## PART 3 - EXECUTION

### 3.1 GROUTING OF ABANDONED PIPE

- A. Where utility pipes are to remain in place (inactive) they shall be filled with a sand/cement grout as specified herein.
- B. The grouting program shall consist of pumping sand-cement grout with suitable chemical additives at pressures necessary to fill the pipe sections in order to prevent the potential for future collapse.
- C. Grouting of pipes shall be in sections not exceeding 300 linear feet.
- D. Grout shall be placed in a maximum of 3 stages, with the initial stage volume equal to or greater than 50% of the total volume for that section of pipe being grouted. The maximum time wait between grouting stages shall be 24-hours.
- E. For each stage, mix and pump the material in one continuous process so as to avoid partial setting of some grout material during that stage; thus, eliminating voids and possible subsequent surface damage due to cave-ins.

- F. Each section shall be grouted by injecting grout from the lowest point and allowing it to flow toward the highest point to displace water from the annulus and assure complete void-free coverage. Grout shall be placed through tubes installed in the bulkheads at the insertion pits or manholes. Grout tubes shall be at least 2-inch nominal diameter.
- G. After the ends of each section of pipe are exposed, the entire space, not to exceed 300 linear feet end to end, shall be sealed by controlled pumping of grout until it flows from the pipe at the opposite end of the grouting. Grouting shall be carried out until the entire space is filled. The ends of these sections shall be capped and/or plugged.
- H. Grout pressure in the void space is not to exceed 5-psi above maximum hydrostatic groundwater level. An open ended, highpoint tap or equivalent vent must be provided and monitored at the bulkhead opposite to the bulkhead through which grout is injected. This bulkhead will be blocked closed as grout escapes to allow the pressuring of the annular space.

### 3.2 FIELD QUALITY CONTROL

- A. The quality of the grout, application of the equipment, and installation techniques are the responsibility of the Contractor. The review and acceptance or approval of specific mix design, equipment, or installation procedures shall in no way relieve the Contractor of his obligation to provide the final product as specified herein.
- B. The County may stop the grouting operations at any time if the operation does not comply with these Specifications.

END OF SECTION

## SECTION 05511

### ALUMINUM STAIRS AND LADDERS

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Section includes aluminum stair frame of structural sections, with Open or Closed risers, open grate, integral balusters, and aluminum hand railing.
- B. Related Sections:
  - 1. Drawings and general provisions of the Contract including General and Supplemental General Conditions, and Technical Specifications.

##### 1.2 REFERENCES

- A. American National Standards Institute:
  - 1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
- B. ASTM International:
  - 1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
  - 2. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
  - 3. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
  - 4. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
  - 5. ASTM A283/283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.
  - 6. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
  - 7. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
  - 8. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
  - 9. ASTM A501. - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
  - 10. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
  - 11. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings.
  - 12. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings.
- C. American Welding Society:
  - 1. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
  - 2. AWS D1.1 - Structural Welding Code - Steel.

- D. National Association of Architectural Metal Manufacturers:
  - 1. NAAMM AMP 510 - Metal Stairs Manual.
  - 2. NAAMM MBG 531 - Metal Bar Grating Manual.
- E. National Ornamental & Miscellaneous Metals Association:
  - 1. NOMMA Guideline 1 - Joint Finishes.
- F. SSPC: The Society for Protective Coatings:
  - 1. SSPC - Steel Structures Painting Manual.
  - 2. SSPC SP 1 - Solvent Cleaning.
  - 3. SSPC SP 10 - Near-White Blast Cleaning.
  - 4. SSPC Paint 15 - Steel Joist Shop Paint.
  - 5. SSPC Paint 20 - Zinc-Rich Primers (Type I - Inorganic and Type II - Organic).

### 1.3 DESIGN REQUIREMENTS

- A. Fabricate stair assembly to support uniform live load of 100 lb/sq ft and concentrated load of 300 lb/sq ft with deflection of stringer or landing framing not to exceed 1/180 of span. Minimum width of steps shall be 36 inches.
- B. Railing assembly, wall rails, and attachments to resist a uniform load of 75 lbs at any point in any direction without damage or permanent set. Assembly must also withstand a concentrated load of 200 lbs applied at any point in any direction. Minimum height of rail shall be 42 inches with on intermediate rail 18 inches below the top rail.
- C. Fabricate stair assembly to NAAMM AMP 510, Class Industrial.

### 1.4 SUBMITTALS

- A. Section 01330 - Submittal Procedures: Submittal requirements.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.
- C. Shop Drawings: Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
- D. Design Data: Submit design calculations.

### 1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with ASTM E985 - Permanent Metal Railing Systems and Rails for Buildings.
- B. Perform work in accordance with NAAMM Metal Bar Grating Manual designated ANSI/NAAMM MBG 531 for Aluminum and light duty steel and Stainless-Steel Gratings, and MBG 532 for Heavy Duty Steel Gratings.
- C. Finish joints in accordance with NOMMA Guideline 1.

D. Perform Work in accordance with State of Alabama Public Work's standard.

## 1.6 QUALIFICATIONS

A. Prepare Shop Drawings under direct supervision of Professional Engineer experienced in design of this Work and licensed in State of Alabama.

B. Welders' Certificates: Submit under provisions of Section 01300, certifying welders employed on the Work, verifying AWS qualification within previous 12 months.

## 1.7 PRE-INSTALLATION MEETINGS – **Not Applicable**

A. Section 01300 - Administrative Requirements: Pre-installation meeting.

B. Convene minimum one week prior to commencing work of this section.

## 1.8 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

## **PART 2 PRODUCTS**

### 2.1 ALUMINUM STAIRS

A. Manufacturers:

1. Benko Products, Inc.
2. Lapeyre Stair.
3. The Sharon Co., Inc.
4. Substitutions: Section 01600 - Product Requirements.

### 2.2 COMPONENTS

A. Aluminum Sections: ASTM B221, Aluminum Alloy, Extruded Bars, Rods, Shapes, and Tubing.

B. Steel Sections if required: ASTM A36/A36M.

C. Steel Tubing If required: ASTM A500, Grade B

D. Plates if Required: ASTM A283/A283M.

E. Pipe if Required: ASTM A53/A53M, Grade B, Schedule 40.

F. Landing Concrete Reinforcement: Welded Wire Mesh type unfinished.

G. Bolts, Nuts, and Washers: ASTM A325 [galvanized to ASTM A153/A153M for galvanized components].

H. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; consistent with design of stair structure.

- I. Welding Materials: AWS D1.1; type required for materials being welded.
- J. Touch-Up Primer for Galvanized Surfaces: SSPC Paint 20 Type I Inorganic or Type II Organic, zinc rich.
- K. Gratings: NAAMM MBG 531, welded type.
- L. Concrete: Type specified in Section 03300.

### 2.3 FABRICATION

- A. Fit and shop assemble components in largest practical sections, for delivery to site.
- B. Fabricate components with joints tightly fitted and secured.
- C. Continuously seal joined pieces by continuous welds.
- D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- E. Exposed Welded Joints: NOMMA Guideline 1 Joint Finish.
- F. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- G. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.
- H. Accurately form components required for anchorage of stairs, landings, and railings to each other and to building structure.

### 2.4 FABRICATION - PAN STAIRS AND LANDINGS – **Not Applicable**

- A. Fabricate stairs and landings with closed risers and treads of metal pan construction, ready to receive concrete.
- B. Form treads and risers with minimum 11 gage sheet steel stock.
- C. Secure tread pans to stringers with clip angles; bolted in place.
- D. Form stringers with rolled steel channels, 12 inches deep. Weld fascia plates to channels using 14gage steel sheet across channel toes.
- E. Form landings with minimum 11 gage sheet stock. Reinforce underside with metal T's to attain design load requirements.
- F. Form balusters with 1.5" inch diameter steel sections, welded to stringers.

2.5 FABRICATION - CHECKERED PLATE STAIRS AND LANDINGS – **Not Applicable**

- A. Form treads with minimum 11 gage checkered steel plate; galvanized finish. Bolt to stringer support clips. Bend nosing to 4 inch radius and return down 4 inch.
- B. Form stringers with rolled steel channels, 12 inches deep; galvanized finish.
- C. Form landings with minimum 11 gage checkered steel plate; galvanized finish. Reinforced underside with metal T's to attain design load requirements.
- D. Form balusters with 1.5" inch diameter steel sections, welded to stringers; galvanized finish.

2.6 FABRICATION - OPEN GRATING STAIRS AND LANDINGS

- A. Fabricate treads 1 inch I-Bar in accordance with NAAMM MBG 531, of welded Aluminum bars, welded to supports with mill finish.
- B. Form hollow stringers with rolled Aluminum channels with mill finish.
- C. Form landings in accordance with NAAMM MBG 531 Aluminum mill finish. Reinforce underside with angles to attain design load requirements.
- D. Form balusters with 1 1/4 inch diameter sections, welded to stringers with mill finish.

2.7 FABRICATION - UNIT STAIR TOWERS – **Not Applicable**

- A. Fabricate self-supporting steel stair towers with formed treads and risers; steel channel stringers; landing platforms; sectioned for transport; corner structural support members designed to support full weight of complete stair tower plus design live load; with steel railings, and balusters.
- B. Fabricate stair towers to height not exceeding 40 feet for transportation purposes; designed for stacking to height of building as self-supporting structure.

2.8 SHOP FINISHING

- A. Prepare surfaces to be primed in accordance with SSPC SP 2.
- B. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- C. Do not prime surfaces in direct contact with concrete or where field welding is required.
- D. Prime paint items with two coats.
- E. Galvanize items to minimum 1.25 oz/sq ft zinc coating in accordance with ASTM A123/A123M.



## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

- A. Section 01300 - Administrative Requirements: Coordination and project conditions.
- B. Verify field conditions are acceptable and are ready to receive work.
- C. Verify concealed blocking and reinforcement is installed and correctly located to receive wall mounted handrails.

### **3.2 PREPARATION**

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply items required to be cast into concrete or embedded in masonry with setting templates.

### **3.3 INSTALLATION**

- A. Install components plumb and level, accurately fitted, free from distortion or defects.
- B. Install anchors, plates, angles, hangers, and struts required for connecting stairs to structure.
- C. Allow for erection loads. Install sufficient temporary bracing to maintain framing safe, plumb, and in alignment.
- D. Field weld components indicated on shop drawings. Perform field welding in accordance with AWS D1.1.
- E. Field bolt and weld to match shop bolting and welding. Conceal bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.
- F. Mechanically fasten joints butted tight, flush, and hairline. Grind welds smooth and flush.
- G. Obtain approval of Engineer prior to site cutting or creating adjustments not scheduled.
- H. After erection, prime welds, abrasions, and surfaces not galvanized, except surfaces to be in contact with concrete.

### **3.4 ERECTION TOLERANCES**

- A. Section 01400 - Quality Requirements: Tolerances.
- B. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- C. Maximum Offset From Alignment: 1/4 inch.

### **3.5 SCHEDULES**

- A. Stairs A and B: Pan stairs and landings, plastic handrail cover, primed finish.

- B. Stair C: Checkered plate stairs and landings, galvanized finish. Pipe handrails specified in Section 05520.

END OF SECTION

## SECTION 05520

### HANDRAILS AND RAILINGS

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Section includes steel and aluminum pipe railings, balusters, and fittings; and handrails.
- B. Related Sections:
  - 1. Drawings and general provisions of the Contract including General and Supplemental General Conditions, and Technical Specifications.

##### 1.2 REFERENCES

- A. American Architectural Manufacturers Association:
  - 1. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.
  - 2. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.
  - 3. AAMA 2604 - Voluntary specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.
  - 4. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.
- B. ASTM International:
  - 1. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
  - 2. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
  - 3. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
  - 4. ASTM A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
  - 5. ASTM B177 - Standard Guide for Chromium Electroplating on Steel for Engineering Use.
  - 6. ASTM B211 - Standard Specification for Aluminum and Aluminum-Alloy Bar, Rod, and Wire.
  - 7. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
  - 8. ASTM B241/B241M - Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube.
  - 9. ASTM B483/B483M - Standard Specification for Aluminum and Aluminum-Alloy Drawn Tubes for General Purpose Applications.
  - 10. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings.

11. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings.
- C. National Ornamental & Miscellaneous Metals Association:
  1. NOMMA Guideline 1 - Joint Finishes.
- D. SSPC: The Society for Protective Coatings:
  1. SSPC - Steel Structures Painting Manual.
  2. SSPC Paint 15 - Steel Joist Shop Paint.
  3. SSPC Paint 20 - Zinc-Rich Primers (Type I - Inorganic and Type II - Organic).

### 1.3 DESIGN REQUIREMENTS

- A. Component handrail system shall be designed and constructed in strict compliance with the requirements of OSHA and the Standard Building Code.
- B. Handrails shall be designed to withstand a uniform horizontal load of 50 pounds per foot with a simultaneous vertical load of 100 pounds per foot applied to the top rail.
- C. In addition, handrails shall be designed to withstand a concentrated load of 200 pounds applied in any direction, at any point on the railing system.

### 1.4 SUBMITTALS

- A. Section 01330 - Submittal Procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.
- C. Samples: Submit one, 12 inch long samples of handrail. Submit one sample, of elbow Tee, escutcheon and end stop.

### 1.5 QUALITY ASSURANCE

- A. Finish joints in accordance with NOMMA Guideline 1.

### 1.6 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.
- B. Field fabrication of the railing system is not permitted.

## **PART 2 PRODUCTS**

### 2.1 HANDRAILS AND RAILINGS

- A. Manufacturers:
  1. Thompson Fabricating, Birmingham, AL.
  2. Hollaender Manufacturing Co., Cincinnati, OH.
  3. Superior Aluminum Products, Inc., Russia, OH.

4. Substitutions: Section 01600 - Product Requirements.

2.2 ALUMINUM RAILING SYSTEM COMPONENTS

- A. Rails and Posts: 1-1/2 inch diameter, schedule 40 aluminum pipe, alloy 6063-T6 or 6105-T5, ASTM B-429 or B-221. Post spacing shall be a maximum of 6'-0" on center.
- B. Handrails shall be made of pipe and fittings mechanically fastened together with stainless steel hardware. Handrail systems which use fittings that are glued or pop-riveted will not be acceptable.
- C. Toeboard, where shown or called out on the Drawings, shall conform to OSHA standards. Toeboard shall be a minimum of 4" high and shall attach to the post using clamps which will allow for expansion and contraction between posts. Toeboard shall be set 1/4" above the walking surface.
- D. Openings in the railing shall be guarded by a self closing gate (OSHA 1910.23). Safety chains are not acceptable.
- E. Exposed Fasteners: Flush countersunk screws or bolts; consistent with design of railing.
- F. All handrail and components shall be clear anodized per Aluminum Association M10C22A41 (215-R1). The pipe shall be plastic capped to protect the finish.
- G. All aluminum surfaces in contact with concrete, grout or dissimilar metals shall be protected with a coat of bituminous paint, mylar isolators or other approved material.

2.3 STEEL RAILING SYSTEM COMPONENTS

- A. Pipe: ASTM A53/A53M, Grade B, carbon steel, Schedule 40.
- B. Rails and Posts: 1.38 inch inside diameter steel pipe; welded or mechanical joints.
- C. Fittings: Elbows, T-shapes, wall brackets, escutcheons; fabricated steel.
- D. Mounting: Adjustable brackets and flanges, with steel inserts for casting in concrete or embedding in masonry.
- E. Exposed Fasteners: Flush countersunk screws or bolts; consistent with design of railing.
- F. Splice Connectors: Steel concealed spigots.
- G. Galvanizing: To ASTM A123/A123M, minimum 2.0 oz/sq ft galvanized coating.
  - 1. Touch-Up Primer for Galvanized Surfaces: SSPC Paint 20 Type I Inorganic zinc rich.
- H. Shop Prefinishing: Powder coated enamel. Color as selected by Owner.

2.4 FABRICATION

- A. Fit and shop assemble components in largest practical sizes for delivery to site.

- B. Fabricate components with joints tightly fitted and secured. Furnish spigots and sleeves to accommodate site assembly and installation.
- C. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- D. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.
- E. Drill condensate drainage holes at bottom of members at locations not encouraging water intrusion.
- F. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- G. Accurately form components to each other and to related structure.
- H. Accommodate for expansion and contraction of members and building movement without damage to connections or members.

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

- A. Section 01300 - Administrative Requirements.
- B. Verify field conditions are acceptable and are ready to receive work.
- C. Verify concealed blocking and reinforcement is installed and correctly located to receive wall mounted handrails.

### **3.2 PREPARATION**

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply items required to be cast into concrete, embedded in masonry or placed in partitions with setting templates, to appropriate sections.

### **3.3 INSTALLATION**

- A. Install components plumb within 1/8" of vertical and align horizontally to within 1/8" in 12 feet.
- B. Anchor railings to structure with anchors. Install wedge anchors to proper depth to develop full pullout and shear values. Check all fasteners and bolts in base connections and splices for tightness.
- C. Field weld anchors as indicated on shop drawings. Touch-up welds with primer. Grind welds smooth.

- D. Conceal bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.
- E. Assemble with spigots and sleeves to accommodate tight joints and secure installation.
- F. Adequate provisions for expansion and contraction shall be incorporated into the rail.
- G. Toeboards shall be shipped loose and attached to the handrail in the field. Attachment to the posts will be made with clamps which will allow for movement while maintaining a straight line.
- H. All defective, damaged or otherwise improperly installed handrail shall be removed and replaced with material which complies with this section at no additional cost to the Owner.
- I. Following installation, aluminum handrail shall be cleaned with mild soap and clean water. Acid solutions, steel wool or harsh abrasives shall not be used.
- J. Following installation, steel handrails shall be painted unless galvanized.

END OF SECTION

## SECTION 05530

### GRATINGS AND PLATES

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Section includes formed floor, mezzanine, or stair tread gratings; flat surface floor plating; and perimeter closure.
- B. Related Sections:
  - 1. Drawings and general provisions of the Contract including General and Supplemental General Conditions, and Technical Specifications.

##### 1.2 REFERENCES

- A. ASTM International:
  - 1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
  - 2. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
  - 3. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
  - 4. ASTM A666 - Standard Specification for Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
  - 5. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
  - 6. ASTM B211 - Standard Specification for Aluminum and Aluminum-Alloy Bar, Rod, and Wire.
  - 7. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- B. American Welding Society:
  - 1. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
  - 2. AWS D1.1 - Structural Welding Code - Steel.
  - 3. AWS D1.2 - Structural Welding Code - Aluminum.
- C. National Association of Architectural Metal Manufacturers:
  - 1. NAAMM MBG 531 - Metal Bar Grating Manual.
  - 2. NAAMM MBG 532 - Heavy Duty Metal Bar Grating Manual.
- D. SSPC: The Society for Protective Coatings:
  - 1. SSPC - Steel Structures Painting Manual.
  - 2. SSPC SP 1 - Solvent Cleaning.
  - 3. SSPC SP 10 - Near-White Blast Cleaning.
  - 4. SSPC Paint 15 - Steel Joist Shop Paint.
  - 5. SSPC Paint 20 - Zinc-Rich Primers (Type I - Inorganic and Type II - Organic).



### 1.3 PERFORMANCE REQUIREMENTS

- A. Design Live (Pedestrian) Load: Uniform load of 200 lb/sq ft minimum with a maximum deflection of 1/4”.
- B. Maximum Spacing Between Bearing Bars: 1-3/16 inches on center.
- C. Maximum Spacing Between Cross Bars: 4” on center.
- D. Maximum fiber stress shall not exceed that which is allowed by the Aluminum Association.

### 1.4 SUBMITTALS

- A. Section 01330 - Submittal Procedures.
- B. Shop Drawings: Indicate details of gratings, plates, component supports, anchorage, openings, perimeter construction details, and tolerances. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
- C. Product Data: Submit span and deflection tables.
- D. Samples: Submit one sample, 6 inch x 6 inch in size illustrating surface finish, color, and texture.
- E. Manufacturer's Installation Instructions: Submit special requirements.

### 1.5 QUALIFICATIONS

- A. Design gratings and plates under direct supervision of Professional Engineer experienced in design of this Work and licensed in State of Alabama.

### 1.6 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

### 1.7 COORDINATION

- A. Section 01300 - Administrative Requirements.
- B. Coordinate Work with placement of frames and tolerances for openings.

## **PART 2 PRODUCTS**

### 2.1 GRATINGS AND FLOOR PLATES

- A. Manufacturers:
  - 1. Thompson Fabricating Company.
  - 2. Ohio Gratings, Inc.
  - 3. Marco Specialty Steel, Inc.
  - 4. Substitutions: Section 01600 - Product Requirements.

## 2.2 COMPONENTS

- A. Aluminum I-Bar Grating: ASTM B221 extruded aluminum alloy 6063-T6.
- B. Aluminum stair treads shall be I-bar grating with an extruded aluminum corrugated nosing.
- C. Cross Bars: ASTM B211.
- D. Floor Plates: Aluminum checkered floor plates shall be 1/4" thick and shall be alloy 6061-T6 or 5086-H112.
- E. Clips: 4 required per panel. Clips shall not protrude above the top of the grating.
- F. Welding Materials: AWS D1.1, AWS D1.2, type required for materials being welded.

## 2.3 ACCESSORIES

- A. Fasteners and Saddle Clips: Aluminum.
- B. Perimeter Closure: Same material as grating.
- C. Edge Banding: required at termination edges and at intermediate panel edges.

## 2.4 FABRICATION

- A. Fabricate grates and plates to accommodate design loads and to sizes indicated.
- B. Mechanically clinch joints of intersecting metal sections.
- C. Fabricate support framing for all openings.
- D. Top Surface of Grating: Serrated.
- E. Top Surface of Plates: Checkered.

## 2.5 SHOP FINISHING

- A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- B. Do not prime surfaces in direct contact with concrete or where field welding is required.
- C. Paint all aluminum surfaces in contact with concrete or dissimilar metals with a shop coat of bituminous paint.
- D. Aluminum: Mill finish.
- E. Stainless Steel: No. 4 finish.

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

- A. Section 01300 - Administrative Requirements.
- B. Verify opening sizes and dimensional tolerances are acceptable.
- C. Verify supports and anchors are correctly positioned.

### **3.2 INSTALLATION**

- A. Place frames in correct position, plumb and level.
- B. Mechanically cut finish surfaces. Do not flame cut.
- C. Anchor by bolting through saddle clips or flange blocks.
- D. Set perimeter closure flush with top of grating and surrounding construction.
- E. Secure to prevent movement.
- F. Aluminum shelf angles shall be anchored to the concrete using stainless steel (type 18-8) wedge anchors.

### **3.3 ERECTION TOLERANCES**

- A. Maximum Space Between Adjacent Sections: 1/4 inch.
- B. Maximum Variation from Top Surface Plane of Adjacent Sections: 1/16 inch.

### **3.4 CLEANING**

- A. Clean welds and damaged coatings and apply one coat of touch-up primer.

END OF SECTION

## SECTION 11217

### PACKAGED LIFT STATION

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Description:
  - 1. The Contractor shall furnish, install, test and place in satisfactory operation, as shown on the Plans and specified, two (2) wet-pit, non-clog submersible pump(s) and related accessories in a new prefabricated fiberglass lift station, controls, and all appurtenances, accessories and spare parts as will be required to produce a complete and workable installation.
- B. Related Sections:
  - 1. Drawings and general provisions of the Contract including General and Supplemental General Conditions, and Technical Specifications.

##### 1.2 REFERENCES

- A. American National Standards Institute (ANSI) and American Water Works Association (AWWA)
  - 1. ANSI B16.1 - Cast iron pipe flanges and flanged fittings
  - 2. ANSI/AWWA C115/A21.51 - Cast/ductile iron pipe with threaded flanges
  - 3. ANSI 253.1 - Safety Color Code for Marking Physical Hazards
  - 4. ANSI B40.1 - Gauges, Pressure and Vacuum
  - 5. AWWA C508 - Single Swing Check Valves
  - 6. AWWA C504 - Plug Valves
- B. American Society for Testing and Materials (ASTM)
  - 1. ASTM A48 - Gray Iron Castings
  - 2. ASTM A126 - Valves, Flanges, and Pipe Fittings
  - 3. ASTM A307 - Carbon Steel Bolts and Studs
  - 4. ASTM F593 - Stainless Steel Bolts, Hex Cap Screws, and Studs
  - 5. ASTM A36 - Structural Steel
- C. Institute of Electrical and Electronics Engineers (IEEE)
  - 1. ANSI/IEEE Std. 100 - Standard Dictionary of Electrical Terms
  - 2. ANSI/IEEE Std. 112 - Test Procedure for Polyphase Induction Motors
  - 3. IEEE Std. 242 - Protection of Industrial and Control Power Systems
- D. National Electric Code (NEC), National Electrical Manufacturers Association (NEMA)
  - 1. NEC - National Electric Code
  - 2. NEC 701 - National Electric Code article 701
  - 3. NEMA Std. MG1 - Motors and Generators

### 1.3 SUBMITTALS

- A. Section 01330 - Submittal Procedures.
- B. Shop Drawings:
  - 1. Submit detailed dimensions for materials and equipment, including wiring and control diagrams, performance charts and curves, installation and anchoring requirements, fasteners, and other details.
  - 2. Include manufacturer's specified displacement tolerances for vibration at operational speed specified for pumps.
- C. Product Data: Submit information concerning materials of construction and fabrication.
- D. Manufacturer's Installation Instructions: Submit detailed instructions on installation requirements including storage and handling procedures, anchoring, and layout.
- E. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.
- F. Manufacturer's Field Reports: Certify equipment has been installed in accordance with manufacturer's instruction.
- G. Other Information: Technical manuals, parts list, warranty information, equipment storage recommendations.

### 1.4 CLOSEOUT SUBMITTALS

- A. Section 01700 - Execution Requirements.
- B. Project Record Documents: Record actual locations and final orientation of equipment and accessories.
- C. Operation and Maintenance Data:
  - 1. Submit five (5) copies of operation and maintenance data in three-ring hard-backed binder, with cover indicating Owner specified station name.
  - 2. Submit maintenance instructions for equipment and accessories.
  - 3. Furnish list of equipment and tools needed to maintain and calibrate equipment.
  - 4. Include detailed dimensions for materials and equipment, including wiring and control diagrams, performance charts and curves, electrical motor data, installation and anchoring requirements, fasteners, recommended spare parts list, equipment start-up documentation.
  - 5. Motor performance chart exhibiting curves for motor torque, current, power factor, input/output kW and efficiency. Data to include motor starting and no-load characteristics.

### 1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with Owner's standard.
- B. Maintain one copy of each document on site.

## 1.6 QUALIFICATIONS

- A. The manufacturer shall have a minimum of five installations of the exact combination of pump and motor model proposed to be furnished for this project. Installations must be in operation for a minimum of five years and shall list the pump model, motor model and horsepower, date of installation, duty point, and contact information including telephone number. A list of these installations shall be furnished to the Engineer with submittals.

## 1.7 PRE-INSTALLATION MEETINGS

- A. Section 01300 - Administrative Requirements.
- B. Convene minimum one week prior to commencing work of this section.

## 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Section 01600 - Product Requirements.
- B. Inspect for damage.
- C. Store products in areas protected from weather, moisture, or possible damage; do not store products directly on ground; handle products to prevent damage to interior or exterior surfaces. Store and handle products in accordance with manufacturer's recommendations.

## 1.9 SEQUENCING

- A. Section 01100 - Summary.
- B. Sequence work to prevent interference with Owner's operation.

## 1.10 SCHEDULING

- A. Section 01300 - Administrative Requirements.
- B. Schedule work to install pumps in wet well prior to connecting piping work.

## 1.11 COORDINATION

- A. Section 01300 - Administrative Requirements.
- B. Coordinate installation and start-up with Owner and Engineer.

## 1.12 MAINTENANCE MATERIALS

- A. Section 01700 - Execution Requirements.
- B. Furnish one complete rebuild kit for each pump.
- C. Furnish special tools required for equipment maintenance.

## PART 2 PRODUCTS

### 2.1 STATION ENCLOSURE

#### A. Station Construction

1. Station shall be fabricated of fiberglass suitable for sewage catch basins. All walls shall be continuous and watertight and shall be supported by reinforcing members where required. Fabrication and erection shall conform to the appropriate requirements. Connections shall conform to the requirements of the American Plumbing Code and shall develop the full strength of the member.
2. Materials of construction used in the station shall be commercial grade and shall either be evaluated as a laminate by test or determined by previous service to be acceptable for the environment.
3. The resins used shall not contain fillers except as required for viscosity control. Up to five percent by weight of thixotropic agent, which will not interfere with visual inspection, may be added to the resin for viscosity control. Resins may contain pigments and dyes by agreement between the fabricator and the purchaser, recognizing that such additions may interfere with visual inspection of laminate quality.
4. The reinforcing material shall be a commercial grade of glass fiber having a coupling agent, which will provide a suitable bond between the glass reinforcing and the resin.
5. The station shall be of the laminated type construction. The laminate shall consist of an inner surface, an interior layer, and an exterior layer of laminate body.
6. The inner surface shall be free of cracks and crazing with a smooth finish and with an average of not over two pits per square foot, providing the pits are less than 1/8" in diameter and not over 1/32" deep and are covered with sufficient resin to avoid exposure of inner surface fabric. Some waviness is permissible as long as the surface is smooth and free of pits. Between 0.010 and 0.020 inches of resin-rich surface shall be provided. This will be a gel-cote surface.
7. A minimum of 0.100 inch of the laminate next to the inner surface shall be reinforced with not less than 20 percent or more than 30 percent by weight of non-continuous glass strands having fiber lengths from 0.5 to 2.0 inches.
8. The exterior layer of body of laminate shall be of construction suitable for the service intended and contain sufficient glass by weight to provide aggregate strength necessary to meet the tensile and flexural requirements. Where separate layers such as mat, cloth or woven roving are used, all layers shall be lapped a minimum of one inch. Laps shall be staggered as much as possible. If woven roving or cloth is used, a layer of chopped strand glass shall be placed as alternate layers. The exterior surface shall be relatively smooth with no exposed fibers of sharp projections. Handwork finished is acceptable, but enough resin shall be present to prevent fiber show.
9. SURFACE HARDNESS - The laminate shall have a Barcol hardness of at least 90 percent of the resin manufacturer's minimum specified hardness for the cured resin when tested. This applies to both interior and exterior surfaces.
10. APPEARANCE - The finished laminate shall be as free as commercially practicable from visual defects such as foreign inclusions, dry spots, air bubbles, pin holes, pimples, and delamination

#### B. Anti-Floatation Flange

1. When the basin is constructed and anti-floatation flange is applied, pump-mounting studs shall be located in the basin bottom. Pump-mounting studs shall be stainless steel and mounted in a 1/4" (minimum) steel plate. The plate shall be drilled and tapped 3/8" for studs to thread into. Studs are welded on the bottom of the plate. The stud plate is fastened in place and another laminate of fiberglass is molded to the bottom to complete the basin construction.

C. Wetwell Chamber

1. A wetwell chamber shall be provided and shall be of the sufficient capacity to provide an efficient pumping operation. The wetwell shall be equipped with access lid, air vent and bug screen, submersible pump system, inlet and outlet connections, electrical control panel and level sensors.
2. The access lid and frame assembly shall be provided in the top of the wetwell structure. The access door shall have means of locking and a latch to hold the door in the open position.
3. Air vent and bug screen shall be constructed of the configuration shown on the plant and shall be fitted with manufactured screen to prevent intrusion of insects or birds into the vent piping.
4. The structure dimensions of the wetwell chamber and air vent shall be as shown on the Drawings.

D. Valve Chamber

1. A valve chamber shall be provided as an integral part of the lift station. The valve chamber shall be equipped with access lid, air vent and bug screen, one (1) check valve and one (1) gate valve for each pump.
2. The access lid and frame assembly shall be provided in the top of the valve chamber structure. The access door shall have means of locking and a latch to hold the door in the open position. Air vent and bug screen shall be constructed of the configuration shown on the plans and shall be fitted with manufactured screen to prevent intrusion of insects or birds into the vent piping.
3. A valve chamber drain shall be furnished so that water can drain to the wetwell chamber. This drain shall be equipped with a check valve.
4. The structure dimensions of the valve chamber shall be as shown on the Drawings.

## 2.2 RAW SEWAGE INFLUENT GRINDER PUMPS

A. Manufacturers:

1. Barnes
2. KSB
3. Ebara
4. ABS
5. Sulzer
6. Substitutions: Section 01600 - Product Requirements

B. General:

1. The sewage pumping units shall be vertical, non-clogging, centrifugal sewage pumps with bottom inlet and side discharge. The pumps shall be direct driven by integral squirrel cage, electric induction motors. Each pump shall include motor, bearings, quick removal system, anchor bolts and all accessories specified herein.
2. Pump Materials of Construction: Compatible with raw sewage.



3. Pump and motor produced by same manufacturer.
- C. Power Cable:
1. Minimum 50 feet of submersible cable (SUBCAB) suitable for submersible pump applications, sized in accordance to NEC and ICEA standards and meeting P-MSHA approval.
- D. Lifting Cable:
1. Minimum 30 feet per pump of stainless-steel cable capable of lifting loads 5 times greater than actual pumping unit weight.
- E. Pump Design:
1. Pump designed to automatically and firmly connect to the discharge connection, guided by no less than two guide bars extending from top of station to discharge connection.
  2. Provide intermediate guide brackets for installations greater than 20 feet.
  3. Sealing of pumping unit to discharge elbow accomplished by machined metal-to-metal watertight contact.
- F. Pump Construction:
1. Major pump components shall be grey cast iron ASTM A-48, Class 35, with smooth surfaces free of blow holes or other irregularities.
  2. Exposed nuts or bolts of stainless steel construction.
  3. Factory applied spray coating of acrylic dispersion zinc phosphate primer with polyester resin paint finish on exterior pump surfaces coming into contact with sewage.
  4. Metal to metal contact sealing design on machined surfaces.
  5. Critical mating surfaces where watertight sealing is required shall be machined and fitted with Nitrile or Viton rubber O-rings.
- G. Cooling System:
1. Integral, closed-loop motor cooling system encircling stator housing providing for dissipation of motor heat, consisting of integral impeller driven by pump shaft.
  2. Cooling system to include one fill port and one drain port integral to the cooling jacket.
  3. Cooling system to provide continuous pump operation at liquid or ambient temperatures up to 104°F.
  4. Collins systems utilizing sewage as a cooling fluid shall not be allowed.
- H. Cable Entry Seal:
1. Dual cylindrical elastomer grommets, flanked by washers, all having close tolerance fit against cable outside diameter and entry inside diameter.
  2. Grommets compressed by cable entry unit, providing strain relief function.
  3. Cable entry junction chamber and motor sealed from each other.
- I. Motor:
1. NEMA B, induction type with squirrel cage rotor, shell type design, housed in air-filled watertight chamber.

2. Stator windings insulated with moisture resistant Class F insulation rated for 180°C.
3. Stator insulated by the trickle impregnation method using Class H monomer-free polyester resin resulting in winding fill factor of no less than 95%.
4. Inverter duty rated in accordance with NEMA MGA, Part 31.
5. Stator heat shrink fitted into cast iron stator housing.
6. Motor designed for continuous duty while handling pumped media up to 104°F.
7. Motor designed to withstand no less than 15 evenly spaced starts per hour.
8. Rotor bars and short-circuit rings constructed of aluminum.
9. Three thermal switches embedded in stator end coils, one per phase winding to monitor stator temperature.
10. Junction chamber sealed from stator housing containing a terminal board for connection of power and pilot sensor cables using threaded compression type terminals.
11. Motor service factor of 1.15.
12. Motor voltage tolerance of +/- 10%.
13. Motor designed for continuous operation up to 40°C ambient temperature with NEMA Class B maximum operating temperature rise of 80°C.
14. Motor horsepower sufficient for pump to be non-overloading throughout entire performance curve, from shut-off to run-out.
15. Motor and cable capable of continuous submergence underwater without loss of watertight integrity up to and including to a depth of 65 feet.

J. Bearings:

1. Integral pump/motor shaft to rotate on two bearings.
2. Motor bearings sealed and permanently grease lubricated with high temperature grease.
3. Two row angular contact ball bearing on upper motor bearing.
4. Two row angular contact ball bearing on lower motor bearing designed to handle both thrust and radial forces.
5. Minimum L<sub>10</sub> bearing life of 50,000 hours at any useable point on the pump curve.

K. Mechanical Seals:

1. Provide pumps with positively driven, dual, tandem mechanical shaft seal system consisting of two seal sets, each with independent spring.
2. Lower primary seal, located between pump and seal chamber, containing one stationary and one positively driven rotating corrosion resistant tungsten-carbide ring.
3. Upper secondary seal, located between seal chamber and seal inspection chamber, containing one stationary and one positively driven rotating corrosion resistant tungsten-carbide seal ring.
4. Provide pumps with lubricant chamber for shaft sealing system. Lubricant chamber designed to prevent overfilling and providing capacity for lubricant expansion. Lubricant chamber designed with one drain plug and one inspection plug accessible from exterior of motor unit.
5. Separate seal leak chamber capable of capturing leakage occurring past upper secondary mechanical seal prior to leakage entry into motor stator housing. Leakage chamber provided with float type switch that will signal if chamber reaches 50% capacity.

- L. Pump/Motor Shaft:
1. Single piece unit, ASTM A479 S43100-T stainless steel.
- M. Impeller:
1. ASTM A-48 Class 35 grey cast iron, dynamically balanced, non-clog design.
  2. Mechanically self-cleaned automatically upon each rotation as passing across spiral groove located on volute suction.
  3. Impeller leading edges hardened to Rc 45.
  4. Impeller capable of handling solids, fibrous materials, heavy sludge and other matter normally found in wastewater.
  5. Impellers shall be key driven and securely held to the shaft by a streamlined impeller washer and bolt assembly specifically designed to reduce friction in the suction eye of the impeller. The arrangement shall be such that the impeller cannot unscrew or be loosened by torque from either forward or reverse rotation.
  6. The impeller shall be capable of passing a 3-inch solid non-deformable sphere through the bottom inlet and out between the two shrouds. Designs which cannot pass a sphere through the impeller or rely on deforming, cutting or chopping solid materials shall not be acceptable.
- N. Volute:
1. ASTM A-48, Class 35 single piece grey cast iron, with smooth passages of sufficient size to pass any solids entering impeller.
  2. Volute to have integral spiral-shaped, sharp-edged grooves cast into suction cover.
  3. Internal volute bottom shall provide effective sealing between the impeller and volute. All mating surfaces requiring a watertight seal shall be machined and fitted with Buna-n O-rings. Paper gaskets are not acceptable.
- O. Discharge Base Elbow:
1. ASTM A-48, Class 35 grey cast iron, ANSI class 125 pound flange, coated with coal tar epoxy.
  2. The discharge base elbow shall be provided to support the full weight of the submersible pump in the installation and provide a leak proof connection in which the pump coupling mates using a conformed Buna-N seal which is held in place by the combined weight of the cantilevered pump and motor. The hydraulic pressure generated while the pump is in operation also aids the sealing.
- P. Guide Rails:
1. 304 stainless steel guide rails supported by upper and intermediate brackets of 316 stainless steel shall guide each pump.
  2. The guide rails shall consist of standard dimension schedule 40 piping with a 2" diameter as shown on the drawings. The guide rails shall be supported by a 316 upper guide rail bracket that will be mounted in the opening of the access cover to support and guide the pump/motor into and out of the wet well. Intermediate guide rail brackets will be provided for all installations deeper than 20 ft.
- Q. Operating Characteristics:

Pumping units as specified herein include units installed at the location(s) as shown on the Drawings. The design characteristics are summarized as follows:

**Gravity Sewer (Influent) Lift Station**

Design Conditions:	145 GPM @ 75' TDH
Minimum Hydraulic Efficiency at Design Point:	60%
Electrical Service:	460 V/ 3Ø/ 60Hz
Motor Hp and Max. Speed:	9 Hp - 3450 RPM
Discharge Elbow Size:	4-inch

**Backwash Lift Station**

Design Conditions:	45 GPM @ 30' TDH
Minimum Hydraulic Efficiency at Design Point:	60%
Electrical Service:	460 V/ 3Ø/ 60Hz
Motor Hp and Max. Speed:	2 Hp - 3450 RPM
Discharge Elbow Size:	2-inch

- R. Pump Warranty:
  - 1. Pump manufacturer shall warrant units supplied against defects in workmanship and materials for a period of five (5) years or 10,000 hours under normal use, operation and service. Warranty period to extend from date of start-up.

2.3 PUMP CONTROLS

- A. Control panels will be provided for each pump station, designed to automatically operate pumps in response to excursions in liquid level as specified for each station. Each control panel shall be UL 508A certified, completely assembled, wired, tested and properly labeled prior to shipment. The control panel shall be supplied by the pump distributor to ensure compatibility between pumps and controls.
- B. The pump controls will be housed in a NEMA 4X “UL Listed” stainless steel enclosure with an aluminum inner door. Wiring shall not have less than 600-volt insulation with a 75-degree Celsius rating. The enclosure will have a 3-point pad lockable stainless-steel latch and stainless steel hinge.
- C. Refer to Specification Section 16480 (“Manufactured Control Panels”) for additional control panel requirements.
  - 1. The following pump control panels shall be provided with the pumps by the pump supplier and shall consist of the following components:
    - a. Gravity Sewer (Influent) Lift Station
      - 1) Voltage 277/480V 3-Phase-4Wire
      - 2) Main Breaker sized by pump supplier.
      - 3) Overload and short circuit protection for each pump.
      - 4) Integral 120/240V-1Phase Load Center and Step-Down Transformer as shown on electrical plans.
      - 5) Circuit breakers for Control power, Site Light, Area GFCI, GFCI Outlet (inside control panel), SCADA RTU, Generator Battery Charger, Generator Block Heater, and spare circuits as indicated on plans.
      - 6) Pump Controls as summarized below.
    - b. Backwash Lift Station
      - 1) Voltage 277/480V 3-Phase-4Wire
      - 2) Main Breaker sized by pump supplier.

- 3) Overload and short circuit protection for each pump.
  - 4) Integral 120V Control Power Transformer with primary/secondary overcurrent protection as required (see diagram on electrical plans).
  - 5) Circuit breakers for Control power and GFCI Outlet (mounted inside control panel).  
Pump Controls as summarized below.
2. Electrical
    - a. Refer to electrical plans for panel short circuit ratings and other similar electrical requirements.
    - b. All breakers shall be mounted such as to be accessible from the outside of the deadfront panel without requiring the operator to be exposed to live/energized parts.
    - c. All circuit breakers shall be heavy duty thermal magnetic or motor circuit protectors similar and equal to SQUARE D type FAL.
  3. The control panels shall consist of the following components.
    - a. Hand-Off-Automatic switch for each pump.
    - b. Red high level tamper resistant LED alarm light with steady and flash circuits.
    - c. Thermal motor protection circuit.
    - d. Solid state cross wired alternator with pump isolation switch.
    - e. Circuit breaker protection capable of full panel operation with interlocked handle.
    - f. Circuit breaker for each pump.
    - g. Pump seal fail monitor.
    - h. Pump run green LED pilot light for each pump.
    - i. Full Voltage across line non reversing NEMA-rated starter/contactors for each pump.
    - j. Overload reset button.
    - k. Run time hour meters.
    - l. Lightning arrestor installed as per the drawing.
    - m. Red overload trip LED pilot light for each pump.
    - n. Amber seal fail LED pilot light for each pump.
    - o. 15A GFCI convenience outlet mounted on inner door.
    - p. All switches and pushbutton to be oil tight NEMA 4X rated.
    - q. SCADA dry contacts for:
      - 1) Power Loss Alarm.
      - 2) High Level Alarm
      - 3) Alarm (overload, seal failure, overtemp) for each pump.
      - 4) Pump running for each pump.
- D. Field wiring connection points will be supplied using terminal strips with the exception of supply power. The terminals will have printed tabs using UV setting printer ink.
  - E. Pump control will use 4 floats. Float switches shall be Anchor Scientific Roto-Float type S with integral weights, chemical-resistant polypropylene casings, and normally-open AND normally-closed dry contacts
  - F. Panel control sequencing will alternate pumps on each off cycle. The alternator shall have a selector switch for pump 1, pump 2 or alternate. No pump will run with the off float in

the deactivated position. When the off float is activated and the level continues to rise and activates the lead float the lead pump will start and run until the off float is deactivated. Should the level continue to rise upon activation of the lag float the second pump will start and both pumps run until the off float is deactivated. Should the level continue to rise the high-level alarm float will be activated turning on the alarm light, and close the alarm SCADA contact.

- G. The control panel will contain a thermal motor temperature circuit and pump seal moisture detector. The thermal circuit will shut down the corresponding motor on winding over temperature. The seal monitor will activate the SCADA alarm contact for the associated pump upon detecting moisture in the pump motor.
- H. The panel will contain a correctly sized main circuit breaker.
- I. Each pump will have a correctly sized breaker, contactor and ambient compensated adjustable overload with a reset button on the inner door. Hour meters will be installed for pump run time display.

### **PART 3 EXECUTION**

#### **3.1 EXAMINATION**

- A. Section 01300 - Administrative Requirements.
- B. Verify layout and orientation of pumps, accessories, and piping connections.

#### **3.2 INSTALLATION**

- A. Install pumps where indicated on Drawings and in accordance with manufacturer's instructions.
- B. Provide and connect piping, power and control conduit and wiring to make system operational, ready for startup.
- C. Flush piping with clean water.

#### **3.3 FIELD QUALITY CONTROL**

- A. Section 01700 - Execution Requirements.
- B. Pre-operational Check: Before operating system or components, make the following checks:
  - 1. Check pump and motor alignment.
  - 2. Check for proper motor rotation.
  - 3. Check pump and drive units for proper lubrication.
- C. Start-up and Performance Testing:
  - 1. Operate pump on clear water at design point for continuous period of two hours, under supervision of manufacturer's representative and in presence of Engineer.

- D. Verify pump performance by performing time/draw down test.
- E. Check pump and motor for high bearing temperature and excessive vibration in accordance with the manufacturer's recommendations. Check for motor overload by taking ampere readings.
- F. Equipment Acceptance:
  - 1. Adjust, repair, modify or replace system components that fail to perform as specified and rerun tests. Make final adjustments to equipment under direction of manufacturer's representative.

#### 3.4 MANUFACTURER'S FIELD SERVICES

- A. Section 01400 - Quality Requirements.
- B. Furnish services of manufacturer's representative experienced in installation of products furnished under this specification for not less than one eight-hour day on-site for installation inspection and field testing, and instructing Owner's personnel in maintenance of equipment.
- C. Certify that equipment has been properly installed and is ready for start-up and testing.

#### 3.5 DEMONSTRATION

- A. Section 01700 - Execution Requirements.
- B. Demonstrate equipment startup, shutdown, routine maintenance, alarm condition responses, and emergency repair procedures to Owner's personnel.

END OF SECTION

## SECTION 11220

### REFRIGERATED SAMPLER

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. This Section includes the following:
  - 1. Refrigerated wastewater samplers

##### 1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

##### 1.3 UNIT PRICE – MEASUREMENT AND PAYMENT

- A. Basis of Measurement: Lump sum for each.
- B. Basis of Payment: Includes all labor, materials and equipment including power cable, conduit, connection to electric, setting of unit, testing, calibration, cleanup and all related items.

##### 1.4 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.
- C. Samplers to be of a single type from a single source from a single manufacturer.

#### PART 2 PRODUCTS

##### 2.1 MANUFACTURER

- A. Teledyne Isco
- B. Emerald Cost Manufacturing
- C. Or Approved Equal.



## 2.2 FUNCTIONAL DESIGN

The automatic refrigerated wastewater sampler shall be furnished for sequential and composite sampling applications and shall be suitable for indoor or outdoor installation without the requirements for additional enclosures for weather protection. The sampler shall be capable of collecting samples from a variety of liquid sources including open channels, sewers, and stormwater conduits. The sampler will route samples to storage containers for collection and off-site analysis. The sample stream will be a direct path from sample source to sample bottle. Samples will not pass-through metering chambers or other diversions. The sampler shall be suited to collect priority pollutant or general-purpose samples in multiple bottles or a single bottle. The sampler will be line (AC) powered (115-volt 60Hz or 230-volt 50Hz).

### A. Refrigerator

1. The refrigerator shall cool to a setpoint selectable from 34 to 48°F (1 to 9°C), with a setpoint stability of  $\pm 1$  °C over a 48-hour period.
2. The refrigerator shall have a 5-minute typical recovery time to return to 39°F (4°C) after the door has been opened for 1 minute in 75°F (24°C) ambient conditions.
3. The collected samples shall be stored in an enclosure capable of operating in ambient temperatures from -20° to 120°F (-29° to 49°C).
4. Built-in heaters shall prevent collected samples from freezing if the ambient air temperature drops below freezing.
5. For single bottle composite sampling only, the refrigerator can, upon program initiation, drop the temperature within the sample compartment by 2.5° C below the set temperature for the first 24 hours of operation before resuming normal operation.

### B. Controller

1. The sampler's memory shall maintain the program settings, stored programs, and the results of the last two sampling sequences when the sampler is turned off or an external power interruption occurs.
2. A user-initiated diagnostics routine shall indicate the operational status of the sampler. The controller will display any error conditions detected by the diagnostic routines.
3. The current refrigeration temperature shall appear on the sampler's display, and temperature readings shall be stored in a report.
4. The controller shall be able to automatically switch input power to a connected battery in the event of a loss of AC power.
5. Sample volumes shall be selectable between 10 and 9,990 ml in 1ml increments.
6. The sampler shall be capable of being programmed to rinse the suction line with the source liquid up to three times.
7. The sampler shall typically deliver sample volumes with an accuracy of  $\pm 10$  ml or  $\pm 10\%$ , whichever is greater, of the programmed value. The typical sample volume repeatability shall be  $\pm 5$  ml or  $\pm 5\%$ , whichever is greater, of the average of the maximum and minimum sample volume in the sample set.
8. The sampler shall collect sequential or composite samples at user-definable intervals and volumes. A delay to first sample collection shall be programmable by the real-time clock.
  - a. Time Pacing

- The sampler will use an internal real-time clock to provide time and date information. Uniform time-paced samples shall be collected at regular time intervals from 1 minute to 99 hours 59 minutes. Sample volumes may be equal or variable in proportion to flow.
- b. Flow Pacing, DC Pulse  
The sampler shall accept a 5 to 15 VDC flow proportional pulse or isolated dry contact closure, at least 25 ms in duration, from an external flow meter for flow pacing. Samples shall be equal in volume and shall be taken at variable times proportional to flow. The number of flow pulses shall be selectable, from 1 to 9,999 pulses, as the flow interval for each sample collection.
  - c. Flow Pacing, Analog Input  
The sampler shall have a standard 4-20mA flow proportional input compatible with most flow meters without additional interfacing. Samples shall be equal in volume and shall be taken at variable times proportional to flow.
  - d. Flow-Weighted Volumes, DC Pulse  
The sampler shall accept a 5 to 15 VDC flow proportional pulse or isolated dry contact closure, at least 25 ms in duration, from an external flow meter. Samples shall be taken at equal time intervals, and variable sample volumes shall be proportional to cumulative flow.
  - e. Flow-Weighted Volumes, Analog Input  
The sampler shall have a standard 4-20 mA flow proportional input compatible with most flow meters without additional interfacing. Samples shall be taken at equal time intervals, and variable sample volumes shall be proportional to cumulative flow.
9. The sampler shall have 3 selectable modes of sample distribution.
    - a. Samples per bottle mode: The sampler shall be capable of placing a sample volume from one or more sample events in a bottle.
    - b. Bottles per sample mode: The sampler shall be capable of filling all sample bottles with a single initiation.
    - c. Multiple bottle composite mode: The sampler shall be able to simultaneously create a user-selected set of bottles for depositing of multiple samples, switching bottles after a programmed period of time has elapsed, or a programmed number of samples has been collected.
  10. Sampler Outputs
    - a. The sampler shall have four standard digital alarm outputs capable of direct wiring to a Programmable Logic Controller (PLC) or data logger (5 volt, 100 mA).
    - b. Output alarms shall include: Program started, Program completed, Pump error, Distributor jammed, 3-way valve control , Taking sample, Pumping forward, Powered up, Pumping reverse, Bottle full, and Delay before sample.
    - c. The sampler shall output an event mark of 12VDC for a duration of 3 seconds, beginning at the start of forward pumping, from the flow meter connector.
    - d. The sampler shall store a one-minute temperature data report retrievable by an IBM-compatible computer using a terminal emulator tool such as

Tera Term. The program shall include failsafe loading with site ID codes to prevent field errors due to multiple files.

11. Pump

- a. Samples will be collected via a peristaltic pump. This pump shall produce typical line velocities of 3.0 feet per second in a 3/8 inch (0.95 cm) ID suction line at 3 feet (1 m) of head. At 25 feet (7.6 m) of head, the pump shall typically produce a line velocity of 2.2 feet (0.67 m) per second. The pump shall be capable of lifting a sample a maximum of 28 feet (8 m).
- b. Before and after each sample is collected, the pump shall air-purge the suction line. Pre-purges and post-purges will be automatically controlled, and no pre-calibration adjustments are required.
- c. With the opening of the pump's latch and band, all power will be removed from the sampler's pump motor, to eliminate the possibility of a pump activation injuring personnel.
- d. The liquid detection system shall minimize the effects of changing head, intermittent flow in the suction line, or variable battery conditions on sample volume.
- e. After initial detection of liquid, the sensor shall monitor for the presence of liquid during the sample collection sequence. In composite mode without use of a distributor arm, this feature can be used for full bottle detection during the post-purge cycle.
- f. The liquid detector shall monitor for anomalies in the sample collection process. If no liquid is detected, the sampler shall be capable of retrying the sampling sequence up to three times.
- g. After liquid detection, the pump revolution counter shall count actual pump revolutions to determine sample volume delivery to the storage containers. If liquid flow is interrupted during the sample collection sequence, the detector shall inhibit the pump revolution counter from incrementing until liquid flow is restored. Automatic compensations for air slugs in the sample shall be made by the delivery system. Additionally, the pump revolution counter shall monitor the total number of pump revolutions and alert the user when a pre-selected number of counts has been reached to alert the user of the need for pump tubing replacement. One pump revolution is equivalent to 12 pump counts. This indicator shall appear on the controller display screen

2.3 Equipment Description

A. Sampler

1. The top section housing the control panel, pump, distributor electronics, and power supply box shall be rated NEMA 4X, 6, and IP 67.
2. The sampler shall include long-life electronic temperature sensing devices that measure the refrigeration compartment and evaporator plate temperatures. A microprocessor will utilize this sensor to control operation of the compressor, built-in heaters, and the self-defrosting cycle of the evaporator plate.

B. Refrigerator

The shell of the refrigerator shall be constructed of rotationally molded UV-resistant polyethylene with molded-in-place thermal insulation, providing exceptional resistance to corrosion and weathering. The top of the refrigerator door shall be recessed for ease of access from above. For 24 bottle configurations, the bottle rack shall slide out for ease of sample recovery. The copper refrigeration lines, condenser coil, and evaporator plate will be powder-coated with heat-treated polyester, and then painted with a rust converter paint overcoat, for additional corrosion resistance.

1. The refrigerator's door shall have hasps capable of accepting a padlock to prevent unauthorized tampering with the sample compartment contents. A compression gasket will be used to seal the refrigerator door. The refrigerator power supply and solid-state thermostat shall be contained in an epoxy-potted enclosure housed in a discrete compartment of the sampler's molded frame. All exposed metal components used in the construction of the refrigeration system shall be either plated aluminum or stainless steel.
2. The refrigerator will use a condensing coil with forced-air cooling.
3. The compressor is rated at (1/5 Hp for 150V)(1/4 Hp for 230V).
4. The refrigeration system will contain HFC-134a refrigerant, a non-CFC refrigerant with an ozone depletion potential of zero.

C. Controller

1. The controller shall be housed in a discrete compartment of the sampler's molded frame beneath a flip cover.
2. The controller will show sampler status and program information via a 2-row, 20-column, 40 total character display. This display shall be angled for easy viewing, and backlit for easy use in all light conditions. All programming and manual control of the sampler will be entered via an 18-position keypad.
3. The controller shall not require a separate heater.
4. Pump
  - a. The modular peristaltic pump shall be housed in a discrete compartment of the sampler's molded frame, beneath a latched cover. The pump casing shall be constructed of high strength Noryl plastic and designed for corrosion resistance.
  - b. The pump shall include a latched housing cover and thumbscrew opening for the replacement of pump tubing. The pump shall include a built-in magnetic safety interlock.
  - c. The pump shall include an optional heater, housed beneath the pump cover, for the prevention of liquid freezing inside the pump under extremely cold conditions. A heater shall be available for both 115VAC and 230VAC samplers.
  - d. Liquid Detector  
The sampler will sense the presence of the liquid via a non-wetted, non-conductive detector. The sensor shall not be dependent on, or affected by, any chemical or physical property of the liquid or its contents. The sensor shall not require routine maintenance or cleaning.
  - e. The pump tubing used shall be specially treated to minimize water extractable pollutants. Specially designed bands shall indicate the correct placement of the tubing inside the pump. The tubing shall typically last for a minimum of 1,000,000 pump counts.

D. Distributor

The modular distributor shall be housed in a discrete compartment of the refrigerator's molded frame. Sample distribution will be belt-driven by a stepper motor. Positive location of the distributor arm will be achieved using an optical sensor. One of two available fixed-length distributor arms will be used for all bottle configurations and sampler mounting possibilities. The distributor arm may be moved by hand for ease of sample recovery and shall relocate itself before the next sample is taken.

E. Suction Lines and Strainers

The sampler will utilize a suction line and strainer for taking samples. The suction line shall be made of 3/8 inch (.95 cm) ID vinyl with a length of 20 feet. The suction line shall have a factory-installed standard 3/8" weighted polypropylene strainer, or an optional all stainless steel strainer for 3/8" (0.95cm) line.

F. Sample Collection Containers

The sampler shall be supplied with sample collection container(s). The container(s) shall be 1 round 10L polyethylene.

### **PART 3 EXECUTION**

**Not used**

END OF SECTION

**SECTION 11390**  
**PACKAGED WASTEWATER TREATMENT SYSTEM**

**PART 1 GENERAL**

1.01 SUMMARY

- A. The Contractor shall furnish, install and place into satisfactory operating condition one (1) prefabricated steel wastewater treatment system and appurtenances as shown on the Drawings, described in the Specifications, and as required to construct a fully operating system.
- B. The system shall be factory assembled, so far as possible, with all piping and controls. All surfaces shall be factory painted.
- C. Related Sections
  - 1. General Conditions, Supplementary Conditions, and General Requirements sections apply to work of this Section.

1.02 REFERENCES

- A. American Institute of Steel Construction (AISC)
- B. American Society of Testing and Materials (ASTM)
  - 1. A36 - Standard Specification for Structural Steel
  - 2. A48 - Standard Specification for Gray Iron Castings
  - 3. A53 - Standard Specifications for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
  - 4. A325 - Standard Specifications for High-Strength Bolts for Structural Steel Joints
  - 5. A536 - Standard Specification for Ductile Iron Castings
- C. American Society of Civil Engineers (ASCE)
- D. American Welding Society (AWS)
  - 1. AWS A2.4 - Symbols for Welding and Non-Destructive Testing
  - 2. AWS D1.1 - Structural Welding Code - Steel
- E. Steel Structures Painting Council (SSPC)

1.03 SYSTEM DESCRIPTION

- A. The wastewater treatment system shall be of the activated sludge type.
- B. The complete system shall include all necessary equipment for efficient plant operation.
- C. Each wastewater treatment system shall be as specified herein and as shown on the drawings and shall consist of, in general, an inlet bar screen, flow equalization chamber, sludge holding chamber, aeration chamber, clarifier chamber, sludge and scum recirculating systems., disinfection chamber, blowers, diffusers, piping, valving, sensors, probes, and electrical controls.

D. Design Summary:

The wastewater treatment system specified herein is to treat municipal wastewater having the general influent parameters shown herein and meeting the anticipated effluent requirements stated. The basic system shall consist of one (1) wastewater treatment system as shown on the Drawings. The design of the equipment is based on the activated sludge process for the following parameters:

<u>Parameter</u>	<u>Influent</u>	<u>Effluent</u>
Average Daily Flow	0.100 mgd	
Peak Hourly Flow	0.250 mgd	
BOD <sub>5</sub> Average	200 mg/l	10 mg/l
Total Suspended Solids (TSS)	200 mg/l	30 mg/l
TKN	30 mg/l	
NH <sub>3</sub> -N Maximum		1.2 mg/l
Total Nitrogen (TN)		10.0 mg/l
Total Phosphorus (TP)	6.0 mg/l	2.0 mg/l
Site Elevation	297 ft	
Wastewater Temperature, Min.	15°C	
Wastewater Temperature, Max.	25°C	
Average Air Temperature, Winter	40°F	
Average Air Temperature, Summer	105°F	

1.04 SUBMITTALS

- A. Refer to Section 01330 for shop drawing submittal requirements.
- B. Submit shop drawings and manufacturer's data showing treatment equipment size, layout, piping and any special requirements prior to proceeding with work. Submit complete wiring diagrams, terminal connections, interior component layout and front layout on the electrical control panel and its control logic. Equipment included in this submittal shall include, but is not limited to:
1. Fabricated Units and their components
  2. Diffuser assemblies
  3. Blowers
  4. Pumps and Motors
  5. Pump Slide Rail Assemblies
  6. Valves
  7. Electrical Control Panel and Components
- C. Review of the shop drawings shall not relieve the Contractor from the responsibility of proper fitting and construction of the work, nor from furnishing materials and work required by the Contract that may not be indicated on any drawings.
- D. As work progresses, the Contractor shall record in red ink on a set of black and white prints of the Contract Drawings the "as-built" locations, sizes, elevations, identifications, etc. of all piping, service trenches, equipment, etc. The prints shall be kept in good conditions at all times. Dimensions and elevations shall relate to datum references established for the project. Required information shall be certified by signature on the prints maintained by the Contractor.

## 1.05 OPERATION AND MAINTENANCE MANUALS

- A. Upon completion of no less than 60 percent of the work and at least 60 days prior to the date set for final inspection, the Contractor shall submit to the Owner five (5) Operation and Maintenance Manuals for all mechanical and electrical systems and equipment furnished for the project. The manual shall include all installation, operation, start-up and maintenance instructions. The data contained in the manuals shall consist of catalogs, brochures, bulletins, charts, curves, schedules, parts, lists, assembly drawings, wiring diagrams, lubrication instructions, preventive maintenance measures, approved working drawings, and all other information necessary for the Owner to establish an effective operating and maintenance program.
- B. The manuals shall be 8 1/2-in. by 11-in. bound in 3-ring loose-leaf binders and indexed. Oversize drawings shall be folded to the above dimensions and placed in envelopes bound at the rear of the manuals. Digital copies of this data shall be provided to the Owner in a suitable electronic format including USB drive or similar media.
- C. The manual shall be prepared to assist the Operator and/or Owner in understanding the functions, capabilities, requirements and limitations of the equipment as well as to provide guidance in operation and maintenance. Technical and maintenance information from original manufacturers of mechanical and electrical components shall be included when available. The manual shall include, but not limited to, the following elements:
  - 1. Operation Responsibilities
  - 2. Plant Safety
  - 3. Theory of Operations
  - 4. Process Design Criteria
  - 5. Operational Modifications
  - 6. Start-up and Operational Procedures
  - 7. Component Equipment O&M
  - 8. System Equipment Drawings, As-Built
  - 9. Electrical Schematics, As-Built
- D. Approval of Manuals: Acceptance will not be reached until approved Operation and Maintenance Manuals have been submitted. Partial approvals will not be made.

## 1.06 QUALITY ASSURANCE

- A. In order to assure uniform quality, ease of maintenance and minimal parts storage, it is the intent of these Specifications that all equipment called for under this Section shall be supplied by a single manufacturer. The equipment manufacturer shall, in addition to the Contractor, assume the responsibility for proper installation and functioning of the equipment.

## 1.07 QUALIFICATIONS

- A. The manufacturer of specified equipment must have a minimum of ten (10) year's active experience in the design and manufacture of similar wastewater treatment systems, and upon request, furnish supporting evidence. Consideration will be given only to products of manufacturers who can demonstrate that their equipment fully complies with all requirements



of the specifications and contract documents. The equipment shall be supplied by a firm which has been regularly engaged in the design, fabrication, assembly, testing, start-up and service of full-scale treatment systems, of the same size as proposed, operating in the U.S., with similar characteristics.

#### 1.08 DELIVERY, STORAGE, AND HANDLING

- A. Section 01600 - Product Requirements.
- B. Inspect for damage.
- C. Store products in areas protected from weather, moisture, or possible damage; do not store products directly on ground; handle products to prevent damage to interior or exterior surfaces. Store and handle products in accordance with manufacturer's recommendations.

#### 1.09 COORDINATION

- A. Section 01300 - Administrative Requirements.
- B. Coordinate installation and start-up with Owner and Engineer.

#### 1.10 WARRANTY

- A. The manufacturer shall warrant, in writing, that all equipment supplied by them shall be free from defects in material and workmanship, for a period of twelve (12) months from the date of startup, not to exceed twenty-four (24) months from the date of delivery, unless noted otherwise within the specifications.

### **PART 2 PRODUCTS**

#### 2.01 MANUFACTURER

- A. The wastewater treatment system shall include all necessary equipment and appurtenances to form a complete and functioning system and shall be as manufactured by
  - 1. Legacy Environmental
  - 2. AUC
  - 3. Smith and Loveless
  - 4. Fluence
  - 5. Vitech
  - 6. Substitutions: Section 01600 - Product Requirements

#### 2.02 TANK CONSTRUCTION

- A. All tank vessels shall be fabricated of a minimum of one-fourth inch structural grade steel plated; ASTM A-36 ¼" minimum thickness joined by arc welding with fillets of adequate section for the joint involved. All walls shall be continuous and watertight and shall be supported by structural reinforcing members where required. Fabrication and erection shall conform to the appropriate requirements of AISC. Connection shall conform to the requirements of the AWS and shall develop the full strength of the member. Aeration tank will

have reinforcing members on 6'-0" maximum spacing and H-frame reinforcing will be provided on end walls and partition walls.

- B. Each vessel shall be equipped with a drain plug to allow for easy cleaning and maintenance of each individual vessel without impact to other vessels.
- C. All sludge & scum return piping shall be schedule 80 PVC.
- D. All diffuser drop piping shall be schedule 40 galvanized steel.
- E. The systems shall be transported to the job site in three (3) section(s). The Contractor shall be responsible for field assembly, including bolting or welding when required.

### 2.03 COATING AND CORROSION CONTROL

- A. All vessel surfaces to be painted shall be properly prepared in a workmanlike manner to obtain a smooth, clean and dry surface. All rust, dust, and mill scale as well as other extraneous matter shall be removed by means sandblast, interior (immersion) surfaces will receive near white blast cleaning SSPC-SP10. All interior vessel surfaces shall be factory painted with two (2) coats of Tnemec series 66 High Build Epoxy, 7-11 mils total dry film thickness. All Exterior (non-immersion) vessel surfaces will receive commercial blast cleaning SSPC-SP6 and will be painted with two (2) coats of Tnemec series 66 High Build Epoxy, 7-11 mils total dry film thickness.
- B. Below Grade installation shall require cathodic corrosion protection and shall be provided using twenty-four (24) magnesium anodes, weighing seventeen pounds each. These shall be buried by the Contractor adjacent to the tank sides and provided with good electrical contact with the tank.
- C. The anodes shall come packed in its own low resistant back fill material with the copper lead wire brazed to the core and insulated with coal tar at that point. The anodes shall be attached to the tank vessel with a similar connector. This connection will also be coated with coal tar insulation. The anodes shall be located at least 5 feet from the tank structure and be at least ½ the distance between the grade level and the bottom of the tank.
- D. Each of the anodes shall be located equidistant from the other anode. Each anode is to be then doused with 5 gallons of water.

### 2.04 FOUNDATION

- A. A poured foundation pad shall be constructed conforming to the project specifications. The slab must be level within tolerances of 1/2" per each 10'-0" of width and within 1/4" per each 10'-0" of length. Anchor rods to be welded to tank for anchoring by the field Contractor as shown on the drawings.

### 2.05 INLET CONNECTION

- A. The influent connection shall be one, 8-inch diameter 150# standard flange. The inlet shall be located at the inlet end wall of the system as shown on the Drawings.

## 2.06 INLET BAR SCREEN

- A. A bar screen shall be provided at the influent port, to remove any unusually large solids from the incoming raw sewage. The bar screen shall be fabricated from one-half inch diameter bars spaced one inch apart and arranged as shown on the drawings. The bars shall be sloped to permit easy cleaning of accumulating debris. A drying deck shall be furnished for drying this debris. A raking mechanism for removing debris from the inlet bar screen shall be provided.

## 2.07 FLOW EQUALIZATION CHAMBER

- A. There shall be supplied, an aerated flow equalization chamber to work in conjunction with the treatment system to enable the incoming sewage flow rate to be equalized so as to reduce the plant surges. The influent shall enter the flow equalization tank by connection of an 8-inch diameter 150# flanged pipe connection.
- B. The flow equalization chamber shall be provided as an integral part of the wastewater treatment system. Volume of this chamber shall not be less than 25,000 gallons. A duplex set of submersible pumps shall be furnished and installed in the chamber for pumping the influent to the flow control box.
- C. The flow proportioning facilities shall be provided at the top inside of the flow equalization chamber at the flow equalization pump discharge to reduce the pumping rate proportional to the system design flow. The chamber shall be equipped with an adjustable flat weir so that the excess pump surges shall overflow this chamber directly to the flow equalization tank. The corrected pumping flow shall pass over the "V" notch weir into the aeration chamber.
- D. A duplex set of flow equalization pumps shall be provided within the flow equalization chamber and attached by piping and valving to the flow-proportioning chamber. The pumps shall be of the submersible type, high quality stainless steel, rated for 104° F max fluid temperature continuous operation fully submerged, or 140° F intermittent. The pumps shall have a double mechanical seal with viton elastomers, shielded, pre-lubricated ball bearings rated for 50,000 hour service life.
  - 1. Manufacturer
    - a. Barnes
    - b. Ebara
    - c. ABS
    - d. Approved Compatible Equal
  - 2. Each pump shall be furnished with a slide rail system for ease of removal from the flow equalization chamber. The slide rail system shall be complete with rail base and upper guide assembly. The pump motor shall be 5 HP for operation on 480 Volt, 3 Phase, 60 Hz. service. The capacity of the flow equalization pumps shall be 200 GPM at a 15' TDH.

## 2.08 FLOW EQUALIZATION AIR SUPPLY BLOWER UNIT

- A. For supplying the air requirement of the flow equalization chamber, one (1) blower unit shall be furnished and installed at the location shown on the drawings. The unit shall be completely

- factory built and tested before shipping to the project site. The blower shall be of the regenerative side channel type design complete with the accessories described below.
- B. The blower unit shall be furnished for supplying the air requirements of the flow equalization chamber outlined herein.
  - C. The blow motor unit shall be capable of delivering 50 scfm when operating at 5 psig.
    - 1. Manufacturer
      - a. FPZ
      - b. Excelsior
      - c. Roots
      - d. Approved Compatible Equal
  - D. Impeller case shall be strongly ribbed to prevent distortion when operating at rated pressure, and be constructed of low weight cast aluminum construction, quiet operation with integral inlet and outlet muffling.
  - E. The unit shall be high efficiency / low noise impeller design, no lubrication and/or maintenance required.
  - F. The motor shall be 5 hp for operation on 480 Volt, 3 Phase, 1800 RPM @ 60 Hz. It shall be of the totally enclosed fan type and will be directly mounted to the blower housing.
  - G. Regenerative blowers are to provide oil-free, odor-free, non-pulsating air pressure and operate at a design rating not to exceed 90% of the aeration system normal operating conditions.
  - H. The blower shall be of aluminum construction, including cast aluminum, dynamically balanced impeller, directly mounted to the motor shaft. The impeller shall be straddle mounted and include a bearing support on both sides of the impeller. Overhung impeller designs are unacceptable.
  - I. The blower motor shall be directly connected to the blower impeller and rated for a 40 Deg F ambient, TEFC (IP54) enclosure, 1.15 SF, Class H insulation and rated for service on the specified plant voltage supply.
  - J. The blower and motor noise level shall not exceed OSHA's maximum exposure level for an eight (8) hour day level of 90 db(A) at one (1) meter distance.
  - K. The blower bearings shall be rated for a minimum of 25,000 hours, average life.
  - L. An inlet filter shall be installed with the blower. The filter shall be of heavy-duty steel construction, with a polyester filter media rated 5 micron at 99.5% efficiency.
    - 1. A filter restriction gauge shall be mounted on the filter to indicate the condition of the filter media.
  - M. A pressure relief valve shall be installed and shall be of brass construction, field adjustable and set to release at a maximum of 90% of the blower and motor maximum rating.

- N. A check valve of the split flapper design shall be installed, with an aluminum body, EPDM seals, suitable for continuous duty up to 300 Deg F.
  - 1. Manufacturer
    - a. US Valve
    - b. M and H Valve
    - c. Mueller
    - d. Valmatic
    - a. Approved Compatible Equal
- B. Blowers will receive factory mechanical run and amperage to be checked for compliance with standards.
- C. Blowers will have minimum 3-year warranty from the startup date.

## 2.02 FLOW EQUALIZATION ELECTRICAL CONTROL CONSOLE

- A. Refer to Specification Section 16480 (“Manufactured Control Panels”) for additional control panel requirements.
- B. An electrical control panel shall be installed within a NEMA 4X “UL Listed” weatherproof enclosure with 3-point external locking latch. The control console shall be provided for mounting as indicated on the plans. Any exterior mounting hardware shall be stainless steel or other corrosion resistant material.
- C. The control console shall be completely factory assembled and tested prior to shipment. The control console shall be furnished with all necessary controls for each pump and blower unit and associated plant equipment. Control voltage shall be 120 VAC, 1 Phase.
- D. Controls shall be mounted to a removable sub-panel within the enclosure and shall be wired and spaced in accordance with the latest NEC. The control console shall be supplied with a properly sized magnetic-circuit breaker to act as the main disconnects for the control console. Magnetic starters with overload protection shall be supplied for all blower units. An electrical alternator shall be furnished to alternate the operation of each pump. The alternator shall be provided with a manual selector switch to allow manual selection of the lead pump if desired. Auxiliary dry contacts shall be furnished for use by the customer (for SCADA monitoring) as shown on electrical plans for General Alarm notification.
- E. All wiring conductors within the control console shall be UL type THHN, stranded #14 AWG minimum, rated at 600 volts. Control wiring shall be numbered on each end.
- F. Control panel shall be furnished and installed by the manufacturer. All wire and conduit required between the control panel and the electrical power service should be furnished and installed by the Contractor. Wiring and conduit between the control panel and plant equipment shall be furnished by the manufacturer of the wastewater treatment plant. The panel may be detached for shipping. The main power supply shall be 460 Volt, 3 Phase, 60 Hz. The control voltage shall be 120 Volt, 1 Phase (powered through local CPT within control panel).
- G. Pump controls shall be of the direct acting mercury float type for complete automatic operation as follows:

1. Turns off both pumps and activates the electrical alternator for the next cycle.
2. Energizes the lead pump on.
3. Turns flow equalization blower on & off.
4. Activates the lag pump on.
5. Activates the high-level alarm.
6. The mercury switch consists of a steel tube that houses mercury and contacts. Contact is through mercury to mercury. No mechanical contacts.
7. The power cord will consist of a type SJOW-A cord rated for 300 maximum capacity.
8. The mercury tube switch and cord are sealed in a vinyl ball with leak proof polyurethane resin.

### 2.03 SLUDGE HOLDING CHAMBER

- A. An aerated sludge holding chamber shall be provided as specified and shown on the plans. It shall be designed to hold a minimum of 6,500 gallons of sludge.
- B. The sludge holding chamber shall be constructed as an integral part of the wastewater treatment system and fabricated out of one-fourth inch steel plate. The chamber shall have the same protective coating as specified for the treatment plant. It shall also have the same structural requirements as the wastewater treatment plant.
- C. The chamber shall be of the aerated type. Diffused air shall be supplied by the plant blower system supplying 27 scfm. The diffusers shall be located parallel to and near the bottom of the tank. All piping and valves within the chamber shall be factory installed.
- D. An airlift pump with vertically adjustable intake and air control valve shall be provided for the purpose of decanting supernatant from the aerobic digester. The airlift piping shall be schedule 40 painted steel piping, and neoprene bands shall isolate the piping from all steel surfaces. The pipe shall pivot on a swivel joint. The intake elevation adjustment shall allow the water level in the sludge holding chamber to be lowered a minimum of 48 inches.
- E. The sludge holding chamber shall be set on the same concrete foundation pad as the wastewater treatment plant and set at the location as shown on the plans.

### 2.04 ANAEROBIC CHAMBER

- A. An anaerobic chamber shall be provided as specified and shown on the plans. It shall be designed to hold a minimum of 5,800 gallons.
- B. The anaerobic chamber shall be constructed as an integral part of the wastewater treatment system and fabricated out of one-fourth inch steel plate. The chamber shall have the same protective coating as specified for the treatment plant. It shall also have the same structural requirements as the wastewater treatment plant.
- C. An industrial duty, direct drive mixer shall be provided for the anaerobic chamber as manufactured by:
  1. Fusion Fluid Equipment
  2. Approved Compatible Equal

- D. The mixer shall be 3/4 hp for operation on 480 Volt, 3 Phase, 1150 RPM @ 60 Hz. It shall be of the totally enclosed fan type and will be directly mounted to the blower housing.

## 2.05 ANOXIC CHAMBER

- A. An anoxic chamber shall be provided as specified and shown on the plans. It shall be designed to hold a minimum of 15,000 gallons.
- B. The anoxic chamber shall be constructed as an integral part of the wastewater treatment system and fabricated out of one-fourth inch steel plate. The chamber shall have the same protective coating as specified for the treatment plant. It shall also have the same structural requirements as the wastewater treatment plant.
- C. A simplex nitrate recycle pump shall be provided within the anoxic chamber and attached by piping and valving to the aeration chamber. The pump shall be of the submersible type, high quality stainless steel, rated for 104° F max fluid temperature continuous operation fully submerged, or 140° F intermittent. The pump shall have a double mechanical seal with viton elastomers, shielded, pre-lubricated ball bearings rated for 50,000 hour service life.
  - 1. Manufacturer
    - a. Barnes
    - b. Ebara
    - c. ABS
    - d. Approved Compatible Equal
- D. The pump shall be 3 hp for operation on 480 Volt, 3 Phase rated at 278 gpm at 10 feet TDH with VFD.
- E. An industrial duty, direct drive mixer shall be provided for the anaerobic chamber as manufactured by:
  - 1. Fusion Fluid Equipment
  - 2. Approved Compatible Equal
- F. The mixer shall be 3 hp for operation on 480 Volt, 3 Phase, 1750 RPM @ 60 Hz. It shall be of the two-stage helical type.

## 2.06 AERATION CHAMBER

- A. There shall be supplied, an aeration chamber to work in conjunction with the clarifier chamber. The aeration chamber shall conform to the following specifications:
  - 1. The aeration chamber shall be of sufficient capacity to provide a minimum of 24 hours retention of the average daily flow, and a minimum chamber volume of 51,668 gallons. The vessel shall be so shaped on each side to prevent sludge accumulation, to enhance rotation of the vessel contents, and to prevent scum and froth accumulation. To ensure maximum retention and eliminate short circuiting of raw sewage particles, the aeration chamber shall be constructed with air diffusers, placed longitudinally along one side of the chamber to, in conjunction with the flow control baffles, enhance the spiral rotation of the chamber contents. To ensure adequate circulation velocity, the proportion of the chamber width to depth, in the direction of rotation, shall not exceed 1.33 to 1. The velocity of rotation shall be sufficient to scour the bottom and prevent

sludge filleting as well as to prevent the escape to the surface of minuscule air diffusion bubbles and by so causing their entrapment to provide maximum oxygenation efficiency.

2. An air distribution manifold shall be installed longitudinally on one side of the tank with diffuser drop assemblies connected thereto.
  3. Each diffuser drop assembly shall be equipped with a readily accessible air regulating and/or shutoff valve, a disconnecting union and a diffuser bar with non-clog air diffuser nozzles mounted thereon at approximately 70" centers. With this spacing, the airflow per diffuser shall range from 1 to 30 SCFM. This minimum air velocity shall be maintained to ensure sufficient velocity for self-cleaning. The diffusers shall be parallel to and near the base of the vessel sidewall and at an elevation, which will provide the optimum diffusion and mixing of the vessel contents. The oxygen transfer capacity of each diffuser shall be such that an adequate supply of oxygen will be maintained in the aeration chamber to meet treatment requirements of the design sewage load.
- B. The diffusers shall be manufactured to produce a double shear when air is released. The air is sheared as it discharges the air orifice of the air diffuser body and again as it crosses over the diaphragm baffle. The air check diaphragm located on top of the diffuser is molded directly to the diffuser body, preventing the cap from blowing off when excess CFM is delivered to the diffuser. The diffuser will be supplied with standard male pipe thread connections.

## 2.07 CLARIFIER CHAMBER

- A. There shall be furnished a clarifier chamber to work in conjunction with the aeration chamber of that system. The clarifier shall conform to the following specifications:
1. The clarifier chamber shall be of such size as to provide a minimum of four (4) hours retention, based upon the same design flow rate governing the aeration chamber, and shall have proper baffling to prevent short circuiting and to provide maximum uniform retention. The clarifier inlet shall be baffled to prevent short-circuiting and provide maximum uniform solids settling area. The bottom of the chamber shall be formed into an inverted pyramidal hopper or hoppers. The flat bottom area of each hopper shall not exceed one square foot. The slope of the hopper walls shall not be less than 1.7 vertical to 1.0 horizontal. Settled sludge shall be returned from the clarifier sludge hopper to the aeration chamber by the positive sludge return system, consisting of an airlift pump. The clarifier effluent shall pass over the edge of the baffled adjustable effluent weir into the effluent trough and then out of the chamber. The weir plate will be constructed of 1/8" galvanized steel and will be gasketed with 1/4" neoprene.
- B. Polymer Feed System
1. Construction
    - a. The Polymer Feed System shall be manufactured by
      - 1) Flo Trend
      - 2) Approved Compatible Equal
    - b. Metering pump shall be a 120V 1-phase 0.5 hp drive motor with progressive cavity pump and DC controller. The controller with flow meter shall be mounted on a common control panel. The controller shall have provisions for remote on/off control. Auxiliary dry contacts shall be furnished for use by the



- customer (for SCADA monitoring) as shown on electrical plans for General Alarm notification and pump on/off indication.
- c. Diluted polymer will be injected by the dosage pump into an 18" clear static mixer manifold. The unit shall be rated for flows from 0 to 10 gpm.
  - d. All components shall be skid mounted, wired, piped to a common manifold for Contractor final installation on site
2. Material Specifications
- a. Hot-rolled structural steel shapes and plates shall be ASTM A36.
  - b. Hot-rolled carbon steel sheet and strip structural quality shall conform to ASTM-A570 grades D & E.
  - c. Hot-formed welded and seamless steel tubing shall conform to ASTM A500 grade B.
  - d. Welded and seamless steel pipe shall conform to ASTM A53 grade B.
  - e. Stainless steel fasteners shall conform to AISI grade 304/305.
  - f. Welding electrodes are E70S used in gas metal arc process conforming to the specifications for mild steel electrodes for gas metal ARL welding AWS A518.
3. Paint
- a. All steel metal surfaces shall be sandblasted to near white metal and commercially powder coated.

## 2.08 SLUDGE RECIRCULATION SYSTEM

- A. There shall be installed within the clarifier chamber, a positive sludge recirculation system, consisting of two (2), 4-inch diameter airlift sludge return assemblies, meeting the following specifications:
- 1. The airlift pump system shall have the recirculation capacity ranging from 0% to 150% of the design flow. The airline supplying air to the pump shall be equipped with a gate valve varying the capacity of the pump. The airlift pump shall be firmly supported and shall be equipped with a clean-out plug to allow for easy cleaning and maintenance.

## 2.09 SCUM RECIRCULATION SYSTEM

- A. There shall be installed within the clarifier chamber a positive scum and skimming recirculation system consisting of two (2), two-inch diameter airlift skimming devices meeting the following specifications:
- 1. The skimming device shall be of the positive airlift pump type, located in a position to skim and return floating material to the aeration chamber. The airline supplying air to the skimming device shall be equipped with a gate valve to regulate the rate of return.
- B. The scum intake shall be equipped with an adjustable assembly, which will enable exact positioning of the skimmer at water level without placing a hand under the water.

## 2.10 MAIN AERATION AIR SUPPLY BLOWER UNITS

- A. For supplying the air requirement of this wastewater treatment system, two (2) blower units shall be furnished and installed at the location shown on the drawings. All units shall be completely factory built and tested before shipping to the project site. The blower shall be of the regenerative side channel type design complete with the accessories described below.

- B. The blower unit shall be furnished for supplying the air requirements of the flow equalization chamber.
- C. The unit shall be capable of delivering 500 scfm when operating at 5 psig.
- D. Impeller case shall be strongly ribbed to prevent distortion when operating at rated pressure, and be constructed of low weight cast aluminum construction, quiet operation with integral inlet and outlet muffling.
- E. The unit shall be high efficiency / low noise impeller design, no lubrication and/or maintenance required.
- F. The motor shall be 20 hp for operation on 480 Volt, 3 Phase, 60 Cycle Service, 3500 RPM @ 60 Hz. Service and 2900 RPM @ 50 Hz. service. It shall be of the totally enclosed fan type and will be directly mounted to the blower housing.
- G. Regenerative blowers are to provide oil-free, odor-free, non-pulsating air pressure and operate at a design rating not to exceed 90% of the aeration system normal operating conditions.
- H. The blower shall be of aluminum construction, including cast aluminum, dynamically balanced impeller, directly mounted to the motor shaft. The impeller shall be straddle mounted and include a bearing support on both sides of the impeller. Overhung impeller designs are unacceptable.
- I. The blower motor shall be directly connected to the blower impeller and rated for a 40 Deg F ambient, TEFC (IP54) enclosure, 1.15 SF, Class H insulation and rated for service on the specified plant voltage supply.
- J. The blower and motor noise level shall not exceed OSHA's maximum exposure level for an eight (8) hour day level of 90 db(A) at one (1) meter distance.
- K. The blower bearings shall be rated for a minimum of 25,000 hours, average life.
- L. An inlet filter shall be installed with the blower. The filter shall be of heavy-duty steel construction, with a polyester filter media rated 5 micron at 99.5% efficiency.
  - 1. A filter restriction gauge shall be mounted on the filter to indicate the condition of the filter media.
- M. A pressure relief valve shall be installed and shall be of brass construction, field adjustable and set to release at a maximum of 90% of the blower and motor maximum rating.
- N. A check valve of the split flapper design shall be installed, with an aluminum body, EPDM seals, suitable for continuous duty up to 300 Deg F.
- O. Blowers will receive factory mechanical run and amperage to be checked for compliance with standards.
- P. Blowers will have minimum 3-year warranty from startup date.

## 2.11 AERATION ELECTRICAL CONTROL CONSOLE

- A. Refer to Specification Section 16480 (“Manufactured Control Panels”) for additional control panel requirements.
- B. An electrical control panel shall be installed within a NEMA 4X “UL Listed” weatherproof enclosure with 3-point external locking latch. The control console shall be provided for mounting as indicated on the plans. Any exterior mounting hardware shall be stainless steel or other corrosion resistant material.
- C. The control console shall be completely factory assembled and tested prior to shipment. The control console shall be furnished with all necessary controls for each blower unit and associated plant equipment. Control voltage shall be 120 VAC, 1 Phase.
- D. Controls shall be mounted to a removable sub-panel within the enclosure and shall be wired and spaced in accordance with the latest NEC. The control console shall be supplied with a properly sized magnetic-circuit breaker to act as the main disconnect for the control console. Magnetic starters with overload protection shall be supplied for all blower units. To vary the air supply, a program timer shall be supplied. An electrical alternator shall be furnished to alternate the operation of each blower unit. An electrical alternator shall be provided with a manual selector switch to allow manual selection of the lead blower if desired. Auxiliary dry contacts shall be furnished for use by the customer (for SCADA monitoring) as shown on electrical plans for General Alarm notification. Auxiliary dry contacts shall be furnished for on/off control of the clarifier polymer system as shown on electrical plans.
- E. The 24-hour, 7-day time clock shall be capable of being programmed to control the blower run cycle and to adjust both the start set point and the blower run time. The clock shall also include a skip-a-day feature which will allow a separate program for weekends (when required).
- F. Control panel shall include all required hardware (overcurrent protection, terminal blocks, controls, etc.) for providing power to the UV system as directed by the UV system supplier.
- G. All wiring conductors within the control console shall be UL type THHN, stranded #14 AWG minimum, rated at 600 volts. Control wiring shall be numbered on each end.
- H. Control panel shall be furnished and installed by the manufacturer. All wire and conduit required between the control panel and the electrical power service should be furnished and installed by the Contractor. Wiring and conduit between the control panel and plant equipment (mixers, blowers, pumps, UV disinfection system, instruments/sensors, etc.) shall be furnished by the manufacturer of the wastewater treatment plant. The panel may be detached for shipping. The main power supply shall be 480 Volt, 3 Phase, 60 Cycle. The control voltage shall be 120 Volt, 1 Phase (powered through local CPT within control panel).

## 2.12 SERVICE WALKWAY

- A. A service walkway shall be provided for the service area (all tank openings) to service the plant equipment. Grating panels shall each consist of one-piece skid resistant steel plate. All grating panels shall be constructed of 18-gauge, galvanized sheet steel with maximum yield strength of 37,000 PSI. Each grating panel shall have a standard 9-inch surface width, and a 2-1/2-inch

rib depth. Furthermore, each panel shall be so supported as to have a safe uniform load carrying capacity of 50 pounds per square foot.

- B. 45-degree access stairways shall be provided leading to the walkway for the service area to service the plant equipment as shown on the Drawings and as necessary for the routine access and maintenance of equipment. Grating panels shall each consist of one-piece skid resistant steel plate. All grating panels shall be constructed of 18-gauge, galvanized sheet steel with maximum yield strength of 37,000 PSI. Each grating panel shall have a standard 9-inch surface width, and a 2-1/2- inch rib depth. Furthermore, each panel shall be so supported as to have a safe uniform load carrying capacity of 50 pounds per square foot.
- C. Handrailing system to be constructed from 1-1/2" OD schedule 40 painted steel pipe. The railing shall consist of two rails supported by posts on spans not to exceed 8'-0" O.C. The top rail shall be 42" from the walkway surface, and the middle rail to be 18" below. Construction shall be welded, with four-bolt stanchion connection to the tank surface at each post.

## 2.13 DISINFECTION EQUIPMENT

### A. Description

- 1. There shall be furnished one (1) ultraviolet disinfection unit as manufactured by:
  - a. Glasco
  - b. Enaqua
  - c. Xylem
  - d. Approved Compatible Equal
- 2. Equipment supplied with the UV system shall include UV lamp racks, supports for the lamp racks, UV intensity sensors, power distribution centers, spare parts and other equipment as required for the complete installation and operation of the system.
- 3. The UV unit shall have the capacity of disinfecting the effluent from the packaged treatment system. The UV disinfection tank shall be integral to the clarifier.

### B. Basic Design Conditions

- 1. The system shall be designed for the water quality and flow conditions as outlined in Section 1.03, D.
- 2. The disinfection chamber shall have the same protective coating as specified for the packaged treatment system. The tank shall have the same structural requirements as the packaged treatment system.
- 3. The UV disinfection system shall reduce the concentration of viable microorganisms in the treatment plant effluent by irradiation with UV light at a wavelength of 254 nm at a minimum transmission of 65%. Less than 100 Fecal Coliform colonies per 100 mL, based on a 30-day geometric mean, shall be the target that must consistently be achieved.
- 4. The system shall be capable of delivering a minimum MS2 RED 30 mJ/cm<sup>2</sup> at the Peak Hourly Flow with all banks in service and at the Average Daily Flow with 1 bank only. The dose should be calculated after 16,000 hours of lamp operation with a minimum 65% UV transmission of the effluent at 254 nm and adjusting for quartz sleeve fouling.

### C. Materials

1. All metal rack components in contact with the effluent and UV light shall be Type 316 stainless steel. Manufacturers that use aluminum on any UV equipment installed in the channel shall not be considered for this project.
2. All other stainless steel shall be Type 304.
3. All wiring exposed to UV light shall be Teflon coated.
4. All material exposed to UV light shall be stainless steel, quartz, Teflon or other UV resistant material.
5. The equipment shall be designed to comply with NEMA 4X (IP65) ratings.

#### D. UV Lamps

1. The UV system shall utilize low pressure high intensity amalgam lamps of the pre-heat start design.
2. Each lamp shall produce UV light with at least 90% of its emission between the wavelengths of 230 to 300 nm.
3. The lamp shall be rated for an average UV output of 205 W at 253.7 nm after 100 hour burn in. The average UV output of any proposed lamp cannot exceed 38% of the lamp input power.
4. The lamp shall be rated to produce no ozone.
5. The lamps shall have a four-pin electrical connector at one end only.

#### E. Quartz Sleeves

1. The quartz sleeves shall be fabricated of Type 214 clear fused quartz circular tubing containing at least 99.9% silicon dioxide.
2. The sleeve wall thickness shall be at least 1.50 mm (nominal).
3. The quartz sleeve material shall be rated for 92% UV transmission and shall not be subject to solarization over its lifespan.
4. The quartz sleeves shall be fabricated with one end closed so that only the open end requires sealing.

#### F. Lamp End Seals

1. The open end of the quartz sleeve shall be sealed by means of a Type 316 stainless steel nut which threads onto a coupling and compresses a sleeve O-ring.
2. The sleeve coupling nut shall have a knurled surface to allow a positive hand grip for tightening. The nut shall not require any tools for removal.
3. The quartz sleeve shall be held in place by means of an O-ring and compression washer.
4. The UV lamp rack shall be designed to isolate the individual lamps and to prevent moisture from coming in contact with the electrical connections of other lamps in the event of a seal failure or a quartz sleeve fracture.

#### G. Lamp Array Configuration

1. The lamp array configuration shall be uniform with all lamps parallel to each other and to the flow.
2. The lamps shall be evenly spaced in horizontal and vertical directions with equal center line spacing in both directions.

#### H. UV Lamp Racks

1. Each UV lamp rack shall consist of 2 UV lamps mounted on a Type 316 stainless steel frame.
2. The ends of the quartz sleeve shall not extend beyond the frame of the UV lamp rack, so that the frame will help protect the lamp/sleeve assembly from breakage.
3. The UV lamp rack shall be connected to receptacles on the Power Distribution Center (PDC) by means of one or two multi-conductor cable(s) with modular repairable connector(s). The cable connector and all of its components shall be field repairable. The connector shall be of a "Snap-On" design having no threads that may bind or be subject to cross threading. The connector shall also allow for visual confirmation that the connection is locked in place. Pins shall be made from a copper alloy with hard silver plating. The connector shall be coated with a corrosion resistant finish and all levers, bolts and screws shall be made of stainless steel. The connector shall meet IP65 (UL574) requirements for direct water spray when mated.
4. At the point of exit from the UV lamp rack, the multi-conductor cable(s) shall pass through a water-resistant strain relief.
5. The UV lamp rack shall incorporate a protective shield to prevent UV light from radiating above the lamp bank during normal operation.
6. The UV lamp rack shall be designed to comply with NEMA 6P ratings.

#### I. Bank Support Brackets

1. Lamp racks shall be suspended on Type 304 stainless steel support brackets. The lamp racks shall not rest on the bottom of the channel but shall be suspended above it. The support brackets shall be held in place by brackets anchored to the channel walls.

#### J. Level Control Weir

1. The level control weir shall be located in the disinfection channel of the packaged system.
2. The weir shall maintain a minimum channel water level and shall be sized to maintain a maximum height of 2 inches of effluent over the top lamp at peak flow conditions with no short circuiting of the lamp array.
3. The level control weir shall be constructed of Type 304 stainless steel and be mounted in the stainless-steel channel.

#### K. UV Intensity Sensor

1. A submersible UV sensor shall continuously sense the UV intensity produced in the bank of UV lamps. The sensor shall measure only the germicidal portion of the light emitted by the UV lamps. The sensor shall be factory calibrated.
2. Intensity of the bank of UV lamps shall be indicated in mW/cm<sup>2</sup>.
3. The sensor shall provide a 4-20 mA analog output signal for local indication of the UV intensity in the UV bank.

#### L. Ballasts

1. Electronic ballasts shall be of the pre-heat start type. The electronic ballast system will provide a minimum power factor of 98%.
2. The lamp current crest factor shall not exceed 1.45.
3. Each ballast shall drive one low pressure high output amalgam lamp for increased redundancy.
4. The ballast shall be capable of providing variable output to the lamp. The variable output shall be a continuous function and not a step function.

5. Each ballast shall provide a lamp failure alarm signal for the lamp they drive.
6. The ballast shall be a modular, plug-in device allowing for easy replacement in the field by operators without the need for special equipment.

#### M. Control and Instrumentation

1. Disinfection system controls shall be furnished and connected to the main control panel by the supplier.
2. The disinfection system controls shall include provisions for local indication of the following system parameters:
  - a. Individual lamp status
  - b. Communications status
  - c. Bank UV intensity (mW/cm<sup>2</sup>)
  - d. Bank ON/OFF status
  - e. Bank elapsed time (h)
  - f. Cleaning motor status
  - g. Bank lamp current (%)
  - h. Time before next cleaning cycle (h)
3. The disinfection system controls shall provide an alarm mode that allows the operator to view up to 20 of the most recent alarms that are still active or have yet to be acknowledged. The alarms displayed shall be common alarms for each UV lamp rack as well as system alarms. Minor and major alarms are defined below.
  - a. Minor Alarms
    - 1) Individual lamp failure
    - 2) Cleaning motor overload
    - 3) Bank UV intensity low alarm
    - 4) High cabinet temperature alarm
  - b. Major Alarms
    - 1) Bank UV intensity low-low alarm
    - 2) Adjacent Lamp Failure
    - 3) Multiple Lamp Failure
    - 4) Circuit breaker/GFI trip alarm
    - 5) Effluent low level
    - 6) Loss of UV intensity signal in Remote mode
4. The control system shall provide elapsed time indication for individual banks with a non-resettable timer and shall be displayed when prompted.
5. Lamp on/off cycling is protected by introducing delays to compensate for brief flow fluctuations and to keep energized banks in service for a defined period of time.

#### 2.14 EFFLUENT FLOW MEASUREMENTS

- A. For measuring the flow rate through the wastewater treatment system, a flow-measuring weir shall be supplied. The weir shall be a 60 degree "V" notch weir located at the outlet end of the disinfection tank.
- B. For measuring the flow rate, an ultrasonic flowmeter with recorder shall be installed. The unit shall record, indicate, and totalize the flow through the wastewater treatment system, the system shall be mounted within a NEMA 4X weatherproof fiberglass enclosure with a locking hasp complete with a 100-watt thermostat-controlled silicone rubber insulated general purpose

heater interior mounted. All components shall be pre-mounted and pre-wired with a circuit protection breaker powered from the main control console. The control console shall be provided for mounting as indicated on the plans. All exterior mounting hardware shall be stainless steel.

- C. The proposed ultra-sonic flowmeter will have a range and blanking distance to 10'-0".
- D. All components shall be installed within a NEMA 4X fiberglass weatherproof enclosure with a locking hasp. The flowmeter/chart recorder shall be provided for mounting as indicated on the plans. Any exterior mounting hardware shall be stainless steel. Components shall be pre-wired and pre-tested (calibrated) at the factory prior to shipment.

## 2.15 SPARE PARTS

A. The Contractor shall furnish the following spare parts and store as directed:

1. One (1) spare control relay for each type supplied.
2. One (1) spare alternator as required for each type supplied.
3. One (1) diffuser assembly completely factory assembled.
4. One (1) of each type of mechanical seal used in the pumps.
5. One (1) complete set of all O-rings used in each type of the pump.
6. Six (6) lamps for disinfection system.
7. Four (4) quartz sleeves for disinfection system.
8. Four (4) end seals for disinfection system.
9. Two (2) electronic ballasts for disinfection system.
10. One (1) service trolley for disinfection system.
11. One (1) Operator Safety Kit including face shield and gloves for disinfection system.

B. All spare parts shall be provided packed in suitable containers for extended storage by the Owner. Any spare parts consumed during equipment startup shall be replaced by the manufacturer without cost to the Owner.

## 2.16 ANCHOR BOLTS

- A. Equipment manufacturer shall furnish all anchor bolts of ample size and strength required to securely anchor each item of equipment. Bolts, washers and hex nuts shall be 304 stainless steel unless noted otherwise. Anchor bolts shall be J-type embedded, L-type embedded, or epoxy-type. Expansion-type anchors will not be acceptable.
- B. Anchor bolts shall be set by template and protected from misalignment by the Contractor. Equipment shall be placed on the foundations, leveled, shimmed, bolted down, and grouted with a non-shrinking grout. All miscellaneous hardware shall be galvanized steel.

## 2.17 SOURCE QUALITY CONTROL

- A. All welded joints fully or partially submerged, shall be sealed watertight with continuous welds.

## PART 3 - EXECUTION



### 3.01 FIELD PREPARATION AND PAINTING

- A. The Contractor shall touch-up all shipping damage to the paint as soon as the equipment arrives on the job site.
- B. Prior to the assembly all stainless-steel bolts and nut threads shall be coated with a non-seizing compound by the Contractor.

### 3.02 INSTALLATION AND STARTUP

- A. The manufacturer shall schedule one (1) trip to the project site for pre-installation assistance and up to three (3) days on site, split between no greater than two (2) trips, for Contractor assistance.
- B. After the Contractor has installed the equipment and the units are capable of being operated, the manufacturer shall schedule one (1) trip to the project site for equipment start-up assistance and up to three (3) days on site for the Contractor and for operator training.
- C. After the equipment has been placed into operation, the manufacturer's representative shall make all final adjustments for proper operation.

### 3.03 OPERATOR TRAINING

- A. Provide operator training for OWNER'S personnel after system is operational. Training shall take place while manufacturer's representative is at the job site for inspection. Operator training shall consist of a minimum of two (2) eight (8) hour day of training with manufacturer's staff or staffing certified by the manufacturer of the equipment.

END OF SECTION

**SECTION 13200**  
**TERTIARY CLOTH MEDIA FILTER**

**PART 1 GENERAL**

1.01 SUMMARY

- A. The Contractor shall furnish all labor, materials, tools and equipment required to furnish and install one (1) filter provided in 304 stainless steel tankage as shown on the Contract Drawings and as specified herein.
- B. The system shall be factory assembled, so far as possible, with all piping and controls. All surfaces shall be factory painted.
- C. Related Sections
  - 1. General Conditions, Supplementary Conditions, and General Requirements sections apply to work of this Section.

1.02 REFERENCES

- A. American Institute of Steel Construction (AISC)
- B. American Society of Testing and Materials (ASTM)
  - 1. A36 - Standard Specification for Structural Steel
  - 2. A48 - Standard Specification for Gray Iron Castings
  - 3. A53 - Standard Specifications for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
  - 4. A325 - Standard Specifications for High-Strength Bolts for Structural Steel Joints
  - 5. A536 - Standard Specification for Ductile Iron Castings
- C. American Society of Civil Engineers (ASCE)
- D. American Welding Society (AWS)
  - 1. AWS A2.4 - Symbols for Welding and Non-Destructive Testing
  - 2. AWS D1.1 - Structural Welding Code - Steel
- E. Steel Structures Painting Council (SSPC)

1.03 SYSTEM DESCRIPTION

- A. Each filter shall be capable of treating an incoming average flow of 100,000 gpd and peak flow of 250,000 gpd.
- B. The filter shall use pile type cloth media to provide filtration of wastewater containing incoming solids from a properly operated secondary treatment process incorporating clarification. Systems that utilize fine mesh screens, micro-screening material, continuously rotating disks, or other non-pile type material for filtration of solids shall not be allowed.

- C. The filter shall be composed of multiple, easily removable element frames that support the cloth media material.
- D. The filter shall provide a minimum submerged filter surface area of 36 ft<sup>2</sup> as provided by three (3) individual filter elements, each containing two (2) cloth media panels. Each media element shall be mounted vertically and have an integral connection to the equipment tankage.
- E. Filtering elements shall be fixed in place and shall not move during filtration, backwash, or normal operation. Filtration systems that utilize rotating disks, spray bars, or vacuum manifolds shall not be allowed.
- F. Each filtering element shall be capable of being removed from the filter independently of other online operating filter elements. Removal of filter elements shall not disrupt flow to other online filtering elements or require incoming flow to be diverted or shutoff during the removal process or while elements are removed.
- G. Design total backwash water volume required shall not exceed 5% of the design influent flow.
- H. Each stainless-steel filter tank shall be designed to withstand with a prudent safety factor all stresses that may occur during fabrication, erection, intermittent, or continuous 24 hour per day operation. The equipment and controls shall be provided by a single supplier as a complete package to ensure coordination and compatibility.
- I. Design Summary:

The filter system shall be capable of meeting the following performance requirements:

<u>Parameter</u>	<u>Influent</u>	<u>Effluent</u>
Average Daily Flow	0.100 mgd	
Peak Hourly Flow	0.250 mgd	
BOD <sub>5</sub> Average	10 mg/l	5 mg/l
Total Suspended Solids (TSS)	30 mg/l	5 mg/l
NH <sub>3</sub> -N Maximum		1.2 mg/l
Total Nitrogen (TN)		10.0 mg/l
Total Phosphorus (TP)	2.0 mg/l	2.0 mg/l
Number of Filter Units	1	

#### 1.04 SUBMITTALS

- A. Refer to Section 01330 for shop drawing submittal requirements.
- B. The Contractor shall submit complete shop drawings of all equipment furnished including cut sheets describing purchased sub-components with the specific sub-components used for this project properly highlighted. All submitted information must include a certification that the submittal describes exactly the equipment to be provided and substitutions subsequent to submittal approvals will not be tolerated.
- C. Complete details of the design, construction, and operating characteristics of the filter equipment shall be submitted for review by the Engineer. Submittal data shall include design

calculations, descriptions of materials of construction, headloss calculations, anticipated process performance, and all other information necessary to completely describe the filter installation. All calculations must be stamped by a Registered Professional Engineer in the State of Alabama.

- D. Submittal drawings shall be returned to Contractor after initial review. If subsequent submittals are judged by the Engineer to not be in compliance with these specifications, the Contractor shall be required to furnish equipment from another manufacturer meeting the specifications.
- E. Review of the shop drawings shall not relieve the Contractor from the responsibility of proper fitting and construction of the work, nor from furnishing materials and work required by the Contract that may not be indicated on any drawings.

#### 1.05 OPERATION AND MAINTENANCE MANUALS

- A. Operation, maintenance and installation manuals shall be provided by the equipment manufacturer as part of shipment of major filter equipment. Hard copy manuals shall be 8 1/2-in. by 11-in. bound in 3-ring loose-leaf binders and indexed. Oversize drawings shall be folded to the above dimensions and placed in envelopes bound at the rear of the manuals. Digital copies of this data shall be provided to the Owner in a suitable electronic format including USB drive or similar media.
- B. At a minimum, each manual shall contain:
  - 1. General arrangement drawings, detail drawings, and erection drawings.
  - 2. Cut sheets for all items of equipment purchased from other manufacturers.
  - 3. Installation and maintenance instructions for the specific equipment including the erection sequence, maintenance items, and trouble-shooting check points and complete lubrication procedures.
  - 4. Wiring diagrams for all controls.
  - 5. A recommended sequence of operations.
  - 6. A list of the manufacturer's recommended spare parts. The list shall include: wear items, long delivery items and all items convenient for stocking as optional replacement items.
- C. Approval of Manuals: Acceptance will not be reached until approved Operation and Maintenance Manuals have been submitted. Partial approvals will not be made.

#### 1.06 QUALITY ASSURANCE

- A. The manufacturer of the cloth media filter equipment shall provide their standard equipment, which shall meet the minimum values specified for dimensions, design, and intent of this specification.
- B. In order to assure uniform quality, ease of maintenance and minimal parts storage, it is the intent of these Specifications that all equipment called for under this Section shall be supplied by a single manufacturer. The equipment manufacturer shall, in addition to the Contractor, assume the responsibility for proper installation and functioning of the equipment.

#### 1.07 QUALIFICATIONS

- A. The manufacturer of specified equipment must have a minimum of ten (10) year's active experience in the design and manufacture of similar wastewater treatment equipment, and upon request, furnish supporting evidence. Consideration will be given only to products of manufacturers who can demonstrate that their equipment fully complies with all requirements of the specifications and contract documents. The equipment shall be supplied by a firm which has been regularly engaged in the design, fabrication, assembly, testing, start-up and service of cloth media filters, of the same size as proposed, operating in the U.S., with similar characteristics.

#### 1.08 DELIVERY, STORAGE, AND HANDLING

- A. Section 01600 - Product Requirements.
- B. Fabricated assemblies shall be shop assembled and shipped complete.
- C. All equipment shall be installed immediately upon receipt from the manufacturer or stored in strict conformance with storage recommendations provided by the manufacturer.

#### 1.09 COORDINATION

- A. Section 01300 - Administrative Requirements.
- B. Coordinate installation and start-up with Owner and Engineer.

#### 1.10 WARRANTY

- A. The manufacturer shall warrant, in writing, that all equipment supplied by them shall be free from defects in material and workmanship, for a period of twelve (12) months from the date of startup, not to exceed eighteen (18) months from the date of delivery, unless noted otherwise within the specifications.

### **PART 2 PRODUCTS**

#### 2.01 MANUFACTURER

- A. The filter equipment shall include all necessary equipment and appurtenances to form a complete and functioning system and shall be as manufactured by
  1. Municipal Filtration Company, LLC (MFC)
  2. Aqua-Aerobic Systems, Inc.
  3. NEXOM
  4. Substitutions: Section 01600 - Product Requirements

#### 2.02 GENERAL

- A. Each filter shall be delivered as a complete package and include 100% stainless steel tankage, influent flanged connection, influent distribution channel, influent valves with pneumatic fail open operators, common effluent collection channel, effluent flanged connection, backwash discharge piping with flanged connection, backwash control valves with pneumatic fail close

operators, control panel, level monitors, and associated wiring and conduits specific to the filter.

- B. All internal components of the filter assembly, including the media support framework, cloth fabric, backwash components, or air headers shall be easily removable from the filter tankage for inspection and media replacement WITHOUT discontinuing or diverting flow from the filter. Systems that require flow to be diverted or discontinued for routine or periodic maintenance shall require additional filters or means to store flow during inspection and media replacement.

### 2.03 FILTER TANKAGE, PIPING, UNDERDRAINS & HARDWARE

- A. All filter tankage, channels, underdrains, and internal piping shall be constructed of 100% 304 stainless steel with sufficient structural stiffening for all loads imposed during shipping, handling, and normal operation.
- B. All filter hardware shall be 100% 304 stainless steel.
- C. Each filter tank shall be shop fabricated, assembled, and shipped as a complete unit.
- D. All fabricated steel shall be 100% stainless steel and shall not require additional coatings. Valve bodies and operators shall be factory painted with the valve manufacturer's standard coating.
- E. Each filter shall include an internal, integrated influent distribution channel with orifices to evenly distribute incoming flow to the filter's online cloth media elements.
- F. Each filter shall include individual, isolated underdrain channels for each included filter element. Each underdrain channel shall be integrated into the tank structure, be isolated from other underdrain channels, and contain influent & backwash piping connection(s).
- G. Heavy solids that enter the filter system shall settle to the bottom of the filter influent channel and underdrain and shall be carried away as part of normal backwash operations. Systems that allow heavy solids to accumulate in a hopper bottom or to accumulate on the media itself shall not be allowed. Systems that require a separate sludge removal step or operation shall also not be allowed.
- H. Each filter shall be equipped with an effluent control box, complete with a fixed stainless-steel weir that is an integral part of the tankage for the purpose of regulating the effluent flow and main tank water level.
- I. All filter internal piping, including influent drop pipes and backwash collection manifold, shall include 125 lb flanges for connection to the tankage and equipment valves. All piping integral to the filter shall be factory installed and tested for leakage and proper fit prior to shipment.
- J. All filter external piping connections, including influent, effluent, and backwash connections shall include 125 lb flanges for connection to system piping provided by the installing Contractor.

- K. Piping to and from filter connection points shall be provided and installed by the installing Contractor, conform to applicable divisions of this specification, and be properly designed to handle all flows under the hydraulic conditions stipulated.

## 2.04 MEDIA ELEMENTS

- A. Each filter shall include a total of three (3) filter media elements. Each element shall consist of two (2) flat, rectangular cloth media panels supported by a stainless-steel element frame and connecting hardware. Elements shall be installed in the stainless-steel tankage and connected to the integrated underdrain channels via neoprene gasketed connection interface.
- B. Media elements, including integrated cloth panels, shall not move or rotate during normal filtration or backwash procedures.
- C. All fabricated components of the media element frame, including internal support framework, cloth panel retainer screen and clamps, shall be 100% 304 stainless-steel.
- D. Each media element shall be equipped with an integral neoprene rubber gasket for sealing against the element inlet.
- E. Media elements shall easily slide into place and be supported along all edges by integral stainless steel locking mechanisms.
- F. Media element frame shall include appropriate structural stiffening, internal baffling, and be easily removable from the filter tankage for inspection and media replacement without discontinuing or diverting flow from the filter. Element frame shall be held in place with simple clamps which can be loosened by hand. No tools or dewatering of the system shall be required to loosen or remove media elements or frames from the filter tankage.
- G. Media element support frames shall include, integral to the internal structure, an air scour drop pipe and air release header for proper backwash function. Air header shall be integrated within the element framework and be easily removed along with the element frame for inspection and cleaning without discontinuing or diverting flow to the remaining online filter elements.
- H. All media elements shall be fixed in place and shall not move during filtration, backwash, or normal operation. Filtration systems that utilize rotating disks, spray bars, or vacuum manifolds shall not be allowed.
- I. Systems that require flow to be diverted or discontinued for routine maintenance or element inspection shall require additional filters or means to store flow during inspection and media replacement.

## 2.05 FILTER TANKAGE COVER

- A. Each filter shall include a removable cover constructed of 304 stainless-steel which shall prevent sunlight from entering the filter's main filter tank containing the filtering elements. Cover shall include sufficient structural stiffening to be self-supporting. Cover shall be notched to allow element vent hoses to protrude as required. Notches shall include appropriate edging material to prevent abrasion of the element vent hoses during normal operation.

- B. Covers shall be a single piece and allow manageable removal by operating personnel.
- C. The section over the effluent channel shall incorporate a hinged cover for simplified inspection of effluent flow & the main filter bay.

#### 2.06 FILTER ELEMENT HOIST

- A. The filter system shall include a removable, portable manual hoist to facilitate periodic element removal and inspection.
- B. Hoists shall include 304 stainless-steel components, including frame, brake winch, cable, hook, sheaves, and hardware.
- C. Hoist sockets for hoist placement are integral to the filter tankage and located along the outside edge of each filter's effluent channel. Access to hoist sockets is from the effluent side and shall remain clear of piping, electrical conduit, or other obstructions that may interfere with normal element removal and inspection.

#### 2.07 ACCESS WALKWAYS, STAIRS & HANDRAILS

- A. Walkways, access stairs, handrails, and associated grating are not required for proper access to the specified filter. Alternate filters or filter systems that require walkways and handrails to safely operate shall include all pertinent walkways, handrails, stairways, and grating at supplier's expense.
- B. Any access stairway(s) and walkways required shall be provided by the installing Contractor as shown on the plans. All access stairways and walkways shall be self-supporting and shall not rely on filter tankage for support or connection. All stairways and walkways shall meet OSHA requirements.

#### 2.08 OPERATION

- A. Filtering elements shall be cleaned in sequence, with all any filtering elements that are not being cleaned shall be online and producing filtered effluent. Systems that need to dewater or take more than one filtering element offline at one time shall not be allowed.
- B. A programmable controller shall be pre-programmed with the interlocks and sequence logic necessary to control all filter components during all filtering and backwash operations.
- C. During automatic operation, the backwash cycle is started by the high-level sensor, manual pushbutton, or pre-set timer through the controller. Once initiated, the influent and backwash valves are operated in sequence allowing each filter panel to be backwashed successively. Backwash cycle times are adjustable through the operator interface panel and can be set in tenths of seconds. The frequency of backwash can also be set through the operator interface and can be set in minutes.
- D. Backwash can also be performed by manually operating each valve through use of the override interface which overrides automatic operation.



- E. Alarm indicators are included in the interface programming and warn the operator of high-water level, equipment malfunction, and alarm acknowledgment condition.

## 2.09 ELECTRICAL CONTROL PANEL (FCP)

- A. A single electrical filter control panel (FCP) shall be provided to control all necessary functions for operation of the valves and level sensing equipment for all filters.
- B. The FCP shall be of NEMA 4X “UL Listed” stainless steel construction.
- C. The FCP shall be mounted to the first filter and interconnected to tank mounted components at the factory.
- D. For multiple filter installations, a common FCP shall be mounted to the first filter, with each subsequent filter having a junction box attached to the filter sidewall. Each filter shall be controlled independently of other filter units.
- E. An adequately sized hinged front door with 3-point external latching shall be provided on the FCP to contain all the required controls and provide access for repairs & wiring as necessary.
- F. The FCP shall use a programmable logic controller (PLC) to provide automatic operation of all filter components and contains the logic components & programmable controls to operate all filter functions.
- G. The FCP shall include auxiliary dry contacts for use by the customer (for SCADA monitoring) as shown on electrical plans for General Alarm notification.
- H. The FCP shall include an integrated touch-screen operator interface to provide access to control set points, display filter component status & alarms, and provide override control of individual filter components.
- I. If the FCP panel is to be mounted outdoors, the FCP shall include an integrated sunshield to cover and protect the operator interface from sun & sunlight exposure.
- J. Filter cleaning frequency of each filter shall be regulated by; an adjustable timer integral to the control panel, manual pushbutton override on the operator interface, or by a float switch mounted in the influent channel of each filter to indicate high influent level.
- K. The FCP shall be capable of tolerating a power outage for a two-year period without loss of programming or data set points. Battery replacement period shall not be shorter than two years.
- L. Contractor shall provide the FCP with a 120-volt, 60 hertz, single phase power supply and include appropriate line surge & ground fault protection as appropriate for local codes. Systems that require 3 phase power, motor starters, motor contactors, transformers, MCCs, or other motor control equipment shall not be allowed.
- M. The FCP shall be factory wired and tested and provide clearly identified, industrial type terminal strips for all external field connections.

- N. See specification section 16480 (“Manufactured Control Panels”) for additional control panel requirements.

## 2.10 AIR COMPRESSOR AND ACCESSORIES

- A. A 3.5 HP air compressor with 60-gallon vertical receiver and accessories shall be supplied and installed by the Contractor. Installation shall include the provision and connection of all required air piping, pipe fittings, conduit, wiring, pressure regulator, pressure relief valve, pressure switch, manual tank drain valve, lubricants, inline air filters and all other items required for a fully functioning compressed air supply for operation of the pneumatic valves and air scour system of the filter system.
1. Manufacturer
    - a. Gardner-Denver
    - b. Quincy
    - c. Ingersoll-Rand
    - d. Champion
    - e. Approved Equal
- B. The compressor unit shall be a self-contained, simplex type unit consisting of a single-stage, air-cooled, oil lubricated reciprocating type compressor and motor with V-belt drives mounted on a 60-gallon vertical receiver. Compressor shall deliver not less than 10 cubic feet of free air per minute at inlet conditions compressed to 100 psig. Valves shall be of stainless steel and shall be easily removed or inspected without use of special tools.
- C. The compressor receiver tank shall include an automated drain/vent valve to allow condensate to be flushed from the receiver periodically. Condensate shall be routed to an exterior location or interior drain as appropriate for local codes.
- D. The motor for the compressor shall be a 3.5 horsepower electric motor operating at no greater than 1800 full-load rpm. Motor enclosure shall be ODP. Motor shall be rated for operation on 480 V, 3 phase power.
- E. The compressor shall be furnished with a dry type air filter-silencer.
- F. Operation of the compressor shall be automatic start and stop, controlled by an adjustable pressure switch.
- G. All rotating parts of the air compressor shall be protected in accordance with the applicable OSHA standards and requirements.
- H. Discharge from the compressor shall be regulated to 85-90psi.
- I. Inline air filters shall include a minimum 5 µm filter along with a coalescing 1 µm filter.
- J. All air piping and fittings from the receiver tank to the air connection on each filter shall be Schedule 40 red brass or stainless steel in conformance with ASTM B43, ASTM B16.15, ASTM B62, and ASME/ANSI B1.20.1 standards. Pipe size shall be nominal ½-inch diameter, minimum.

- K. A 1/2-inch minimum threaded connection shall be provided in the compressed air piping, near the compressor, to allow the connection of an auxiliary air compressor to the compressed air piping system (should the primary air compressor fail). The connection tee shall have two 1/2-inch brass or stainless-steel ball valves installed to close the auxiliary connection point when it is not in use and to close the primary airline to the installed compressor when the auxiliary connection point is in use.
- L. The compressed air system shall include an appropriately sized refrigerated dryer system to condense and remove moisture from the compressor discharge. Dryer shall be powered by 120 V, 1 phase via integrated 3 prong outlet plug. Properly grounded outlet shall be provided by the installing Contractor near the dryer system. Condensate shall be routed to an exterior location or interior drain as appropriate for local codes.
  - 1. Manufacturer
    - a. Gardner Denver
    - b. Quincy
    - c. Ingersoll-Rand
    - d. Approved Equal

### **PART 3 - EXECUTION**

#### **3.01 GENERAL**

- A. The filters shall be installed in accordance with the system manufacturer's recommendations.
- B. Contractor shall inspect crating and packaging for signs of damage during shipping and report any damage to the filter manufacturer prior to uncrating or removing damaged packaging.
- C. Prior to the assembly all stainless-steel bolts and nut threads shall be coated with a non-seizing compound by the Contractor.

#### **3.02 INSTALLATION AND STARTUP**

- A. The filter equipment manufacturer shall provide a factory trained field service representative to inspect the installation and operation of the filter equipment. In addition, the field service representative shall instruct the owner's personnel in the proper operation and maintenance of the filter equipment. At a minimum, the field service representative must be available for 3 days of service in 1 continuous trip.
- B. The field service representative shall submit to the Engineer a written report stating that the filter system has been checked and is suitable for operation.

END OF SECTION

**SECTION 13500**  
**SLUDGE DEWATERING SYSTEM**

**PART 1 GENERAL**

1.01 SUMMARY

- A. The Contractor shall furnish all labor, materials, tools and equipment required to furnish and install one (1) sludge dewatering system, consisting of a container filter and polymer injection and mixing unit, as shown on the Contract Drawings and as specified herein.
- B. The system shall be factory assembled, so far as possible, with all piping and controls. All surfaces shall be factory painted.
- C. Related Sections
  - 1. General Conditions, Supplementary Conditions, and General Requirements sections apply to work of this Section.

1.02 REFERENCES

- A. American Institute of Steel Construction (AISC)
- B. American Society of Testing and Materials (ASTM)
  - 1. A36 - Standard Specification for Structural Steel
  - 2. A48 - Standard Specification for Gray Iron Castings
  - 3. A53 - Standard Specifications for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
  - 4. A325 - Standard Specifications for High-Strength Bolts for Structural Steel Joints
  - 5. A536 - Standard Specification for Ductile Iron Castings
- C. American Society of Civil Engineers (ASCE)
- D. American Welding Society (AWS)
  - 1. AWS A2.4 - Symbols for Welding and Non-Destructive Testing
  - 2. AWS D1.1 - Structural Welding Code - Steel
- E. Steel Structures Painting Council (SSPC)

1.03 SUBMITTALS

- A. Refer to Section 01330 for shop drawing submittal requirements.
- B. The Contractor shall submit complete shop drawings of all equipment furnished including cut sheets describing purchased sub-components with the specific sub-components used for this project properly highlighted. All submitted information must include a certification that the submittal describes exactly the equipment to be provided and substitutions subsequent to submittal approvals will not be tolerated.

- C. Complete details of the design, construction, and operating characteristics of the sludge dewatering system shall be submitted for review by the Engineer. Submittal data shall include design calculations, anticipated equipment output and performance data, descriptions of materials of construction, and all other information necessary to completely describe the sludge dewatering system installation.
- D. Submittal drawings shall be returned to Contractor after initial review. If subsequent submittals are judged by the Engineer to not be in compliance with these specifications, the Contractor shall be required to furnish equipment from another manufacturer meeting the specifications.
- E. Review of the shop drawings shall not relieve the Contractor from the responsibility of proper fitting and construction of the work, nor from furnishing materials and work required by the Contract that may not be indicated on any drawings.

#### 1.04 OPERATION AND MAINTENANCE MANUALS

- A. Operation, maintenance and installation manuals shall be provided by the equipment manufacturer as part of shipment of sludge dewatering system. Hard copy manuals shall be 8 1/2-in. by 11-in. bound in 3-ring loose-leaf binders and indexed. Oversize drawings shall be folded to the above dimensions and placed in envelopes bound at the rear of the manuals. Digital copies of this data shall be provided to the Owner in a suitable electronic format including USB drive or similar media.
- B. At a minimum, each manual shall contain:
  - 1. General arrangement drawings, detail drawings, and erection drawings.
  - 2. Cut sheets for all items of equipment purchased from other manufacturers.
  - 3. Installation and maintenance instructions for the specific equipment including the erection sequence, maintenance items, and trouble-shooting check points and complete lubrication procedures.
  - 4. Wiring diagrams for all controls.
  - 5. A recommended sequence of operations.
  - 6. A list of the manufacturer's recommended spare parts. The list shall include wear items, long delivery items and all items convenient for stocking as optional replacement items.
- C. Approval of Manuals: Acceptance will not be reached until approved Operation and Maintenance Manuals have been submitted. Partial approvals will not be made.

#### 1.05 QUALITY ASSURANCE

- A. The manufacturer of the sludge dewatering system equipment shall provide their standard equipment, which shall meet the minimum values specified for dimensions, design, and intent of this specification.
- B. In order to assure uniform quality, ease of maintenance and minimal parts storage, it is the intent of these Specifications that all equipment called for under this Section shall be supplied by a single manufacturer. The equipment manufacturer shall, in addition to the Contractor, assume the responsibility for proper installation and functioning of the equipment.

## 1.06 QUALIFICATIONS

- A. The manufacturer of specified equipment must have a minimum of ten (10) year's active experience in the design and manufacture of similar dewatering equipment, and upon request, furnish supporting evidence. Consideration will be given only to products of manufacturers who can demonstrate that their equipment fully complies with all requirements of the specifications and contract documents. The equipment shall be supplied by a firm which has been regularly engaged in the design, fabrication, assembly, testing, start-up and service of sludge dewatering systems, of the same size as proposed, operating in the U.S., with similar characteristics.

## 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Section 01600 - Product Requirements.
- B. Fabricated assemblies shall be shop assembled and shipped complete.
- C. All equipment shall be installed immediately upon receipt from the manufacturer or stored in strict conformance with storage recommendations provided by the manufacturer.

## 1.08 COORDINATION

- A. Section 01300 - Administrative Requirements.
- B. Coordinate installation and start-up with Owner and Engineer.

## 1.09 WARRANTY

- A. The manufacturer shall warrant, in writing, that all equipment supplied by them shall be free from defects in material and workmanship for a period of twelve (12) months from the date of startup.

## **PART 2 PRODUCTS**

### 2.01 MANUFACTURER

- A. The sludge dewatering system shall include all necessary equipment and appurtenances to form a complete and functioning system and shall be as manufactured by
  1. Flo Trend
  2. Clean It Up
  3. Approved Compatible Equal

### 2.02 SLUDGE FEED PUMP

- A. A single sludge feed pump shall be provided adjacent to the sludge holding chamber portion of the packaged wastewater treatment plant and attached by piping and valving to the dewatering polymer feed system and sludge dewatering container. The pump shall be of the suction type with carbon steel pump housing, alloy steel chrome plated rotor, nitrile stator, and single mechanical seal.

1. Manufacturer
    - a. MOYNO EZ Strip
    - b. Approved Compatible Equal
  2. The pump gear reducer shall be 2 HP for operation on 460 Volt, 3 Phase, 60 Hz service in a TEFC enclosure.
  3. Design Features
    - a. Pump shall be equipped with technology for easy de-ragging while maintaining in place functionality.
    - b. The rotor and stator shall be capable of being removed and replaced without disturbing or removing the suction and discharge pipe connections. This shall also apply to the removal/replacement of the connecting rod, driveshaft and seal.
    - c. Each pump rotor shall be joined to the drive shaft by a heavy duty, oil lubricated, pin type universal joint. A two-piece design of connecting rod is required which allows the rotor and stator to be removed without disturbing/dismantling the pump pin-joint drive connections.
    - d. The pump casing shall be designed to provide for unrestricted 360-degree access to the suction chamber, connecting rod, pin joints and rotor head for de-ragging and unblocking without disturbing suction or discharge flanges.
- B. An electrical control panel shall be installed within a NEMA 4X “UL Listed” stainless steel weatherproof enclosure with 3-point external locking latch. The control panel shall be provided for mounting as indicated on the plans. Any exterior mounting hardware shall be stainless steel or other corrosion resistant material.
- C. Refer to Specification Section 16480 (“Manufactured Control Panels”) for additional control panel requirements.
- D. The control panel shall be completely factory assembled and tested prior to shipment. The control panel shall be furnished with all necessary controls for the pump and associated Sludge Pump Solenoid Valve. Control voltage shall be 120 VAC, 1 Phase.
- E. Controls shall be mounted to a removable sub-panel within the enclosure and shall be wired and spaced in accordance with the latest NEC. The control panel shall be supplied with a properly sized magnetic-circuit breaker to act as the main disconnects for the control console. Magnetic starters with overload protection shall be supplied for the sludge pump. Auxiliary dry contacts shall be furnished for use by the customer (for SCADA monitoring) as shown on electrical plans for General Alarm notification and Sludge Pump on/off indication. Auxiliary dry contacts shall be furnished for on/off control of the dewatering polymer system as shown on electrical plans. 120V relaying shall be furnished for on/off control of the Sludge Pump Solenoid Valve as shown on electrical plans.
- F. Control panel shall be furnished and installed by the manufacturer. All wire and conduit required between the control panel and the electrical power service should be furnished and installed by the Contractor. Wiring and conduit between the control panel and plant equipment shall be furnished by the manufacturer of the wastewater treatment plant. The panel may be detached for shipping. The main power supply shall be 460 Volt, 3 Phase, 60 Hz. The control voltage shall be 120 Volt, 1 Phase (powered through local CPT within control panel).

## 2.03 CONTAINER

### A. CONTAINER FILTER CONSTRUCTION

1. Container Filter shall be constructed of A-36 carbon steel plate with 1/4" floor and 3/16" walls. The unit shall be round bottom shape in shape.
2. Container Filter shall have a minimum of two 3" threaded drainage ports on each lower side at opposing ends for the floor and two 3" drainage ports for walls. Each port shall have a 3" hose cam connection with cap and chain. The drainage system shall be constructed in such a way so the wall filters and bottom filters both drain to a common cavity.
3. The Container Filter shall be equipped with a minimum of four (4) wheels.
4. Wall gussets shall be 7 gauge formed plate.
5. Door sealing face will be totally watertight and have a one-piece extruded gasket made of a SBR/neoprene 50/50 blend. The gasket shall be held in place by a welded metal seal retainer. Doorframe shall be made of structural tubing with three steel hinges located on the side. Door sealing shall have 1" ratchet chain binders, one on each side and two in the middle of the door. Hinges shall be constructed of 1/2" wall steel tubing and 1" diameter hot rolled bar pins with welded retainer washers.
6. Internal filter support system will be comprised of 1/4" angles, structural channels and removable filter support panels. Floor panels will be made from 1/4" thick perforated plate with 3/8" diameter holes at 1/2" staggered centers. Side wall panels will be made from #9 flattened expanded metal – hot dipped galvanized.
7. All removable filter panels shall have a 1/4" x 2" wide neoprene gasket installed between the panel and framework. Chalking or other sealant is not acceptable.
8. Filter Media shall be four pieces made from Polyester, Color: Clear White, Count: 64 x 24 (per inch), Weave: 6 x 2 Herringbone Satin, Warp Diameter: 500 Microns, Weft Diameter: 800 Microns, Weight: 38.9 (oz. per sq. yd), Tensile Strength: 1560 (lbs/inch), Air Permeability: 400 CFM, Water Permeability: 282 (mm<sup>3</sup>/mm<sup>2</sup>/s), Thickness: .083", Micron Opening: 0 x 325, Micron Retention: 260, Open Area: 19%. A commercial heat knife and hole-maker shall be used for cutting ends and locating holes.
9. Filter media shall be installed on each sidewall, and floor. The wall filter media shall be 24" minimum in vertical height and shall be held in place with 1/4" x 2" retainer bars. All filter panel supports, bars and media are bolted into place with stainless steel fasteners consisting on studs, flat washers, and acorn nuts.

### B. MATERIAL SPECIFICATIONS

1. Hot-rolled structural steel shapes and plates shall be ASTM A36.
2. Hot-rolled carbon steel sheet and strip structural quality shall conform to ASTM-A570 grades D & E.
3. Hot-formed welded and seamless steel tubing shall conform to ASTM A500 grade B.
4. Welded and seamless steel pipe shall conform to ASTM A53 grade B.
5. Stainless steel fasteners shall conform to AISI grade 304/305.
6. Welding electrodes shall be E70S used in gas metal arc process conforming to the specifications for mild steel electrodes for gas metal ARL welding AWS A518.
7. All exposed welds shall be cleaned of welding slag and rounded. All exposed sharp edges and corners shall be rounded.
8. All steel metal surfaces shall be sandblasted to near white metal and commercially coated with a two-part epoxy primer.



9. The external final surface shall receive 5 mils dry polyurethane industrial coating.
10. Interior surfaces will have a final coating of industrial epoxy applied totaling 5 mils dry.

## 2.04 DEWATERING POLYMER MIXING AND INJECTION SYSTEM

### A. CONSTRUCTION

1. The Dewatering Polymer Mixing and Injection System shall be manufactured by
  - a. Flo Trend
  - b. Approved Compatible Equal
2. Mixing/blending tank shall be a 75-gallon polypropylene flat bottom tank with mounting for the agitator motor, drain valve connection, bulkhead connection for injection manifold, and a water fill connection with shutoff valve.
3. Mixing/blending of the concentrated polymer shall be by 0.5 hp electric agitator with TEFC motor drive, shaft, and mixing blade.
4. Dosage/injection pump shall be a 0.5 hp drive motor with progressive cavity pump and DC controller. The controller with flow meter shall be mounted on a common control panel. The controller shall have provisions for remote on/off control. Auxiliary dry contacts shall be furnished for use by the customer (for SCADA monitoring) as shown on electrical plans for General Alarm notification and pump on/off indication.
5. Diluted polymer will be injected by the dosage pump into a static mixer manifold with cross-elliptic nozzle orifice and with 2" inlet and 2" outlet connections. The unit shall be rated for flows from 30 to 100 gpm.
6. A visual flow meter shall be mounted on control panel to monitor the polymer being injected into the waste stream.
7. All components shall be skid mounted, wired, piped to a common manifold for Contractor final installation on site
8. Unit shall be designed for use with liquid polymer at an average dosage rate of up to 4 gpm diluted polymer.
9. Agitator and dosing pump shall be wired for 110-volt single phase.

### B. MATERIAL SPECIFICATIONS

1. Hot-rolled structural steel shapes and plates shall be ASTM A36.
2. Hot-rolled carbon steel sheet and strip structural quality shall conform to ASTM-A570 grades D & E.
3. Hot-formed welded and seamless steel tubing shall conform to ASTM A500 grade B.
4. Welded and seamless steel pipe shall conform to ASTM A53 grade B.
5. Stainless steel fasteners shall conform to AISI grade 304/305.
6. Welding electrodes are E70S used in gas metal arc process conforming to the specifications for mild steel electrodes for gas metal ARL welding AWS A518.

### C. PAINT

1. All steel metal surfaces shall be sandblasted to near white metal and commercially powder coated.

## PART 3 - EXECUTION

### 3.01 GENERAL

- A. The sludge dewatering system shall be installed in accordance with the system manufacturer's recommendations.
- B. Contractor shall inspect crating and packaging for signs of damage during shipping and report any damage to the filter manufacturer prior to uncrating or removing damaged packaging.
- C. Prior to the assembly all stainless-steel bolts and nut threads shall be coated with a non-seizing compound by the Contractor.

### 3.02 INSTALLATION AND STARTUP

- A. The sludge dewatering system equipment manufacturer shall provide a factory trained field service representative to inspect the installation and operation of the dewatering equipment. In addition, the field service representative shall instruct the owner's personnel in the proper operation and maintenance of the dewatering equipment. At a minimum, the field service representative must be available for 3 days of service in 1 continuous trip.
- B. The field service representative shall submit to the Engineer a written report stating that the sludge dewatering system has been checked and is suitable for operation.

END OF SECTION

# DIVISION 16 ELECTRICAL



10/3/2023

## SECTION 16050

### BASIC ELECTRICAL MATERIALS AND METHODS

#### PART 1 GENERAL

##### 1.1 DESCRIPTION

###### A. General Conditions:

1. The accompanying General Conditions (front-end specifications) shall apply to and form a part of this section.

###### B. General Requirements:

1. Carefully examine General Conditions, other specification sections, and other drawings (in addition to Electrical) in order to be fully acquainted with their effect on electrical work.
2. Do all work in compliance with all applicable codes, laws, and ordinances, the National Electrical Safety Code, the National Electrical Code (hereinafter referred to as "Code"), applicable energy codes, and the regulations of the local utility companies. Obtain and pay for any and all required permits, inspections, certificates of inspections and approval, and the like.
3. Cooperate with other trades and contractors at job. Perform work in such manner and at such times as not to delay work of other trades. Complete all work as soon as the structure and installations of equipment will permit. Patch, in a satisfactory manner and by the proper craft, any work damaged by electrical workmen.
4. The Owner shall be provided access to all software to include copies of software for all systems provided under this division of the specifications. Software shall be password protected where applicable.
5. Only qualified electrical sub-contractors will be allowed to submit proposals for this project. In order to be considered qualified, contractor shall have completed a minimum of five (5) projects of similar type/scope and equal or greater magnitude and complexity within the last ten (10) years. Sub-contractors without qualifications will be rejected. If desired, potential electrical sub-contractors may submit qualification evidence for review and pre-bid approval a minimum of ten (10) days prior to bid. Previous projects used to meet this experience requirement must have included similar (or greater) scopes of work for each of the following areas:
  - a. Power Systems.
  - b. Control Systems.
  - c. Instrumentation Systems.
6. Electrical contracting firm shall be licensed as an electrical contractor in the state where work will be performed

##### 1.2 GENERAL SCOPE OF ELECTRICAL WORK (REFER TO DRAWINGS FOR OTHER SPECIFIC SCOPE ITEMS)

- ###### A.
1. Furnish all labor and materials to complete electrical work as shown on drawings and/or herein specified.

- B. Remove all existing electrical equipment and wiring made obsolete by this project and remove or relocate all electrical services located on or crossing through the project property, either above or below grade, which would obstruct the construction of the project or conflict in any manner with the completed project or any code pertaining thereto. Dispose of salvageable materials as directed by the Engineer. Contractor shall schedule meeting to review scope of electrical demolition and to confirm scope and phasing of proposed demolition with the owner in the presence of the prime consultant prior to start of any electrical demolition.
- C. Furnish and install complete power, telephone and other electrical services as shown on drawings and/or specified herein.
- D. Pay all electrical utility company service charges (if any) in connection therewith, including permanent meter deposit. Meter deposits will be refunded to Contractor at time of Owner's acceptance.
- E. Furnish and install complete power distribution system as shown on drawings and/or specified herein.
- F. Furnish and install a complete Power Generation and Automatic Transfer Switch System as shown on drawings and/or specified herein.
- G. Furnish and install disconnect switches for motors as shown on drawings and/or specified herein.
- H. Furnish and install complete electrical grounding systems as shown on drawings and/or specified herein.
- I. Install and connect electrical equipment mentioned in Division 16 Specifications or noted in drawings, whether furnished by electrical contractor or by others.
  - 1. Where shown or specified, equipment furnished by others shall be installed and connected under this Contract.
  - 2. Where shown or specified, Contractor shall receive, unpack, check and assume custody of equipment furnished by Others. Contractor shall assume responsibility for care and safekeeping of this equipment, when delivered into his custody. He shall protect it from moisture, dust and damage during construction and until Owner acceptance of project.
- J. Furnish and install complete electrical lighting systems as shown on drawings and/or specified herein.
- K. Furnish and install all electrical items shown on drawings and/or herein specified, unless shown or specified otherwise.
- L. Furnish and install complete controls, instrumentation & auxiliary systems as shown on drawings and/or specified herein.
- M. Furnish and install a complete Surge Protection System as shown on drawings and/or specified herein.

- N. Procure and pay for permits and certificates as required by local and state ordinances and fire underwriter's certificate of inspection.
- O. Balance loads as equally as practicable on services, distribution feeders, circuits and buses. Provide typewritten directory for each panel.
- P. Unless specifically indicated or required otherwise, terminate all circuitry/cabling provided within this contract at associated equipment/devices/etc. in accordance with all applicable codes, standards and supplier requirements, whether associated equipment/device/etc. is furnished within this contract or by others.
- Q. Complete field testing, adjustment & startup of all systems listed above as shown on drawings and/or specified herein.

## **PART 2 PRODUCTS**

### **2.1 APPROVED MATERIALS AND DEVICES**

- A. Where not otherwise specified, provide only new, standard, first-grade materials/systems throughout, conforming to standards established by Underwriter's Laboratories, Inc., and so marked or labeled, together with manufacturer's brand or trademark. All equipment/systems subject to approval of Engineer before installation. All like items and associated equipment/systems shall be of one manufacturer.
- B. To ensure proper coordination, it is intended that all electrical equipment and materials specified in Division 16 of these specifications and shown on the electrical drawings be furnished and installed by the electrical sub-contractor. It will not be permissible for any of these items to be furnished directly by the general contractor without the electrical contractor's coordination.
- C. To ensure commonality of spare parts, it is required that the electrical contractor provide the same brand for all circuit breakers, starters, power equipment, etc. provided under the following divisions of these specifications:
  - 1. SECTION 16055: Power Distribution System Electrical Studies
  - 2. SECTION 16410: Safety Switches And Fuses
  - 3. SECTION 16442: Lighting Panelboards

### **2.2 SUBMITTALS**

- A. All submittals to the design team shall be accompanied by a letter summarizing all proposed deviations from specified products or pre-approved substitutions. The absence of such a letter shall be understood to indicate that the contractor intends to meet all contract requirements, regardless of cut-sheets/data-sheets provided within the submittal.
- B. Submit to Engineer ten (10) days prior to bid date three (3) copies of any items and/or manufacturers which are proposed as substitutes for those specified.
- C. Submit to Engineer promptly after award of Contract and prior to purchasing, the number of copies required by the contract. All drawings of a specific item or system shall be made in one submittal, and within thirty (30) days after award of Contract. Shop

drawings of all power equipment shall contain exact details of device placement, phasing and numbering, in form of elevations, for each major piece of equipment. Shop drawings shall be submitted on the following:

1. SECTION 16055: Power Distribution System Electrical Studies
  2. SECTION 16231: Generator Sets
  3. SECTION 16289: Surge Protective Devices
  4. SECTION 16410: Safety Switches And Fuses
  5. SECTION 16415: Automatic Transfer Switches
  6. SECTION 16442: Lighting Panelboards
  7. SECTION 16480: Manufactured Control Panels
  8. SECTION 16511: Lighting Materials And Methods
  9. SECTION 16850: ELECTRICAL HEAT TRACING SYSTEMS
  10. SECTION 16900: SCADA System
  11. ALL POWER DISTRIBUTION EQUIPMENT (i.e. SWITCHBOARDS, PANELBOARDS, DRY TYPE TRANSFORMER, ETC.)
  12. ALL ELECTRICAL AND TELECOMMUNICATION EQUIPMENT LAYOUTS - Submittals shall include ¼" = 1'-0" CAD drawings (hand drawn sketches will not be accepted) of each electrical room, IT room, electrical equipment stand, generator area, or any other similar area with electrical equipment. Drawings shall indicate all panelboards, transformers, switchboards, generators, equipment racks, control panels, HVAC equipment, etc. that are located in each electrical/IT area. Layouts shall show that each piece of electrical equipment has the clearances, working space and dedicated equipment space required by applicable codes. No conduits to equipment within these areas shall be installed until submittals have been provided and returned without exception by the design team.
  13. ALL CONTROL ITEMS & SYSTEMS
- D. The contractor shall fully review, comment upon and correct all shop drawings as required to assure compliance with contract documents prior to submittal to Engineer. The failure of the contractor to properly review and correct shop drawings prior to submittal will result in rejection of shop drawings by the engineer. Review by the Engineer will be for general conformance with contract documents. The contractor shall be fully responsible for correctness of all submitted dimensions, details, quantities and locations.
- E. None of the above items shall be installed until shop drawings or catalog data have been reviewed by Engineer without rejection or required resubmittal. Any listed item not submitted, even if specified, shall be considered not acceptable and shall be removed if directed.
- F. Any required resubmittal will be reviewed by the Engineer for conformance with previously issued comments only. The contractor shall be responsible for verifying that all items not specifically requiring resubmittal have not been altered from the previously reviewed submittal.
- G. Material proposed for substitution shall be of the same quality, perform the same functions, conform to such physical dimensions and appearance as are required by the Engineer. All material proposed for substitution is subject to the approval of the Engineer and his authority for approval is final. No material proposed for substitution will be

considered unless all submittal data complies with the drawings and specifications of Section 16 as to time of submission, number of copies of submittal, and detail requirements.

- H. Samples of material shall be furnished where required by drawings or Division 16 Specification, or as requested by the Engineer on items proposed as substitutes.
- I. Submit to Engineer a certificate of final inspection from local inspection department.

### **PART 3 EXECUTION**

#### **3.1 SITE VISIT**

- A. The Contractor shall visit the site to determine existing dimensions and conditions affecting electrical work. Failure to do so in no way relieves Contractor of his responsibility under Contract.

#### **3.2 CLEARANCE WITH UTILITIES**

- A. It shall be the responsibility of this Contractor, prior to bid, to reaffirm with the utility companies involved, that the locations, arrangement (and with power company voltage, phase, and metering required) and connections to utility service are in accordance with their regulations and requirements. If their requirements are at variance with these drawings and specifications, the Contract price shall include any additional cost necessary to meet those requirements without extra cost to Owner after a contract is entered into.
- B. On many projects the utility company may levy charges due to locations, size or type service involved. The Contractor shall be responsible for these charges (including permanent meter deposit), unless such charges are not available prior to bid and Contractor so documents as described below. The meter deposit will be refunded to the contractor at time of Owner's acceptance.
- C. Should above cost not be available, prior to bid, Contractor must submit a letter signed by a responsible utility company person so stating with his bid and in turn must be submitted by Prime Contractor with his bid to Owner. The cost will then be deleted from the Contract and become responsibility of the Owner.
- D. Arrange with utility companies for such services as shown or herein specified and installation of meter where shown. Furnish with shop drawings a signed document from utility companies describing the location and type of services to be furnished and any requirements they may have. This document shall be signed for each utility company by a person responsible for granting such service.

#### **3.3 WORKMANSHIP**

- A. All work shall be in accordance with the latest editions of NFPA 70 (National Electrical Code), NFPA 101 (Life Safety Code), National Electric Safety Code, International Building Code, applicable NECA standards and the rules and regulations of State and Local Authorities Having Jurisdiction.



- B. All work shall be executed in a workmanlike manner and shall present a neat and mechanical appearance upon completion.
- C. All equipment, devices, etc. shall be installed in accordance with manufacturer's recommendations.
- D. All items shall be installed straight and plumb in a workmanlike manner and care shall be exercised so that like items are mounted the same position, heights and general location.
- E. Keep site clean of accumulation of cartons, trash and debris.

#### 3.4 SAFETY

- A. The contractor is solely responsible for all job safety. Engineer assumes no responsibility for job safety. Maximum consideration shall be given to job safety and only such methods as will reasonably insure the safety of all persons shall be employed. The codes and regulations of OSHA shall be given strict compliance as well as such other codes, laws, and regulations as may be applicable.

#### 3.5 CONTRACT DOCUMENTS

- A. Contract documents indicate diagrammatically, extent, general character and approximate location of work. Where work is indicated but minor details omitted, furnish and install it complete so as to perform its intended functions. For details and mechanical equipment, follow drawings provided by other disciplines (Architectural, Mechanical, Structural, Civil, etc.) and fit electrical work thereto.
- B. Contract documents consist only of the hardcopy documents issued by the Prime Engineer. Electronic documents issued directly by the electrical engineer to the contractor and/or its sub-contractors/vendors are issued for convenience only (electronic documents are not formal contract documents).
- C. If the contractor and/or one of its suppliers require a one-time transfer of electronic files of the current electrical construction documents to prepare shop drawings (or for another similar purpose), it shall:
  - 1. Sign a waiver prepared by the electrical engineer prior to the transmittal of these files.
  - 2. Agree to pay the electrical engineer a fee of \$50.00 per drawing, up to a maximum of \$400 per transfer, payable upon receipt of the files.
  - 3. To the fullest extent permitted by law, indemnify, hold harmless, and defend JRA from all claims, damages, losses and expenses, including attorneys' fees arising out of or resulting from the use of the CAD files.
- D. Take finish dimensions at job in preference to scaled dimensions.
- E. Except as above noted, make no changes in or deviations from work as shown or specified except on written order of Engineer.

#### 3.6 UNDERGROUND UTILITY/EQUIPMENT COORDINATION

- A. Prior to commencement of work, verify exact locations of all existing or proposed underground utilities and/or underground equipment and verify that proposed electrical installation does not conflict with these items. Notify Engineer immediately if any conflict is found.

### 3.7 EQUIPMENT STORAGE

- A. Store all electrical equipment in dry, covered locations as directed by equipment manufacturers. Contractor shall be responsible for replacing or repairing improperly-stored equipment as directed by Engineer.

### 3.8 EXCAVATION, CUTTING AND PATCHING

- A. Perform all cutting and excavating as necessary for installation of electrical systems, unless specifically covered under another section. After Engineer's observation, complete all excavation, filling and backfilling as directed under specifications for preparation of site and earthwork. Foundations for equipment shall be as specified under concrete section. Concrete pads shall be minimum of 6" thick; unless greater thickness required by equipment manufacturer. Obtain specific approval of Engineer before cutting into any structural members.
- B. For all such work employ competent workmen, and finish up in neat and workmanlike manner, equal to quality and appearance to adjacent work.

### 3.9 PENETRATIONS

- A. All penetrations in water tight barriers shall be made so that barrier rating is not compromised. Furnish roof flashing for all equipment installed under Division 16 that penetrates through the roof. Appropriate flashing is specified under roofing and sheet metal section. Supply these flashings for installation under roofing and sheet metal section.
- B. All fire/smoke barrier penetrations shall be made in accordance with a U.L. listed assembly to maintain the fire/smoke rating of the associated membrane.
- C. Where penetrations are required through structural elements, verify penetration locations and sizes with structural engineer. In no case shall the structural integrity be compromised without written approval from structural engineer.

### 3.10 INSTALLATION OF EQUIPMENT - GENERAL

- A. Care shall be exercised in exact routing and location of all items so as not to obstruct access to equipment, personnel walkways, or expose it to potential mechanical damage.
- B. Items shall be securely anchored and/or fastened. Provide proper support for all equipment, devices, conduits, boxes, panels, etc. as required by code and for a workmanlike installation. Provide guy wiring for wood poles where required to prevent leaning. All construction shall meet the seismic design requirements of the building code. Items (especially transformers, light fixtures, equipment racks, freestanding gear, etc.) installed in seismic zones C, D, E or F shall be supported and braced per applicable codes and standards.

- C. All wall, pole or frame-mounted electrical equipment shall be mounted to metal unistrut (or similar) frames of same material as electrical equipment. For example, pole-mounted stainless steel disconnect switches shall be mounted to stainless steel unistrut frames.
- D. All electrical equipment, furnished by Contractor or by others shall be covered and protected during construction.
- E. All control cabinets, panels, motor control centers and other electrical cabinets and enclosures shall have all trash removed and be vacuumed clean. All foreign paint, etc., shall be removed from exterior and all scratches in finish touched up with same color and material as original. Any rusted areas shall be sanded, primed and repainted.
- F. All relays, starters, push-button and other control devices shall be cleaned and if necessary, lubricated with CRC 2-26 to assure free operation.

### 3.11 MOTORS, STARTERS AND CONTROLS

- A. Unless otherwise specified or shown, all motors will be furnished and installed under other sections of this specification.
- B. Electrical Contractor shall install all starters and all electrical power wiring and connections to motors and starters.
- C. Unless otherwise specified or shown, all control items for motors shall be furnished, installed and wired in conduit by the electrician.

### 3.12 CIRCUITS AND BRANCH CIRCUITS

- A. Outlets shall be connected to branch circuits as indicated on drawings by circuit numbers. No more outlets than are indicated shall be connected to a circuit.
- B. Branch circuit homeruns shall be installed as shown on drawings. Multiple homerun conduits shall not be combined by contractor into larger, single homerun conduits unless specific permission is granted by the Engineer.

### 3.13 LUG/TERMINAL RATINGS

- A. All lug/terminal ratings, sizes, locations, types, etc. shall be coordinated with the associated conductor sizes, types, routings, etc. by the contractor.
- B. All lugs/terminals/etc. shall be rated for 75 degree C terminations (minimum, unless specified otherwise).

### 3.14 EQUIPMENT FAULT CURRENT RATINGS

- A. All equipment and breakers shall meet the minimum RMS symmetrical interrupting capacity ratings shown on plans for the associated distribution equipment. All interrupting ratings shall be full ratings. Where new devices or breakers are added to existing distribution equipment, the new devices/breakers shall have interrupting ratings matching or exceeding that of the existing distribution equipment.

### 3.15 OUTLET LOCATION

- A. Symbols shown on drawings and mounting heights indicated on drawings and in specifications are approximate only. The exact locations and mounting height must be determined on the job and it shall be the Contractor's responsibility to coordinate with other trades to insure correct installation.

### 3.16 IDENTIFICATION

- A. Each panel shall have each circuit identified. Panels without branch circuit nameplates shall have typewritten directories.
- B. Each individually mounted switch, circuit breaker, starter and/or any other control or protective device shall identify equipment fed and fuse size, if any, by engraved plastic nameplate, white with black letters, screw attached.
- C. See Specification Section 16075 for additional requirements.

### 3.17 GROUNDING

- A. All equipment shall be grounded and bonded in accordance with all state/local regulations, The National Electrical Code and as specified herein.

### 3.18 PAINTING

- A. Refer to Painting/Finishing specifications for requirements regarding field painting of exposed conduit. Any scratches, dents or rust spots in conduit electrical enclosures, panels, motor control or any other electrical items shall have the dents removed, and they, along with any rust spots or scratches, sanded and touched up with the same exact color paint as original finish.

### 3.19 ACCEPTANCE TESTING

- A. Upon completion of work, the entire electrical system installed within this project shall be tested and shall be shown to be in perfect working condition, in accordance with the intent of the specifications and drawings. It shall be the responsibility of the Electrical Contractor to have all systems ready for operation and to have an electrician available to operate same in accordance with and under the supervision of the observation representative(s) of the Engineer. The Electrician shall be available to assist in removal of panel fronts, etc., to permit inspection as required.
- B. The electrical sub-contractor shall include in bid price start-up assistance and training from a certified representative of the manufacturer for the following systems:
  1. SECTION 16231: Generator Sets
  2. SECTION 16415: Automatic Transfer Switches
  3. SECTION 16850: ELECTRICAL HEAT TRACING SYSTEMS
  4. SECTION 16900: SCADA System

### 3.20 OPERATION AND MAINTENANCE DATA

- A. One set of marked "AS BUILT" drawings, three (3) sets of all equipment catalog and maintenance data and three (3) sets of all final shop drawings, on all equipment requiring same shall be turned over to owner. These items shall be bound in hard back book. Contractor shall explain and demonstrate all systems to Owner's representative.

### 3.21 GUARANTY-WARRANTY

- A. Furnish a written Guarantee-Warranty, countersigned and guaranteed by General Contractor, stating:
1. That all work executed under this section will be free from defects of workmanship and materials for a period of one (1) year from date of final acceptance of this work.
  2. Above parties further agree that they will, at their own expense, repair and replace all such defective work, and all other work damaged thereby, which becomes defective during the term of the Guaranty-Warranty.

END OF SECTION 16050

## SECTION 16055

### POWER DISTRIBUTION SYSTEM ELECTRICAL STUDIES

#### PART 1 GENERAL

##### 1.1 SCOPE OF WORK

- A. THE WORK UNDER THIS SECTION INCLUDES BUT IS NOT LIMITED TO THE FOLLOWING:
  - 1. Power Distribution System Electrical Studies.

#### PART 2 PRODUCTS

##### 2.1 GENERAL REQUIREMENTS

- A. Short Circuit Studies, Protective Devices Evaluation Studies, Protective Device Coordination Studies and Arc Flash Hazard Studies shall be performed by the same entity, which shall be a Professional Engineer registered in the state where the equipment will be installed. The studies shall be per the requirements set forth in the latest edition of NFPA 70E-Standard for Electrical Safety in the Workplace. The arc flash hazard analysis shall be performed according to the IEEE 1584 equations that are presented in NFPA70E, Annex D.
- B. The studies shall be submitted to the Engineer prior to shipment of any electrical distribution equipment.
- C. The studies shall include all portions of all electrical systems affected by the project (including any existing systems/equipment) from the utility service to any existing equipment at the facility (including all existing equipment fed from the same service point as any new equipment) and to all new equipment installed under this contract. All induction motors 50 HP or below and fed from the same bus may be grouped together. All induction motors greater than 50 HP shall be included individually with associated starters and feeder impedance. See individual study sections below for additional scope requirements.
- D. The studies shall be performed using the latest revision of the SKM Systems Analysis Power\*Tools for Windows (PTW) or EasyPower software program.
- E. Normal system connections and those which result in maximum fault conditions shall be adequately covered in the study.
- F. The contractor shall be responsible for collecting data on any existing or proposed electrical equipment, devices, conductors, etc. as required to prepare the study, and shall supply pertinent electrical system conductor, circuit breaker, generator, and other component and system information in a timely manner to allow the studies to be completed prior to shipment of equipment.

- G. The Power Distribution System Electrical Studies shall be performed by Square 'D' or Cutler Hammer; or a third-party vendor if specifically approved by the engineer prior to preparation of the studies.
- H. The proposed vendor shall have completed a minimum of five (5) equivalent Arc-Flash Hazard Studies in the past three (3) years.

## 2.2 SHORT CIRCUIT STUDY

- A. The Short Circuit Study shall be performed with aid of a computer program. The study input data shall include the power company's short circuit contribution, resistance and reactive components of the branch impedances, X/R ratios, base quantities selected, and other source impedances.
- B. Short circuit momentary duty values and interrupting duty shall be calculated on each individual basis with the assumption that there is a three-phase bolted short circuit at the respective switchgear bus, switchboard, low voltage motor control center, distribution panelboard, and other significant locations throughout the system.
- C. The short circuit tabulation shall include symmetrical and asymmetrical fault currents, and X/R ratios. For each fault location, the total duty on the bus, as well as the individual contributions from each connected branch, including motor back EMF current contributions shall be listed with its respective X/R ratio.

## 2.3 PROTECTIVE DEVICE EVALUATION STUDY

- A. The Protective Device Evaluation Study shall be performed to determine the adequacy of circuit breakers, switches, transfer switches, and fuses by tabulating and comparing the short circuit rating of these devices with the calculated fault currents. Appropriate multiplying factors based on system X/R ratios and protective device rating standards shall be applied.
- B. Any problem areas or inadequacies in the equipment due to short circuit currents shall be promptly brought to the Engineer's attention.

## 2.4 PROTECTIVE DEVICE COORDINATION STUDY

- A. The Protective Device Coordination Study shall be performed to provide the necessary calculation and logic decisions required to select or to check the selection of power fuse ratings, protective relay characteristics and settings, ratios and characteristics of associated current transformers, and low voltage breaker trip characteristics and settings. The objective of the study is to obtain optimum protective and coordination performance from these devices.
- B. The coordination study shall show the best coordination attainable for all breakers down through the largest breaker at each piece of distribution equipment. Coordination study shall demonstrate selective coordination where required by applicable codes or contract documents.
- C. Phase and ground overcurrent protection shall be included as well as settings of all other adjustable protective devices. Where ground fault protection is used, coordination of the

ground fault protection with the first downstream overcurrent phase protection device shall be demonstrated.

- D. All restrictions of the National Electrical Code shall be adhered to and proper coordination intervals and separation of characteristic curves be maintained.

## 2.5 ARC-FLASH HAZARD STUDY

- A. The Arc-Flash Hazard Study shall be performed with the aid of computer software intended for this purpose in order to calculate Arc-Flash Incident Energy (AFIE) levels and flash protection boundary distances.
- B. The Arc-Flash Hazard Study shall be performed in conjunction with a short-circuit Study and a time-current coordination Study.
- C. The Arc-Flash Hazard Study shall be performed for the following equipment:
  - 1. All Distribution Equipment – This includes but is not limited to the following:
    - a. Switchgear
    - b. Switchboards
    - c. Motor Control Center
    - d. All Lighting and Power Panelboards
    - e. Fused Disconnect Switches rated greater than 100A
  - 2. Separately enclosed devices fed from protection device rated greater than 100A - This includes but is not limited to the following:
    - a. Control Panels
    - b. VFD's
    - c. RVSS
- D. A generic Arc-Flash label shall be applied to other electrical equipment that has not been included in the study. This includes but is not limited to the following equipment:
  - 1. Non-fused Disconnect Switches
  - 2. Fused Disconnect Switches rated 100A or less
  - 3. Transformers
  - 4. Control Panels, VFD's, RVSS, etc. rated 100A or less
- E. Where a main protective device is provided, the study shall be performed on the line side and load side of the main. The worst-case result shall be used for the study result and label.
- F. The Study shall be performed under worst-case Arc-Flash conditions, and the final report shall describe, when applicable, how these conditions differ from worst-case bolted fault conditions.
- G. Where incident energies are calculated to fall within the high marginal region of a given Hazard/Risk Category Level, the Hazard/Risk Category Level shall be increased one level.
- H. The Arc-Flash Hazard Study shall be performed in compliance with the latest IEEE Standard 1584, the IEEE Guide for Performing Arc-Flash Calculations. Where IEEE 1584 does not have a method for performing the required arc-flash calculations (such as for single phase equipment), calculations shall be performed and system shall be modeled



using modules/methods as recommended by the arc flash software supplier (for example, using SKM Unbalanced/Single Phase Studies module for modeling single phase systems).

- I. Equipment labels to identify AFIE and appropriate Hazard/Risk Category in compliance with NFPA 70E and ANSI Z535.4 (latest version of these requirements) shall be provided to the Electrical Contractor. The Electrical Contractor shall affix the labels to the distribution equipment devices as directed by the equipment manufacturer. These labels shall, at a minimum, include the following:
  1. WARNING label.
  2. Hazard/Risk Category.
  3. Arc Flash Boundary Distance.
  4. Incident Energy (in cal/cm<sup>2</sup>) at Working Distance.
  5. Shock Hazard Voltage.
  6. Limited Approach Boundary Distance.
  7. Restricted Approach Boundary Distance.
  8. Prohibited Approach Boundary Distance.
  9. Equipment Name.
  10. Name of Firm who prepared the Study.
  11. Project Number of the Firm who prepared the Study.
  12. Date that the Study was prepared.
  13. Method for calculating analysis data.
  14. Statement to read: “Any system modification, adjustment of protective device settings, or failure to properly maintain equipment will invalidate this label” (or equivalent).

## **PART 3 EXECUTION**

### **3.1 SUBMITTAL REQUIREMENTS**

- A. The results of the studies shall be summarized in a final report. The report shall include the following sections:
  1. General:
    - a. Description, purpose, basis and scope of the studies
    - b. Single line diagram of the portion of the power system which is included within the scope of the work. The single line diagram shall fit on one sheet of paper (size as required) unless approved otherwise by engineer. The following information shall be shown on the single line diagram:
      - 1) Device Name
      - 2) Branch Fault Currents with directional indicators
      - 3) General Location (for busses only)
      - 4) Other basic component information such as cable type, cable length, breaker rating, buss short circuit rating, transformer voltages, transformer size, fuse size, etc..
  2. Short Circuit Study:
    - a. Tabulation of circuit breaker, fuse and other protective device ratings versus calculated short circuit duties, and commentary regarding same.
  3. Protective Device Evaluation/Coordination Study:

- a. Protective devices time versus current coordination curves, tabulations of relay and circuit breaker trip settings, fuse selection, and commentary regarding same.
  - b. Fault current calculations including definitions of terms and a guide for interpretation of computer printout.
  - c. Documentation from utility company on their letterhead showing their anticipated values of available short circuit currents X/R ratios and protective devices with which the power distribution system will coordinate.
  - d. Time-current characteristics of the respective protective devices shall be plotted on log-log paper. Plots shall be printed in color with a dedicated color and pattern for each curve for clear identification.
  - e. Plots shall include complete titles, respective single line diagrams and legends, and associated power company's relay or fuse characteristics, significant motor starting characteristics, complete parameters of transformers, complete operating bands of low voltage circuit breakers trip curves and fuses.
  - f. The coordination plots shall indicate the type of protective devices selected, proposed relay taps, time dial and instantaneous trip settings, transformer magnetizing inrush and ANSI transformer withstand parameters, cable thermal overcurrent withstand limits and significant symmetrical and asymmetrical fault currents.
  - g. The coordination plots for phase and ground protective devices shall be provided on a system basis.
  - h. A sufficient number of separate curves shall be used to clearly indicate the coordination achieved.
4. Arc-Flash Hazard Study:
- a. Tabulation of device or bus name, bolted fault and arcing fault current levels, flash protection boundary distances, personal-protective equipment classes and AFIE levels.
  - b. Recommendations for reducing AFIE levels and enhancing worker safety.
- B. Furnish all labor, materials, calculations, electrical equipment, technical data and incidentals required to provide a complete short circuit study, coordination study and arc flash hazard study of protective devices, busses, etc. from the utility service to any existing equipment at the facility and all new equipment installed under this contract.
- C. The study shall comply with the following applicable provisions and recommendations of the latest revisions of the following: ANSI C37.5, IEEE Standard No. 399, and IEEE Standard No. 141.
- D. Submit calculations and results of the short circuit, protective device evaluation and coordination and arc flash hazard studies prior to submitting shop drawings for new equipment. Contractor shall verify that all proposed equipment is properly rated per the short circuit and protective device evaluation portions of the study prior to releasing equipment for manufacturing.
- E. Submit a copy of a sample typical arc flash label layout (meeting requirements outlined above) that will be used for the project.

- F. Submit final electronic copies of all SKM program files/models/input data/etc. used to perform the study to the owner with final close-out documents. These files shall be complete as required to allow future users to recreate the study.

### 3.2 INSTALLATION

- A. Contractor shall adjust all breaker settings as recommended by the coordination study prior to energizing equipment.
- B. Contractor shall affix arc flash hazard notification labels (as determined by the results of this study) to each piece of distribution equipment prior to energization of equipment. A generic arc-flash warning label shall be affixed to any electrical equipment not included in the analysis as outlined above.
- C. Where short circuit rating of equipment is dependent on setting of upstream overcurrent device, provide and install label for equipment indicating the required settings of the associated device.

END OF SECTION 16055

## SECTION 16060

### GROUNDING

#### PART 1 GENERAL

##### 1.1 GENERAL

- A. THE WORK UNDER THIS SECTION INCLUDES BUT IS NOT LIMITED TO GROUNDING OF THE FOLLOWING:
1. Service Equipment.
  2. Transformers.
  3. Non-current carrying conductive surfaces of equipment.
  4. Metal Buildings.
  5. Structures.
  6. Other Equipment.

##### 1.2 GENERAL REQUIREMENTS

- A. All equipment, building steel, and main service shall be effectively and permanently grounded with a conductor cross section as required by the National Electrical Code and of capacity sufficient to insure continued effectiveness of the ground connections for fault current. Ground conductors shall be as short and straight as possible, protected from mechanical injury and, if practicable, without splice or joint.
- B. All grounding connections shall be installed in accordance with the National Electrical Code and all local codes and requirements. Such codes shall be considered minimum requirements and the installation of the grounding system shall insure freedom from dangerous shock voltage exposure and provide a low impedance ground fault path to permit proper operation of overcurrent and ground fault protective devices.

#### PART 2 PRODUCTS

##### 2.1 CONDUCTORS

- A. All grounding conductors shall be insulated with green colored, 600 volt insulation unless noted otherwise.
- B. Motors having power supplied by single conductor wire in conduit shall be grounded through the conduit system. Flexible conduit shall be "jumpered" by an appropriate bonding conductor.
- C. Supplemental grounding system conductors shall be bare, softdrawn, stranded, single conductor copper wire, and generally sized as follows (unless shown otherwise on plans):
1. Switchgear, motor control centers, and power transformer #4/0 minimum or as shown on plans.
  2. Power panels, #2/0.
  3. Control panels and consoles, #4.
  4. Process Motors, #1/0.
  5. Building Columns, #4/0.

6. Light Poles, #2.
7. Telephone Backboard & Cabinet ground busses, #2.

## 2.2 GROUNDING ELECTRODES

- A. Grounding electrodes shall be copper-clad steel rods 3/4 inch in diameter and ten feet long. Where longer electrodes are necessary to reduce the ground resistance, Contractor shall provide sectional rods, connectors, drive heads, etc.

## 2.3 CONNECTIONS

- A. All conductor-to-conductor, conductor-to-ground rod, conductor-to-structure, conductor-to-fence connections of #6 and larger sized conductors and underground ground connections shall be permanent exothermic welded connections (Cadweld or equal) unless otherwise noted on applicable drawings.
- B. Connections to equipment shall be by bolted compression type lugs (except for motors). When the conductor is #6 and larger, the lug shall be joined to the conductor by an exothermic weld (Cadweld or equal).
- C. Motors to be grounded by the grounding conductors run with the power conductors shall have a split-post grounding stud installed in the connection box.
- D. Each cast pull box or junction box shall have a ground lug, connected to largest ground conductor to enter box.
- E. Ground connections at conduit terminations shall be made by approved grounding bushings (see Raceways Specification Section for additional requirements).

## 2.4 MANUFACTURERS

- A. Conduit clamps and connectors shall be manufactured by Raco, OZ., or Ercon.
- B. Lugs shall be as manufactured by Square "D", Burndy, or T and B.
- C. Exothermic weld connections shall be as manufactured by Cadweld, or approved equal.
- D. Ground rods shall be as manufactured by Joslyn or McGraw Edison.
- E. Split post grounding shall be as manufactured by Burndy or T and B.

# PART 3 EXECUTION

## 3.1 MAIN SERVICE GROUND

- A. The main service grounding electrode system shall consist of the following items bonded together by the grounding electrode conductor:
  1. The main underground cold water pipe (metal).
  2. The metal frame of the building.
  3. Driven ground rods. Ground rods shall be embedded at the lowest point in the building and below the permanent moisture level. Ground rods shall be spaced a

minimum of ten (10) feet apart and connected in parallel until resistance to ground does not exceed five (5) ohms.

- B. The grounding electrode system shall be connected to the grounded conductor (neutral) on the supply side of the service disconnecting means by a grounding electrode conductor not smaller than that shown in Table 250.66 of the N.E.C. The main service equipment grounding conductor shall be connected to the grounding conductor on the supply side of the service disconnecting means in accordance with Table 250.122 of the N.E.C. for the ampere rating of the service entrance equipment. Where in a service entrance switchboard, the equipment grounding conductor shall not be less than 25% of the main bus rating. These connections shall be made inside the service entrance equipment enclosure.

### 3.2 TRANSFORMER GROUNDS

- A. Dry type insulation transformers with a grounded conductor in the secondary shall be grounded in accordance with N.E.C. Section 250-30.

### 3.3 EXPOSED NON-CURRENT-CARRYING METAL PARTS

- A. General: Ground connections to equipment or devices shall be made as close to the current carrying parts as possible, that is, to the main frame rather than supporting structures, bases or shields. Grounding connections shall be made only to dry surfaces that are clean and dry. Steel surfaces shall be ground or filed to remove all scales, rust, grease, and dirt. Copper and galvanized steel shall be cleaned to remove oxide before making welds or connections. Code size ground conductors shall be run in all power conduits and properly terminated at each end.
- B. Ground conductors shall be routed as straight as possible. Where possible, ground conductors shall be routed such as to avoid bends exceeding 90 degrees or with a radius of less than 8".
- C. Motors: Exposed non-current-carrying metal parts, shall be grounded by a grounding conductor either run with power conductors, and/or separate grounding conductors. Drawings will show method(s) to be used. The ground conductors with all motor conductors shall be connected to the ground buss in the motor connection box. Jumper connections shall be installed between frames and rigid conduit for equipment having flexible conduit connections (sealtight). All AC motor grounds shall provide a low impedance path to ground. Connections from the supplemental grounding system (when specified) shall be made directly to the motor frame. Additionally, utilization equipment connected to the motor (pump, fan, mixer, etc.) shall be bonded to the motor with flexible braid-type bonding strap to ensure equalization of ground potentials.
- D. Raceways & boxes: All raceways, conduits, armored or shielded cable and all exposed non-current carrying metal parts shall be grounded. Such items shall be bonded together and permanently grounded to the equipment ground buss. Metallic conduits shall be connected by grounding or clamps to ground buss. Flexible "jumpers" shall be provided around all raceway expansion joints. Bonding straps for steel conduit shall be copper. Jumper connections shall be provided to effectively ground all sections of rigid conduit connected into plastic pipe. No metallic conduit shall be left ungrounded. In conduit systems interrupted by junction or switch boxes where locknuts and bushings are used to

secure the conduit in the box, the sections of conduit and box must be bonded together. If conduit, couplings or fittings have a protective coating or non-conductive material, such as enamel, such coating must be thoroughly removed from threads of both couplings and conduit and the surface of conduit or fitting where the ground clamp is secured.

- E. Enclosures: Metal conduits entering free standing motor control centers, switchboards or other free standing equipment shall be grounded by bare conductors and approved clamp. Any conduits entering low voltage (480 volts or below) equipment through sheet metal enclosure and effectively grounded to enclosure by double locknut or hub need not be otherwise bonded.
- F. Equipment: In addition to equipment grounding provisions mandated by code requirements, additional equipment grounding provisions (including local ground rods, connections, etc.) shall be provided by the contractor as directed by equipment suppliers.
- G. Both ends of ground busses in motor control centers, switchboards, etc., shall be separately connected to the main ground buss to form two separate paths to ground.
- H. Fences and Grills: Fences and metal grills around equipment carrying voltage above 500 volts between phases shall be bonded together and to ground. Fences and grill work shall be grounded at every post, column, or support, and on each side of every gate.

#### 3.4 ACCEPTANCE DOCUMENTATION AND TESTING

- A. Contractor shall take and store photographs of all underground grounding system connections prior to burial of connections, for review by Engineer.
- B. Upon completion of work, the entire ground system shall be shown to be in perfect working condition, in accordance with the intent of the Specifications.
- C. Contractor shall measure the resistance between the main ground bonding jumper to true earth ground using the Fall of Potential method as described by ANSI/IEEE Standard 81 (“Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of an Earth System”). If the measured value is greater than five ohms, additional grounding electrodes shall be installed as described in Part 3.1 above. The final ground resistance value shall be submitted in writing, and documented via picture of the meter reading from the Fall of Potential test, to the Engineer prior to the final observation, and shall be included in final O&M documentation.

END OF SECTION 16060

## SECTION 16075

### ELECTRICAL IDENTIFICATION

#### PART 1 GENERAL

##### 1.1 DESCRIPTION

- A. Wire and cable identification.
- B. Pullbox & Junction Box Identification
- C. Electrical distribution & utilization equipment identification.
- D. Emergency and Standby Power receptacle identification.
- E. Instrument and control device identification.
- F. Raceway identification.

#### PART 2 PRODUCTS

##### 2.1 WIRE AND CABLE IDENTIFICATION

- A. Intermediate Locations:
  - 1. Wires and cable labels shall be white, thermal transfer, halogen-free, flame-retardant marker plates (sized to accommodate three lines of text) permanently affixed to the associated cable with UV-resistant plastic wire ties. Labels shall be Panduit #M200X/300X series or equal.
- B. Circuit/Cable Termination Locations:
  - 1. Wires and cable labels shall be non-ferrous identifying tags or pressure sensitive labels unless noted otherwise.

##### 2.2 ELECTRICAL DISTRIBUTION & UTILIZATION EQUIPMENT IDENTIFICATION

- A. Labels on electrical distribution & utilization equipment shall be black-on-white engraved Bakelite nameplates permanently affixed to the equipment with rivets or silicone adhesive unless noted otherwise.

##### 2.3 INSTRUMENT AND CONTROL DEVICE IDENTIFICATION

- A. Instruments and control device labels shall be black-on-white engraved Bakelite nameplates permanently affixed to the equipment or the adjacent, visible mounting surface with silicone adhesive or stainless steel wire ties.

##### 2.4 RACEWAY IDENTIFICATION

- A. Raceway labels shall be white thermal transfer marker plates permanently affixed to the associated raceway with stainless steel wire ties, with two wire ties (one on either end of



marker plate to provide a flush installation) where possible. Labels shall be Panduit #M300X series or equal.

## **PART 3 EXECUTION**

### **3.1 GENERAL**

- A. Any proposed deviation in identification methods and materials from those described herein shall be submitted to Engineer for review and comment prior to installation.
- B. Contractor shall provide all labeling or identification required by applicable local, state and national codes. These specifications do not intend to itemize all code-required labeling or identification requirements.
- C. All labels/identification shall be positioned such as to be readable from the normal perspective without adjusting wiring/cables/labels. For example, labels/identification of wires/cables within cable trays shall be positioned to point towards the viewer (typically downward for overhead cable trays, or upward for cable trays within trenches).
- D. All labels/identification (except for handwritten labels on concealed pullbox/junction box covers as noted below) shall be typewritten/printed/engraved in a neat, workmanlike, permanent, legible, consistent and meaningful manner. Labels shall not be handwritten unless specific approval is granted by engineer.

### **3.2 WIRE AND CABLE IDENTIFICATION**

- A. General:
  - 1. Where cabling is exposed (such as within cable trays), provide two wire ties per cable (one on either end of marker plate to provide a flush installation). Where cabling is concealed (such as within pullboxes/wireways), one wire tie per cable will be acceptable.
- B. Intermediate Locations:
  - 1. Thermal transfer labels shall be securely fastened to all wiring and cabling in the following locations:
    - a. Wireways
    - b. Pullboxes/Junction boxes larger than 4-11/16"
    - c. Pullboxes/Junction boxes through 4-11/16" where wires and cables are not easily identifiable via the color coding and box labeling
    - d. Vaults & Manholes
    - e. Approximately every 50 feet within cable trays (especially at locations where cables exit or diverge). Labels within cable trays shall be grouped (rather than being pre-labeled on cables and pulled into cable trays).
    - f. Other similar intermediate locations.
  - 2. Labels shall be stamped or printed with the following data so that the feeder or cable can be readily identified and traced:
    - a. From where the circuit originates (including panel designation and circuit number):
      - 1) Ex: "FROM: PP-A CIR. 3 (IN MAIN ELEC ROOM)"
    - b. To where the circuit extends (using the common name of the equipment):

- 1) Ex: "TO: RTU-6 (ON ROOF)"
  - c. The purpose of the circuit:
    - 1) Ex: "POWER"
  - d. The set number (If parallel power feeds are used).
    - 1) Ex: "SET NO. 3 OF 4"
- C. Circuit/Cable Termination Locations:
  - 1. Where multiple termination points exist within a circuit origination point (panelboard, switchboard, MCC, starter, etc.) or other similar circuit endpoint (control panel, etc.), labels shall be securely fastened to all ungrounded and neutral conductors to clearly identify the terminal and/or circuit number associated with each conductor. For example, within lighting panels, each phase and neutral conductor shall be labeled near the terminals at a clearly visible location with the associated circuit number(s), so that if all conductors were unterminated, the labels would clearly indicate which conductor was associated with each circuit.
- D. Refer to Specification Section 16120 for all color-coding requirements of wires and cables.

### 3.3 PULLBOX & JUNCTION BOX IDENTIFICATION

- A. Concealed pullboxes/junction boxes:
  - 1. Front surface of all pullbox/junction box covers in concealed areas (such as above lay-in ceilings) or within mechanical/electrical rooms (and other similar areas where appearance of boxes is not an issue) shall be neatly marked with the ID of circuits/cables contained with permanent black marker on cover of box (Ex: "RP-1A Cir. 1, 2 & 3"). Additionally, front surface of box shall be painted red where box contains fire alarm system cabling.
- B. Exposed pullboxes/junction boxes:
  - 1. Interior surface of all pullbox/junction box covers in exposed areas shall be labeled "Power", "Telecommunications", "Fire Alarm" or with other similar general text neatly with permanent black marker to indicate function of box. Circuit/cable labeling within box (see above) shall identify specific cables contained. Additionally, interior surface of cover shall be painted red where box contains fire alarm system cabling.
- C. Where pullboxes/junction boxes are named on contract documents (Ex: "PULLBOX #3"), an engraved nameplate shall be installed on the front surface of the box to identify the name.

### 3.4 ELECTRICAL DISTRIBUTION & UTILIZATION EQUIPMENT IDENTIFICATION

- A. General:
  - 1. All new and existing equipment modified by this project shall include arc-flash warning labels in accordance with NEC article 110.16.
- B. All Panels, Motor Control Centers, Switchboards, Switchgear, Transformers, Etc.:
  - 1. Engraved nameplates identifying name of equipment, nominal voltage and phase of the equipment and where the equipment is fed from shall be installed on front

surface of all panels, motor control centers, switchboards, switchgear, transformers, etc.:

- a. Ex: First Line: "NAME: RP-A", Second Line: "120/208V-3Ø-4W", Third Line: "FED FROM: PP-A CIR. 4 (IN MAIN ELEC ROOM)"
2. Refer to Panelboard Specification Sections for additional labeling requirements (circuit directory cards, permanent circuit labels, permanent circuit numbers, etc.) required inside panelboards.

C. Safety/Disconnect Switches and Utilization Equipment (HVAC Equipment, Pumps, Powered Valves, Control Panels, Starters, Etc.)::

1. Engraved nameplates identifying equipment being fed and where the equipment is fed from shall be installed on front surface of all disconnect switches (including both visible blade type switches and toggle-type switches) and on utilization equipment (where not clearly identified by immediately adjacent local disconnect switch):
  - a. Ex: First Line: "RTU-6", Second Line: "FED FROM: PP-A CIR. 5"
2. Where safety/disconnect switches are installed on the load side of variable frequency drives, the safety/disconnect switch shall be furnished with an additional engraved nameplate to read: "WARNING: TURN OFF VFD PRIOR TO OPENING THIS SWITCH".
3. Safety/Disconnect switches feeding equipment that is fed from multiple sources (such as motors with integral overtemperature contacts that are monitored via a control system) and Utilization Equipment fed from multiple sources shall be furnished with an additional BLACK-ON-YELLOW engraved nameplate to read: "WARNING: ASSOCIATED EQUIPMENT FED FROM MULTIPLE SOURCES – DISCONNECT ALL SOURCES PRIOR TO OPENING COVER".

D. Emergency Systems:

1. A sign shall be placed at the service entrance equipment (and at any remote shunt trip operators, or similar, for service equipment) indicating the type and location of on-site emergency power sources (such as generators, central battery systems, etc.) per NEC requirements.
2. All boxes and enclosures (including transfer switches, generators, power panels, junction boxes, pullboxes, etc.) dedicated for emergency circuits shall be permanently marked with white-on-red engraved nameplates so they will be readily identified as a component of an emergency circuit or system.
3. Where an Essential Electrical System (EES) is installed, all enclosures, raceways and equipment that are components of the EES shall be readily identified as such. Raceway shall be identified at intervals not exceeding 25 ft.

E. Services:

1. All Service Equipment:
  - a. Engraved nameplates identifying maximum available fault current, including date the fault current calculation was performed, in accordance with NEC article 110.24.
    - 1) Ex: First Line: "AVAILABLE FAULT CURRENT: 16,154 AMPS", Second Line: "DATE CALCULATED: JULY 8, 2013"
  - b. All service entrance equipment shall be clearly labeled as being service entrance rated.

2. Where a building or structure is supplied by more than one service (or any combination of branch circuits, feeders and services), a permanent plaque or directory shall be installed at each service disconnect location denoting all other services, feeders & branch circuits supplying that building or structure and the area served by each, per NEC requirements.

F. Generators:

1. Generators shall be labeled with engraved nameplates identifying name of equipment.

### 3.5 INSTRUMENT AND CONTROL DEVICE IDENTIFICATION

- A. New Instruments and control devices (whether furnished by contractor or not) shall be labeled with black-on-white engraved nameplates permanently affixed to the equipment or to the adjacent, readily-visible mounting surface with silicone adhesive or stainless steel wire ties.
1. Instruments and process control devices (float switches, etc.) shall be labeled with instrument name and, where available, instrument ID number.
  2. Pushbutton stations shall be labeled with equipment being controlled. Labels shall be installed on front surface (or adjacent mounting surface) of all pushbutton stations.
  3. Thermostats and other similar HVAC control devices installed in process areas shall be labeled with equipment being controlled. Labels shall be installed on front surface (or adjacent mounting surface) of all thermostats and other similar HVAC control devices.

### 3.6 RACEWAY IDENTIFICATION

- A. Each exposed raceway shall be labeled at the point where it becomes concealed, such as where it enters a concrete floor slab, a concrete wall, the ground, etc.
- B. Each raceway entering in-grade or on-grade pullboxes/junction boxes, where the conduits are only visible inside the box, shall be labeled within the box at the point where the raceway becomes concealed.
- C. Raceway nameplates shall identify:
1. The location of the other end of the raceway ("TO MCC-1" or similar). If the other end of the raceway is at an intermediate, named pullbox ("INSTRUMENTATION PULLBOX #4" or similar), that pullbox name shall be labeled rather than the endpoint of the circuitry.

### 3.7 OTHER IDENTIFICATION

- A. Factory-engraved coverplates identifying functions of light switches and other similar devices shall be installed where so required by plans/specifications.

END OF SECTION 16075

## SECTION 16110

### RACEWAYS

#### PART 1 GENERAL

##### 1.1 DESCRIPTION

- A. THE WORK UNDER THIS SECTION INCLUDES BUT IS NOT LIMITED TO THE FOLLOWING:
1. Conduits
  2. Conduit Fittings
  3. Couplings & Connectors
  4. Bushings
  5. Raceway Hardware, Conduit Clamps & Supports
  6. Watertight Entrance Seal Devices

#### PART 2 PRODUCTS

##### 2.1 CONDUITS

- A. PVC-Coated Rigid Steel:
1. The PVC coated rigid metal conduit must be UL Listed. Hazardous location fittings, prior to plastic coating must be UL listed. All conduit and fittings must be new, unused material. Applicable UL standards may include: UL 6 Standard for Safety, Rigid Metal Conduit, UL514B Standard for Safety, Fittings for Conduit and Outlet Boxes.
  2. The PVC-coated rigid metal conduit shall be ETL PVC-001 listed.
  3. The conduit shall be hot dip galvanized inside and out with hot galvanized threads.
  4. Form 8 Condulets<sup>®</sup>, 3/4" through 2" diameters, shall have a tongue-in-groove "V-Seal" gasket to effectively seal against the elements. The design shall be equipped with a positive placement feature to ease and assure proper installation. Certified results confirming seal performance at 15 psig (positive) and 25 in. of mercury (vacuum) for 72 hours shall be available.
  5. A PVC sleeve extending one pipe diameter or two inches, whichever is less, shall be formed at every female fitting opening except unions. The inside sleeve diameter shall be matched to the outside diameter of the conduit.
  6. The PVC coating on the outside of conduit couplings shall have a series of longitudinal ribs 40 mils in thickness to protect the coating from tool damage during installation.
  7. Form 8 Condulets<sup>®</sup> shall be supplied with plastic encapsulated stainless steel cover screws.
  8. A urethane coating shall be uniformly and consistently applied to the interior of all conduit and fittings. This internal coating shall be a nominal 2 mil thickness. Conduit or fittings having areas with thin or no coating shall be unacceptable.
  9. The PVC exterior and urethane interior coatings applied to the conduit shall afford sufficient flexibility to permit field bending without cracking or flaking at temperatures above 30deg.F (-1deg.C).

10. All male threads on conduit, elbows and nipples shall be protected by application of a urethane coating.
  11. All female threads on fittings or conduit couplings shall be protected by application of a urethane coating.
  12. Independent certified test results shall be available to confirm coating adhesion per ETL PVC-001 standards under the following conditions:
    - a. Conduit immersed in boiling water with a minimum mean time to adhesion failure of 200 hours. ASTM D870)
    - b. Conduit and conduit exposure to 150deg F (65deg C) and 95% relative humidity with a minimum mean time to failure of 30 days. (ASTM D11513.
    - c. The interior coating bond shall be confirmed using the Standard Method of Adhesion by Tape Test (ASTM D3359).
    - d. No trace of the internal coating shall be visible on a white cloth following six wipes over the coating which has been wetted with acetone (ASTM D1308).
    - e. The exterior coating bond shall be confirmed using the methods described in Section 3.8, NEMA RN1.
    - f. After these tests the physical properties of the exterior coating shall exceed the minimum requirements specified in Table 3.1, NEMA RN1.
  13. Water tight flex connectors used in areas where PVC coated metal conduit is utilized shall be PVC coated also.
  14. Shall be as manufactured by Perma-Cote, Plastibond, Korkap, Ocal or Okote.
- B. Rigid Galvanized Steel and I.M.C.:
1. Shall be galvanized outside and inside by hot dipping.
  2. Shall be as manufactured by Republic, Wheatland, Triangle, Pittsburg Standard, Youngstown, Allied or equal.
- C. Rigid Aluminum:
1. Shall be manufactured of 6063 Alloy, T-1 temper.
  2. Shall be as manufactured by Republic, Wheatland, Triangle, Pittsburg Standard, Youngstown, Allied or equal.
- D. Schedule 40 and 80 PVC:
1. Shall be composed of polyvinyl chloride and shall be U.L. rated type 40 or 80 for use with 90 degree rated conductors. Conduit shall conform to NEMA Standards and applicable sections of N.E.C.
  2. The conduit manufacturer shall have had a minimum of 5 years experience in the manufacture of the products. Non-metallic raceways shall be as manufactured by Carlon, Triangle, Can-Tex, Allied or equal.
- E. HDPE Innerduct
1. Shall be composed high density polyethylene and shall be orange in color, unless noted otherwise.
  2. Shall be corrugated unless noted otherwise.
  3. Shall be manufactured by Carlon, Ipex or equal.
  - 4.
- F. Liquidtight Flexible Metallic Conduit:

1. Shall be galvanized steel-core sealtite, code approved for grounding.
2. Shall have an outer liquidtight, nonmetallic, sunlight-resistant jacket over an inner flexible metal core.
3. Shall be as manufactured by Electric-Flex, Anaconda or equal.

## 2.2 FITTINGS, COUPLINGS & CONNECTORS

- A. Rigid Galvanized Steel and I.M.C. couplings and connectors shall be standard threaded type, galvanized outside and inside by hot dipping. Threadless and clamp type are not acceptable. Couplings/connectors shall be as manufactured by Raco, Efcor, or Appleton or equal.
- B. All fittings, conduit bodies, couplings and connectors (including, but not limited to, condulettes, conduit couplings, connectors, hubs, nipples, unions, expansion fittings, explosion proof seal-offs, threaded hole closures, and seal-tight connectors, etc.) used in areas where PVC-Coated Rigid conduit is used shall also be PVC-coated.
- C. All fittings, conduit bodies, couplings and connectors (including, but not limited to, condulettes, conduit couplings, connectors, hubs, nipples, unions, expansion fittings, explosion proof seal-offs, threaded hole closures, and seal-tight connectors, etc.) installed in other wet, exterior or process areas where PVC-coated conduit systems are not required, shall be aluminum or stainless steel type. Standard steel fittings will not be acceptable.
- D. All rain tight connectors shall be threaded Myers or approved equal, rated for outdoor application.
- E. Rigid Aluminum couplings and connectors shall be standard threaded type, of the same alloy as the associated conduit. Threadless and clamp type are not acceptable. Fittings shall be as manufactured by Thomas & Betts, Crouse-Hinds, Appleton, Pyle-National or equal.
- F. All PVC couplings, adapters, end bells, reducers, etc., shall be of same material as conduit.
- G. Liquidtight Flexible Metallic Conduit connectors shall be liquidtight with insulating throat or end bushing, designed for application with Liquidtight Flexible Metallic Conduit. Fittings shall be as manufactured by Efcor, Raco, Midwest or equal.
- H. All LB unilets sizes 1 ¼" or larger shall have rollers.
- I. Miscellaneous conduit fittings shall be as manufactured by Appleton, Crouse-Hinds, Pyle-National, Russell & Stoll or equal.

## 2.3 BUSHINGS

- A. All non-grounding rigid bushings 1-1/4" and larger shall be the insulating type (O-Z/Gedney type "BB" or equal by T&B, Midwest Electric or Penn Union).
- B. All non-grounding rigid bushings 1" and smaller shall be threaded malleable iron with integral noncombustible insulator rated for 150°C. Non-grounding rigid conduit

bushings shall be O-Z/Gedney type “B” or equal by T&B, Midwest Electric or Penn Union.

- C. All grounding rigid bushings shall be threaded malleable iron with integral noncombustible insulator rated for 150°C. All grounding rigid conduit bushings shall be O-Z/Gedney type “BLG” or equal by T&B, Midwest Electric or Penn Union.

## 2.4 HARDWARE, CONDUIT CLAMPS AND SUPPORTS

- A. All hardware such as expansion shields, machine screws, toggle bolts, “U” or “J” bolts, machine bolts, conduit clamps and supports shall be of corrosion resistant materials (stainless steel, aluminum, galvanized or plated steel, or other approved materials).
- B. Hardware in contact with aluminum handrails, plates or structural members and all hardware in exterior, wet or corrosive areas shall be type 316 stainless steel or aluminum (with bitumastic paint coating to isolate aluminum from contact with concrete where necessary) unless specifically noted otherwise.
- C. Supports in exterior, process, wet or corrosive locations shall be type 316 stainless steel or aluminum (with bitumastic paint coating to isolate aluminum from contact with concrete where necessary) unless specifically noted otherwise.
- D. Supports in extremely corrosive environments (such as chlorine or fluoride storage rooms) shall be PVC-Coated steel unless specifically noted otherwise.
- E. Hardware and conduit clamps shall be as manufactured by Efcor, Steel City, G.A., Tinnerman or equal.

## 2.5 WATERTIGHT ENTRANCE SEAL DEVICES

- A. For new construction, seal devices shall consist of oversized sleeve and malleable iron body with sealing rings, pressure rings, sealing grommets and pressure clamps as required (O-Z/Gedney type FSK/WSK or equal).
- B. For cored-hole applications, seal devices shall consist of assembled dual pressure disks with neoprene sealing rings and membrane clamps as required (O-Z/Gedney type CSM or equal).

## PART 3 EXECUTION

### 3.1 RACEWAY APPLICATION

- A. Minimum Diameter: 3/4-inch.
- B. Raceway Type: Raceway types shall be as specified below, unless indicated otherwise on drawings:
  - 1. Exterior, Exposed: Rigid Aluminum unless otherwise noted.
  - 2. Exterior, Used for Instrumentation Circuits: See Below.
  - 3. Other Exterior (Concrete-Encased or Direct Earth Buried): Schedule 40 PVC. PVC conduit shall convert to metallic conduit prior to exiting concrete-



- encasement or direct earth burial. See “transition” items below for additional requirements. Conduits shall be left exposed until after Engineer’s observation.
4. Raceways used for Instrumentation Circuits:
    - a. Typical Dry or Wet Locations: Rigid Aluminum .
    - b. Underground or Locations Embedded inside Poured Concrete: PVC-Coated Rigid Steel.
    - c. Extremely Corrosive Locations (Chlorine Storage Rooms, Fluoride Storage Rooms and other similar areas): PVC-Coated Rigid Steel.
  5. Terminations at motors, transformers and other equipment which has moving or vibrating parts:
    - a. Exterior or Wet Locations (including, but not limited to, Pump Rooms, Wet Wells, Underground Vaults, and other similar locations):  
Liquidtight Flexible Metallic Conduit (shall generally not exceed 24 inches in length) with watertight fittings.
    - b. Dry, Interior Locations: Flexible Metallic Conduit (shall generally not exceed 24 inches in length).
  6. Terminations at instruments:
    - a. Liquidtight Flexible Metallic Conduit (shall generally not exceed 12 inches in length) with watertight fittings.
  7. Transition from underground or concrete-encased to exposed:
    - a. Convert PVC to PVC-Coated Rigid Steel utilizing PVC-Coated Rigid Steel 90 degree bends (and vertical conduits as required by application) prior to exiting concrete/grade (except at outdoor pull boxes and under freestanding electrical equipment, where terminations shall be by PVC end bells installed flush with top of slab). Exposed portions of these coated conduits shall extend a minimum of 6” above floor level, and shall be installed at uniform heights.

### 3.2 RACEWAY INSTALLATION

- A. General:
  1. Follow methods which are appropriate and approved for the location and conditions involved. Where not otherwise shown, specified, or approved in a particular case, run all wiring concealed.
  2. Where conduit crosses a structural expansion joint an approved conduit expansion fitting shall be installed.
  3. Where any run of rigid aluminum conduit (including bends) exceeds 50’ in length, an approved conduit expansion fitting shall be installed (beginning at center of run) at intervals not to exceed 50’ on center.
  4. A non-conductive polypropylene pull string, properly tied/secured at either end, shall be installed in all empty conduits.
  5. Metal conduit field-cuts shall be cut square with a hacksaw and the ends reamed after threading.
  6. PVC conduit field-cuts shall be made with hacksaw, and ends shall be deburred.
  7. All PVC joints shall be made as follows:
    - a. Clean the outside of the conduit to depth of the socket, and the inside of socket with an approved cleaner.
    - b. Apply solvent cement as recommended by the conduit manufacturer to the interior of the socket and exterior of conduit, making sure to coat all surfaces to be joined.

- c. Insert conduit into the socket and rotate 1/4 to 1/2 turn and allow to dry.
8. All metallic conduit installed below grade or within concrete shall be coated with two (2) spiral-wrapped layers of 3M Scotchrap 50 PVC tape or two coats of asphaltum paint prior to installation.
9. Install ground wire sized per N.E.C. Table 250.122 in all conduits.
10. Use of running threads is absolutely prohibited. Conduit shall be jointed with approved threaded conduit couplings. Threadless and clamp type not acceptable.
11. Conduits shall be sized in accordance with latest National Electrical Code except when size shown on drawings.
12. Exposed, field-cut threads on all metal conduits shall be painted with zinc primer (for Galvanized Rigid or I.M.C.) or urethane paint (for PVC-Coated Rigid Steel) as recommended by conduit manufacturer .
13. Installation of PVC coated conduit systems shall be performed in strict accordance with the manufacturer's installation instructions. Damage to PVC coated conduit coating shall be touched up with patching compound as directed by manufacturer. To assure correct installation, the installer shall be certified by the manufacturer to install coated conduit.

B. Routing/Locating:

1. Exposed conduit runs shall be run level and plumb and shall, on interior of buildings, be run parallel and/or at right angles to building walls and/or partitions.
2. Conduit with an external diameter larger than 1/3 the thickness of a concrete slab shall not be placed in the slab. Conduits in slab shall not be spaced closer than 3 diameters on center.
3. Conduit run in ceiling spaces shall be run as high as possible, all at same level, and shall be supported from building structure. Do not support conduit from any other installation.
4. Conduit run within exterior CMU, concrete or other similar walls shall be run within the CMU cells / concrete structure / etc. Conduits shall not be run on the outside surface of CMU cells / concrete structure / etc. underneath exterior veneers / etc., which could cause a thermal break in the wall insulation or a future water intrusion problem.
5. Install conduit runs to avoid proximity to steam or hot water pipes. In no place shall a conduit be run within 6" of such pipes except where crossing is unavoidable, then conduit shall be kept at least 3" from the covering of the pipe crossed.
6. Before installing raceways for motors, HVAC equipment and other fixed equipment, check location of all equipment connections/terminal boxes with equipment supplier and locate and arrange raceways appropriately.
7. No conduit for instrumentation shall be run closer than 12 inches to parallel power conduits.
8. A minimum of 12" of clearance (or more as required by associated utility companies) shall be provided between the finished lines of exterior, underground conduit runs and exterior, underground utilities (gas, water, sewer, etc.).
9. Where any portion of raceway is installed in a wet environment (such as below grade) and located at a higher elevation than the raceway termination point in a dry environment, install watertight compound inside raceway at termination around cabling to prevent transfer of water through conduit system. Watertight

compound shall be rated for the potential water head pressure, based on the assumption that ground water level would be at grade level.

C. Bends:

1. Do not make bends (in any raceway, including flexible conduits) that exceed allowable conductor bending radius of cable to be installed or that significantly restrict conductor flexibility.
2. All bends within concrete-encased ductbanks installed in exterior locations shall be long radius bends (24" minimum bending radius – varies with conduit diameter).
3. All bends in raceways containing multi-conductor power cables (such as shielded VFD cables) shall be long radius bends (24" minimum bending radius – varies with conduit diameter).
4. Where numerous exposed bends or grouped together, all bends shall be parallel, with same center and shall be similar in appearance
5. All PVC elbows, bends, etc., shall be either factory bends or made with an approved heat bender.

D. Support:

1. Anchor conduit securely in place by means of approved conduit clamps, hangers, supports and fastenings. Arrangement and methods of fastening all conduits shall be subject to Engineer's direction and approval. All conduits shall be rigidly supported (wire supports may not be used in any location). Use only approved clamps on exposed conduit.
2. Rigid Aluminum Conduits shall be supported at intervals not to exceed 5' on center.
3. Conduit in riser shafts shall be supported at each floor level by approved clamp hangers.
4. Right angle beam clamps and U bolts shall be specially formed and sized to snugly fit the outside diameters of conduits.
5. Where installed in seismic zones, suspended raceways shall be braced in two (2) directions as required to prevent swaying and excessive movement.
6. Raceways installed on top of flat roofing shall be supported a minimum of 3 ½" above roof with rubber block supports (Cooper B-Line Dura-Blok or equal). Installation shall be in strict accordance with support manufacturer's instructions and recommendations.

E. Terminations:

1. All conduit connections to sheet metal cabinets or enclosures located in exterior or wet locations shall terminate by use of rain tight (Meyers) hubs.
2. In wet, exterior or process areas, conduits shall NOT enter tops of enclosures. All conduits shall enter enclosures from bottom, left or right sides of the enclosure (utilizing rain-tight Meyers hubs as indicated above).
3. Where rigid or I.M.C. conduits enter sheet metal boxes, they shall be secured by approved lock nuts and bushings.
4. Where metal conduits enter outdoor pull boxes, manholes, under freestanding electrical equipment or other locations where direct metal-to-metal contact does not exist between enclosure and conduit, grounding bushings shall be installed. Each grounding bushing shall be connected to the enclosure ground and all other grounding bushings with properly sized grounding conductors.

5. Where PVC enters outdoor pull boxes, manholes or under freestanding electrical equipment, PVC end bells shall be installed.
6. Contractor shall be responsible for coordinating required conduit sizes with equipment hubs/conduit entry provisions (such as at motor tap boxes) prior to installation of conduit systems. Contractor shall field adjust final conduit sizes at terminations where so required (only as allowed by code) from those indicated on plans to coordinate with equipment hubs/conduit entry provisions.
7. Where conduit terminates in free air such that associated cabling/circuitry becomes exposed (such as at cable trays, etc.), conduit shall generally terminate in a horizontal orientation (to prevent dust/debris/etc. from entering conduit system). Where vertical conduit termination is necessary, the termination shall be provided with cord-grip conduit terminations to seal the conduit system.
8. Conduit ends shall be carefully plugged during construction.
9. Permanent, removable caps or plugs shall be installed on each end of all empty raceways with fittings listed to prevent water and other foreign matter from entering the conduit system.

F. Penetrations:

1. All penetrations shall be at right angles unless shown otherwise.
2. Structural members (including footings and beams) shall not be notched or penetrated for the installation of electrical raceways unless noted otherwise without specific approval of the structural engineer.
3. Dry-packed non-shrink grout or watertight seal devices shall be used to seal openings around conduits at all penetrations through concrete walls, ceilings or aboveground floors.
4. All raceways entering structures, or where water is otherwise capable of entering equipment/devices through the raceway system, shall be sealed (at the first box or outlet) with foam duct sealant to prevent the entrance of gases or liquids from one area to another or into equipment/devices.
  - a. Where the elevation of the raceway penetration (into the structure) is no more than 15' below the other (higher) end of the same raceway, Polywater FST sealant (rated to hold back up to 22' of continuous water head pressure), or pre-approved equal, shall be used.
  - b. Where the elevation of the raceway penetration (into the structure) is between 15' and 75' below the other (higher) end of the same raceway, Polywater PHRD Custom Mechanical Seals (rated to hold back up to 36psi or 83' of continuous water head pressure), or pre-approved equal, shall be used.
  - c. Where the elevation of the raceway penetration (into the structure) is more than 75' below the other (higher) end of the same raceway, the contractor shall propose a custom solution designed to hold back or to drain the possible water within the associated raceway. Submittals shall be provided to the engineer for review/approval, including a summary of the anticipated elevations/PSIs, details of the proposed installation, cut-sheets of devices/materials, etc.
5. Additionally, where necessary to ensure that water does not enter equipment/devices through the raceway system (where raceways extend to equipment/devices from wet areas), junction boxes with drain assemblies in bottom shall be located at low point of raceway system near equipment/devices (to drain water out of raceway system before it enters equipment/devices).

Contractors shall provide drains in raceway systems where so necessary to prevent water entry into equipment/devices. In special applications (such as to instruments, etc.), where cabling rated for exposed application is provided, contractor may propose short air gaps (approximately 6" or less) between the end of the conduit system and the equipment/device cable entry (to be made with cable gland connectors) to prevent water in conduit system from entering equipment/devices in lieu of drained junction boxes.

6. All raceways passing through concrete roofs or membrane-waterproofed walls or floors shall be provided with watertight seals as follows:
  - a. Where ducts are concrete encased on one side: Install watertight entrance seal device on the accessible side of roof/wall/floor as directed by equipment manufacturer.
  - b. Where ducts are accessible on both sides: Install watertight entrance seal device on each side of roof/wall/floor as directed by equipment manufacturer.
7. All raceways passing through walls of rooms containing/storing noxious chemicals (chlorine, ammonia, etc.) or through hazardous locations shall be sealed with conduit seals (Crouse-Hinds type EYS or equal).
8. All raceways terminating into electrical enclosures/devices/panels/etc. located in hazardous locations shall be sealed with conduit seals (Crouse-Hinds type EYS, EZS or equal) within 18" of the termination.

G. Exterior Electrical Ductbanks:

1. Where exterior electrical concrete-encased ductbanks are indicated on drawings, conduit runs between buildings or structures shall be grouped in concrete-encased ductbanks as follows:
  - a. A minimum of 3" of concrete shall encase each side of all ductbanks.
  - b. A minimum of 1 ½" of separation shall be provided between each conduit within ductbanks. PVC spacers shall be installed at the necessary intervals prior to placement of concrete to maintain the required spacing and to prevent bending or displacement of the conduits.
  - c. Top of concrete shall be a minimum of 30" below grade. A continuous magnetic marking tape shall be buried directly above each ductbank, 12" below grade.
  - d. Exact routing of ductbanks shall be field verified and shall be modified as necessary to avoid obstruction or conflicts.
  - e. Underground electrical raceways shall be installed to meet the minimum cover requirements listed in NEC Table 300.5. Refer to drawings for more stringent requirements.

END OF SECTION 16110

## SECTION 16116

### AUXILIARY SYSTEM CABLES, 0-50V

#### PART 1 GENERAL

##### 1.1 DESCRIPTION

- A. Cables rated for 0V-50V application

#### PART 2 PRODUCTS

##### 2.1 GENERAL

- A. Unless specified otherwise, all cables within the scope of this specification section shall:
  1. Be rated for exposed cable tray installation.
  2. Be plenum rated (Class 1 Control cabling and Instrumentation cabling installed in conduit or exposed in cable tray in non-plenum areas is not required to be plenum-rated).
  3. Be UL-rated for the proposed application.
  4. Be multi-conductor with overall outer sheath as required by the application. The insulation of each conductor within the overall multi-conductor cable shall be uniquely color-coded. Ground conductors (when provided) within the multi-conductor cable shall have green insulation. Conductors with green insulation shall not be used for conductors other than ground.
  5. Utilize copper conductors.
  6. Have wire gauge as required to limit voltage drop to acceptable limits determined by the system supplier and to meet all applicable code requirements.
  7. Where installed underground, within slab-on-grade or in exterior locations, be rated for wet locations.
  8. Where required for specific systems, meet the specific requirements (conductor quantity, wire gauge, insulation type, shielding, etc.) of the system supplier.

##### 2.2 INSTRUMENTATION CABLING

- A. In addition to above requirements, and unless specified otherwise, Instrumentation cabling shall:
  1. Be #16AWG minimum.
  2. Be rated for 300V.
  3. Have aluminum foil shielding.
  4. Have stranded, twisted conductors.
  5. Have PVC insulation/jacket with ripcord.
  6. Be manufactured by Belden, AlphaWire or General Cable.

##### 2.3 CLASS 1 CONTROL CABLING (120VAC CONTROL CIRCUITS, ETC.)

- A. In addition to above requirements, and unless specified otherwise, Class 1 control cabling shall:
  1. Be rated for 600V.
  2. Be industrial grade.
  3. Have stranded conductors.

4. Have sunlight/oil-resistant PVC/Nylon insulation and jacket with ripcord.
5. Be manufactured by Belden, AlphaWire or General Cable.

#### 2.4 CLASS 2 & 3 CONTROL CABLING (FED FROM CLASS 2 OR 3 POWER SUPPLIES)

- A. In addition to above requirements, and unless specified otherwise, Class 2 & 3 control cabling shall:
1. Be rated for 300V.
  2. Be shielded if so recommended by the system supplier/integrator.
  3. Have twisted conductors.
  4. Have plenum-rated insulation/jacket with ripcord.
  5. Be manufactured by AlphaWire, Belden, General Cable, Superior Essex or West Penn.

#### 2.5 NETWORK CABLING

- A. Furnish and install all Ethernet, Fiber Optic and Backbone Copper Telephone cabling in accordance with all BICSI requirements and in accordance with other applicable specification sections.

### **PART 3 EXECUTION**

#### 3.1 GENERAL INSTALLATION

- A. Routing:
1. All wires and cables shall be installed in conduit unless specifically noted otherwise. Where conduit is not otherwise required by contract documents, 0-50V Cabling located within concealed, accessible ceiling spaces (such as above lay-in ceilings) may be run without conduit if the following requirements are met:
    - a. Cabling is plenum-rated, multi-conductor.
    - b. Cabling is supported by cable tray or with J-hook supports on intervals not to exceed 5'-0" on center. Cabling shall be supported solely from the cable tray or j-hooks supported from the building structure, without using piping, ductwork, conduit or other items as supports.
    - c. Cabling is neatly formed, bundled and tied with plenum-rated Velcro straps on intervals not to exceed 30" on center.
    - d. Properly-sized conduit(s) are provided wherever cabling enters an inaccessible or exposed area (such as above gyp board ceilings, within walls or through walls).
    - e. Cabling is not a part of a Fire Alarm System, Smoke Control System, Emergency Generator Control System or other life-safety related system.
  2. End bushings shall be provided on both ends of all raceway terminations.
  3. No splices shall be pulled into conduit.
  4. No cabling shall be pulled until conduit is cleaned of all foreign matter.
- B. Excess Cabling:
1. Excess cabling shall be neatly coiled within all junction boxes, pullboxes, wireways, etc. and at all terminations as required to allow future re-termination of cabling.

- C. Terminations:
  - 1. All conductors/cabling (including spare conductors) shall be properly terminated unless specifically directed otherwise. See below for general termination hardware requirements.
  - 2. Cabling shall be neatly formed, bundled and tied at all terminations.

### 3.2 SPLICES/CONNECTIONS/TERMINATIONS:

- A. Network Cabling:
  - 1. Network and fiber optic cabling shall be continuous from endpoint to endpoint and shall not be spliced unless specifically noted otherwise.
- B. Control Cabling:
  - 1. Connections shall be made with T & B Sta-Kon wire joints EPT66M, complete with insulating caps. To be installed with WT161 Tool or C nest of WT11M Tool, Ideal Super - Nuts (not wire nuts), Ideal Wing Nuts, or Buchanan Elec. Products B Cap or Series 2000 Pressure connectors complete with nylon snap on insulators to be installed with C24 pressure tool.
- C. Shielded cabling:
  - 1. Unless directed otherwise by the system supplier, 0-50V cable shielding shall be grounded at the PLC/control panel end only (not at the field device end) with a termination kit as directed by the PLC/control panel supplier.
  - 2. Shielded cabling shall be continuous from endpoint to endpoint and shall not be spliced without prior written approval from the Engineer.

### 3.3 LABELING

- A. Refer to Specification Section 16075 for all labeling requirements.

END OF SECTION 16116



## SECTION 16120

### POWER CONDUCTORS AND CABLES 51V-600V

#### PART 1 GENERAL

##### 1.1 DESCRIPTION

- A. Power Wires and Cables
- B. Low Voltage Wires and Cables

#### PART 2 PRODUCTS

##### 2.1 POWER WIRES AND CABLES - 600 VOLT

- A. General: Conductors shall have current carrying capacities as per N.E.C. and with 600 volt insulation, #12 minimum except for controls and fixture wire. Conductors shall be copper.
- B. General Application (see below for exceptions):
  - 1. At or Below Grade (including within slab-on-grade):
    - a. #8 or larger conductors:
      - 1) XHHW or RHH/RHW/USE stranded (in conduit).
    - b. #10 or smaller conductors for circuits terminating at motors:
      - 1) THHN/THWN or XHHW stranded (in conduit).
    - c. #10 or smaller conductors (excluding circuits terminating at motors):
      - 1) THHN/THWN or XHHW solid (in conduit).
  - 2. Above Grade:
    - a. #8 or larger conductors:
      - 1) THHN/THWN, XHHW or RHH/RHW/USE stranded (in conduit).
    - b. #10 or smaller conductors for circuits terminating at motors:
      - 1) THHN/THWN, XHHW or RHH/RHW/USE stranded (in conduit).
    - c. #10 or smaller conductors (excluding circuits terminating at motors):
      - 1) THHN/THWN, XHHW or RHH/RHW/USE solid (in conduit).
  - 3. Power Wire and cable shall be as manufactured by Southwire, Rome, Encore Wire, American Insulated Wire, Okonite, Phelps-Dodge, Americable, Aetna or approved equal.
- C. VFD Cabling
  - 1. Wiring/Cabling installed between each VFD (Variable Frequency Drive) and the associated motor shall be multi-conductor shielded VFD power cable with the following characteristics:
    - a. Multi-conductor cable with three (3) power conductors and three (3) ground conductors
    - b. Soft annealed flexible stranded copper conductors.
    - c. 1kV cross-linked polyolefin insulation (to resist the potential reflected voltages experienced in 600VAC VFD applications).
    - d. Metallic shielded providing 100% shield coverage

- e. Oil, abrasion, chemical & sunlight resistant thermosetting compound outer jacket.
  - f. Flexible TC-ER rated, UL listed for use in cable trays.
  - g. Equal to AmerCable #37-108VFD cable.
- D. Class 1 Control Cabling (120VAC Control Circuits, Etc.)
1. Unless specified otherwise, Class 1 control cabling shall:
    - a. Be rated for exposed cable tray installation.
    - b. Be plenum rated (Class 1 Control cabling and Instrumentation cabling installed in conduit or exposed in cable tray in non-plenum areas is not required to be plenum-rated).
    - c. Be UL-rated for the proposed application.
    - d. Be multi-conductor with overall outer sheath as required by the application. The insulation of each conductor within the overall multi-conductor cable shall be uniquely color-coded. Ground conductors (when provided) within the multi-conductor cable shall have green insulation. Conductors with green insulation shall not be used for conductors other than ground.
    - e. Utilize copper conductors.
    - f. Have wire gauge as required to limit voltage drop to acceptable limits determined by the system supplier and to meet all applicable code requirements.
    - g. Where installed underground, within slab-on-grade or in exterior locations, be rated for wet locations.
    - h. Where required for specific systems, meet the specific requirements (conductor quantity, wire gauge, insulation type, shielding, etc.) of the system supplier.
    - i. Be rated for 600V.
    - j. Be industrial grade.
    - k. Have stranded conductors.
    - l. Have sunlight/oil-resistant PVC/Nylon insulation and jacket with ripcord.
  2. Control cabling shall be as manufactured by Belden, AlphaWire or General Cable.

## 2.2 WIRE CONNECTIONS:

- A. All connector types:
1. Shall be properly rated for the proposed application by UL and per the manufacturer.
- B. At Motor Connections (within motor terminal boxes):
1. On Unshielded Wire:
    - a. Single conductor per phase: shall be made with insulated set screw connectors or 3M 5300 Series 1kV Motor Lead Connections kits with mechanical lugs as required.
    - b. Multiple conductors per phase: shall be made with insulated mechanical lugs, rated for the associated motor cable types, by Polaris or Ilsco.
  2. On Shielded Power Wire:

- a. The braided shields and internal grounding conductors of shielded power (not instrumentation) cables shall be grounded at BOTH ends (at VFD/starter and at motor) with a termination kit provided by the cable supplier. This termination kit shall include a connection ring that makes contact around the full circumference of the braided shield, and connects all internal grounds to a common external ground point.
- C. Other Dry locations:
- 1. On Wire larger than #10: shall be made with solderless, non-insulated compression-type connectors meeting requirements of Federal Specification WS-610e for Type II, Class 2 and shall be covered with Scotch #33 electrical tape so that insulation is equal to 150% of conductor insulation.
  - 2. On Wire #10 and smaller: shall be made with one of the following:
    - a. Ideal Wing Nuts or equal by 3M .
    - b. Ideal Push-In Wire Connectors (for #12 and smaller only).
- D. Other Wet/Damp locations:
- 1. On Wire larger than #10: shall be made with underground/direct-burial, waterproof rated EPDM or TPE-insulated connectors by IISCO, Burndy or T&B.
  - 2. On Wire #10 and smaller: shall be made with one of the following:
    - a. Ideal Weatherproof or Underground Wire Connectors pre-filled with 100% silicone sealant as required by the application.

## **PART 3 EXECUTION**

### **3.1 GENERAL INSTALLATION**

- A. All wires and cables shall be installed in conduit unless specifically noted otherwise.
- B. All joints and splices on wire shall be made with solderless connectors, and covered so that insulation is equal to conductor insulation.
- C. No splices shall be pulled into conduit.
- D. No conductor shall be pulled until conduit is cleaned of all foreign matter.
- E. Wire and cable shall be neatly formed, bundled and tied in all panelboards, wireways, disconnect switches, pullboxes, junction boxes, cabinets and other similar electrical enclosures.
- F. All wires and cables installed in underground or other wet locations shall be rated by the manufacturer for wet locations.
- G. Network cabling shall be continuous from endpoint to endpoint and shall not be spliced unless specifically noted otherwise.
- H. All conductors/cabling (including spare conductors) shall be properly terminated unless specifically directed otherwise. See above for general termination hardware requirements.

### 3.2 POWER WIRE AND CABLE INSTALLATION:

- A. No power conductor shall be smaller than #12 except where so designated on the drawings or hereinafter specified.
- B. Multi-wire lighting branches shall be used as indicated.
- C. Where more than three current-carrying conductors are installed in a single raceway or cable, conductors shall be derated as indicated in NEC Table 310.15(B)(3)(a).
- D. Raceways/cables shall generally not be installed exposed to sunlight on roofs unless specifically required. Where raceways or cables are installed exposed to sunlight on roofs, conductors shall be derated with ampacities adjusted per NEC Table 310.15(B)(3)(c).
- E. In installing parallel power conductors, it is mandatory that all conductors making up the feeder be exactly the same length, the same size, the same type of conductor with the same insulation. Each group of conductors making up a phase or neutral must be bonded at both ends in an approved manner.
- F. In installing overhead main power services, a minimum of 5'-0" of cable per run shall be extended beyond the weatherhead(s) for connection to service drop. Confirm exact requirements with local utility company.

### 3.3 WIRE CONNECTIONS

- A. See Part 2 above for material types.
- B. Aluminum Wire Connections:
  - 1. Where aluminum wiring is allowed, connections shall utilize compression fittings, no exceptions (Anderson Versa Crimp or equal).
- C. Any stranded wire connection to wiring devices shall be made with crimp type terminals.
- D. All electrical connections and terminals shall be tightened according to manufacturer's published torque-tightening values with calibrated torque wrenches as required to clearly indicate final torque value to the contractor. Where manufacturer's torque values are not provided, those specified in UL 486A & 486B shall be used.
- E. All connections and connector types shall be installed in strict compliance with all requirements of the connector manufacturer.
- F. Under no condition shall the specified conductors be connected to terminals rated less than 75°C. Where conductors sized #1 or smaller are shown to be terminated at equipment and the terminals of that equipment are rated for less than 75°C, contractor shall install junction box near equipment to capture the specified conductors, splice with compression connections (rated for a least 75°C) and extend conductors with ampacity rating as required by NEC (based on terminal temperature rating) to equipment terminals. The length of the conductors to be terminated shall be as directed by the AHJ but not less than 48 inches.

3.4 SHIELDED CABLE INSTALLATION

- A. Shielded VFD (power) cables:
  1. The braided shields and internal grounding conductors of shielded VFD (power) cables shall be grounded at BOTH ends (at VFD and at motor) with a termination kit provided by the cable supplier. This termination kit shall include a connection ring that makes contact around the full circumference of the braided shield, and connects all internal grounds to a common external ground point.
  2. Contractor shall coordinate the necessary size of conduit with the outer diameter of the proposed cable type to verify that the raceway loading does not exceed NEC requirements prior to rough-in of the conduit system.
- B. Shielded instrumentation (low voltage) cables:
  1. The outer foil of shielded instrumentation cables shall be grounded at the PLC/control panel end only (not at the field device end) with a termination kit as directed by the PLC/control panel supplier.

3.5 LOW VOLTAGE (LESS THAN 50V) CONTROL AND NETWORK CABLE INSTALLATION:

- A. All wires and cables shall be installed in conduit unless specifically noted otherwise. Low voltage control and/or network cabling located within concealed, accessible ceiling spaces (such as above lay-in ceilings) may be run without conduit if the following requirements are met:
  1. Cabling shall be plenum-rated, multi-conductor.
  2. Cabling shall be supported by cable tray or with J-hook supports on intervals not to exceed 5'-0" on center. Cabling shall be supported solely from the cable tray or j-hooks supported from the building structure, without using piping, ductwork, conduit or other items as supports.
  3. Cabling shall be properly bundled with plenum-rated Velcro straps on intervals not to exceed 30" on center.
  4. Properly-sized conduit(s) shall be provided wherever cabling enters an inaccessible or exposed area (such as above gyp board ceilings or through walls). End bushings shall be provided on both ends of all raceway terminations. All fire/smoke barrier penetrations shall be made in accordance with a U.L. listed assembly.

3.6 CIRCUITS AND BRANCH CIRCUITS

- A. Outlets shall be connected to branch circuits as indicated on drawings by circuit number adjacent to outlet symbols, and no more outlets than are indicated shall be connected to a circuit.

3.7 LABELING AND COLOR CODING OF WIRE AND CABLE

- A. Refer to Specification Section 16075 for all labeling requirements.
- B. A color coding system as listed below shall be followed throughout the network of branch power circuits as follows:

	120/208/240/	120/240 HIGH LEG	277/480 VOLT
PHASE	COLOR	DELTA COLOR	COLOR

A	BLACK	BLACK	BROWN
B	RED	ORANGE (FOR HI-LEG)	ORANGE
C	BLUE	BLUE	YELLOW
NEUTRAL	WHITE	WHITE	GRAY
GROUND	GREEN	GREEN	GREEN

- C. Where dedicated neutrals are installed for multi-wire branch circuits, the neutral conductors shall be color coded as follows:

PHASE	120/208/240/ COLOR	120/240 HIGH LEG DELTA COLOR	277/480 VOLT COLOR
NEUTRAL A	WHITE W/ BLACK TRACER	WHITE W/ BLACK TRACER	GRAY W/ BROWN TRACER
NEUTRAL B	WHITE W/ RED TRACER	WHITE W/ ORANGE TRACER (FOR HI-LEG NEUTRAL)	GRAY W/ ORANGE TRACER
NEUTRAL C	WHITE W/ BLUE TRACER	WHITE W/ BLUE TRACER	GRAY W/ YELLOW TRACER

- D. Control Conductors: Shall be color coded by use of colored “tracers”. No control circuit shall contain two identical conductors. For example, a set of five (5) control conductors for a pushbutton station represents one (1) control circuit which would require five (5) uniquely-colored control conductors.

### 3.8 TESTING

- A. The insulation resistance of all feeder conductors (feeding electrical distribution equipment such as switchboards, panelboards, transfer switches, transformers, etc.) shall be tested at the load side of the feeder breaker with a 1000-volt DC Megger Tester prior to energization or final termination. Any feeder conductor with an insulation resistance less than the recommended minimums in the latest version of NETA Acceptance Testing Specification (“ATS”) standard shall be replaced by the contractor at the contractor’s expense. All final test results shall be clearly documented (with date, time, feeder, results, test equipment, etc.), and the final test results shall be submitted to the design team for review.

END OF SECTION 16120

## SECTION 16130

### OUTLET BOXES, JUNCTION BOXES, WIREWAYS

#### PART 1 GENERAL

##### 1.1 DESCRIPTION

- A. Outlet and Junction Boxes
- B. Pull Boxes
- C. Wireways

#### PART 2 PRODUCTS

##### 2.1 OUTLET BOXES & JUNCTION BOXES (THROUGH 4-11/16")

- A. Sheet Metal: Shall be standard type with knockouts made of hot dipped galvanized steel as manufactured by Steel City, Raco, Appleton, Bowers or equal.
- B. Cast: Shall be type FS, FD, JB, GS, or SEH as required for application as manufactured by O-Z/Gedney, Appleton, or equal.
- C. Nonmetallic: Shall be type Polycarbonate/ABS construction as required for application with non-metallic quick-release latches as manufactured by Hoffman, O-Z/Gedney, Appleton, or equal.

##### 2.2 JUNCTION AND PULL BOXES (LARGER THAN 4-11/16")

- A. Oil-Tight JIC: Shall be Hoffman Type CH box or approved equal.
- B. Galvanized Cast Iron or Cast Aluminum: Shall be O-Z/Gedney or approved equal.
- C. Stainless Steel: Shall be as manufactured by O-Z/Gedney, Hoffman or approved equal. Boxes shall have continuous hinges, seamless foam-in-place gaskets and screw-down clamps.
- D. Nonmetallic: Shall be type Polycarbonate/ABS construction as required for application with non-metallic quick-release latches as manufactured by Hoffman, O-Z/Gedney, Appleton, or equal. Boxes shall have hinged covers and screw-down clamps.
- E. Wireways: Shall be standard manufacturer's item as manufactured by Hoffman, Square "D", Burns, B & C or equal. Wireways shall have hinged covers and screw-down clamps.
- F. Pre-cast Polymer Concrete Below-Grade Hand Holes & Pull Boxes:
  - 1. Enclosures, boxes and cover are required to be UL Listed and conform to all test provisions of ANSI/SCTE 77 "Specifications For Underground Enclosure Integrity" for Tier 15 applications (15,000lb design load and 22,500lb test load) unless noted otherwise.

2. All covers shall have a minimum coefficient of friction of 0.05 in accordance with ASTM C1028 and the corresponding Tier level shall be embossed on the top surface.
3. Cover shall be bolt-down include factory-labeling to read "Electric", "Communications" or other as directed.
4. Hardware shall be stainless steel.
5. Shall be Quazite PG/LG Style or approved equal.

## **PART 3 EXECUTION**

### **3.1 APPLICATION**

#### **A. General**

1. All boxes and wireways shall be of sufficient size to provide free space for all enclosed conductors per NEC requirements. Fill calculations shall be performed by contractor per NEC requirements.

#### **B. Outlet Boxes & Junction Boxes (through 4-11/16")**

- a. Sheet metal boxes shall be used on concealed work in ceiling or walls.
2. Cast boxes shall be used wherever Rigid or I.M.C. conduits are installed. Cast boxes shall be Cast Aluminum wherever installed in same locations as Rigid Aluminum conduit
3. All boxes installed in extremely corrosive areas (such as chlorine and fluoride storage rooms) where non-metallic raceways are used shall be non-metallic.
4. Except when located in exposed concrete block, switch and receptacle boxes shall be 4" square for single gang installation. Appropriate gang boxes shall be used for mounting ganged switches.
5. When installed in exposed concrete block, switch and receptacle boxes shall be square type designed for exposed block installation.
6. Ceiling outlet boxes shall be 4" octagon 1-1/2" deep or larger required due to number of wires.
7. Boxes installed in hazardous locations shall be explosion-proof rated for the associated application, constructed of copper-free cast aluminum.

#### **C. Junction & Pull Boxes (larger than 4-11/16")**

1. For all below grade exterior use and elsewhere as shown:
  - a. In areas subject to future vehicular traffic: shall be galvanized cast iron (rated AASHTO H-20 Loading unless noted otherwise).
  - b. In areas not subject to vehicular traffic: shall be galvanized cast iron or pre-cast polymer concrete (rated for Tier 15 Loading unless noted otherwise).
2. All boxes installed exposed in exterior or wet areas shall be stainless steel (NEMA 4X).
3. All boxes installed exposed in corrosive areas shall be stainless steel (NEMA 4X).
4. All boxes installed in extremely corrosive areas (such as chlorine and fluoride storage rooms) where non-metallic raceways are used shall be non-metallic.
5. Padmounted Pull Boxes shall be installed as shown on Plans or as required by project conditions. Transclosure-style Padmounted boxes shall be installed



wherever required by the quantities and sizes of conductors. Contractor shall submit all Padmounted Pull Box types prior to ordering for engineer's review and comment.

6. Boxes installed in hazardous locations shall be explosion-proof rated for the associated application, constructed of copper-free cast aluminum.
7. All others shall be oil tight JIC box not less than 16 gauge.

### 3.2 INSTALLATION

#### A. General

1. All boxes and wireways shall be securely anchored.
2. All boxes shall be properly sealed and protected during construction and shall be cleaned of all foreign matter before conductors are installed.
3. All boxes and wireways shall be readily accessible. Contractor shall be responsible for furnishing and installing access panels per architect's specifications. Locations shall be as directed by the architect as required to make boxes, wireways, electrical connections, etc. accessible where above gypsum board ceilings or in other similar locations.
4. All metallic boxes and wireways shall be properly grounded.
5. Refer to Specification Section 16075 for identification requirements.

#### B. Outlet Boxes & Junction Boxes (through 4-11/16")

1. Boxes shall be provided with approved 3/8" fixture studs were required.
2. Recessed boxes for wiring devices, surface fixtures, or connections, shall be set so that the edge of cover comes flush with finished surface.
3. There shall be no more knockouts opened in any sheet metal box than actually used.
4. Any unused opening in cast boxes shall be plugged.
5. Back to back boxes to be staggered at least 3 inches.
6. Under no circumstances shall through-the-wall boxes be used.

#### C. Junction & Pull Boxes (larger than 4-11/16")

1. Pull boxes shall be installed as indicated on plans and/or as required due to number of bends, distance or pulling conditions.
2. Boxes to be imbedded in concrete shall be properly leveled and anchored in place before the concrete is poured.
3. All pull boxes and/or junction boxes installed exterior below grade, shall have their tops a minimum of 1-1/2 inches above surrounding grade and sloped so that water will not stand on lid. A positive drain shall be installed, to prevent water accumulation inside.
4. Above grade pull boxes shall be installed on concrete anchor bases as shown on Plans.

#### D. Wireways and/or wall-mounted equipment

1. Mount each wireway to channels of the same metal type as the wireway.
2. Conductors serving a wireway shall be extended without reduction in size, for the entire length of the wireway. Tap-offs to switches and other items served by the wireway shall be made with ILSCO type GTA with GTC cap.

END OF SECTION 16130

## SECTION 16140

### WIRING DEVICES

#### PART 1 GENERAL

##### 1.1 DESCRIPTION

- A. Wiring Devices
- B. Plates
- C. Finishes

#### PART 2 PRODUCTS

##### 2.1 WIRING DEVICES AND PLATES

- A. Switches shall be AC type, extra-heavy duty industrial grade (unless otherwise shown) of ratings shown on drawings. Switches shall be as manufactured by Hubbell, P & S, Sierra, Bryant, GE, Arrow Hart or equal.
- B. Receptacles shall have blade configuration and shall be heavy duty industrial grade (unless otherwise shown) of current and voltage rating as shown on drawings. Receptacles shall be as manufactured by Hubbell, P & S, Sierra, Bryant, GE, Arrow Hart or equal.
- C. All GFCI-type receptacles shall continuously self-test and shall trip/deny power if the receptacle does not provide proper GFCI protection or if the line/load terminations are miswired and shall provide visual indication of power status, trip conditions, ground fault conditions and end-of-life status.
- D. Each wiring device shall have a plate (see "Finishes" section below for specific requirements).

##### 2.2 FINISHES

- A. All wiring devices (switches, receptacles, etc.) shall be colored to match the coverplates described below. For instance, all items covered by stainless steel, aluminum or malleable iron plates shall be gray in color.
- B. Coverplates for recessed, wall-mounted electrical items (switches, receptacles, telephone outlets, etc.) shall be stainless steel unless shown otherwise.
- C. Coverplates, trim rings, etc. for recessed, floor-mounted electrical items (floor outlets, underfloor duct junctions, etc.) shall match finish of building hardware (302/304 stainless steel, brass, etc.) in area installed.
- D. Coverplates for exposed electrical items (switches, receptacles, telephone outlets, etc.) shall be of same material as exposed boxes (see Outlet Box Specification for required material type) and shall have beveled edges.

- E. Coverplates for receptacles in wet locations shall be metallic, in-use type, rated for wet locations per NEC requirements unless noted otherwise.
- F. See “Electrical Identification” specification section for coverplate labeling requirements.

## **PART 3 EXECUTION**

### **3.1 GENERAL MOUNTING**

- A. Symbols on drawings and mounting heights are approximate. The exact locations and mounting heights shall be determined on the job, and it shall be the Contractor's responsibility to coordinate with all trades to secure correct installation. For example, Contractor shall coordinate exact mounting heights over counters, in or above backsplashes, in block walls, and at other specific construction features.
- B. Verify all door swings with Architectural. Locate boxes for light switches within four inches of door trim on swing side (not hinge side) of door.
- C. Devices and associated plates shall not be used as support; outlet boxes shall be rigidly supported from structural members.
- D. Mount all straight-blade receptacles vertically with ground pole up, unless specifically noted otherwise.
- E. Unless otherwise shown or required by local handicap codes, outlet boxes shall be the following distances above the finished floor unless otherwise noted.
  - 1. Receptacles and telephone outlets in offices and other finished areas: 1'-6" to the center of the box.
  - 2. Receptacles and telephone outlets in equipment rooms and other unfinished areas: 4'-0" to the center of the box.
  - 3. Receptacles over counters: As Noted
  - 4. Switches, general: 4'-0" to the top of the box.
  - 5. Push-button, etc., general: 4'-0" to the top of the box.
  - 6. Other device types: verify with engineer prior to rough-in.

END OF SECTION 16140

## SECTION 16231

### GENERATOR SETS

#### PART 1 GENERAL

##### 1.1 SCOPE

- A. Provide complete factory assembled generator set equipment with digital (microprocessor-based) electronic generator set controls, digital governor, and digital voltage regulator.
- B. Provide factory test, startup by a supplier authorized by the equipment manufacturer(s), and on-site testing of the system.
- C. The generator set manufacturer shall warrant all equipment provided under this section, whether or not is manufactured by the generator set manufacturer, so that there is one source for warranty and product service. Technicians specifically trained and certified by the manufacturer to support the product and employed by the generator set supplier shall service the generator sets.

##### 1.2 CODES AND STANDARDS

- A. The generator set installation and on-site testing shall conform to the requirements of the following codes and standards, as applicable. The generator set shall include necessary features to meet the requirements of the latest editions of the following standards/codes where applicable:
  - 1. CSA 282, 1989 Emergency Electrical Power Supply for Buildings
  - 2. IEEE446 – Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications
  - 3. International Building Codes.
  - 4. NFPA70 – National Electrical Code. Equipment shall be suitable for use in systems in compliance to Article 700, 701, and 702.
  - 5. NFPA99 – Essential Electrical Systems for Health Care Facilities.
  - 6. NFPA110 – Emergency and Standby Power Systems. The generator set shall meet all requirements for Level 1 systems. Level 1 prototype tests required by this standard shall have been performed on a complete and functional unit, component level type tests will not substitute for this requirement.
- B. The generator set and supplied accessories shall meet the requirements of the latest editions of the following standards where applicable:
  - 1. NEMA MG1-1998 part 32. Alternator shall comply with the requirements of this standard.
  - 2. UL142 – Sub-base Tanks
  - 3. UL1236 – Battery Chargers
  - 4. UL2200. The generator set shall be listed to UL2200 or submit to an independent third party certification process to verify compliance as installed.
- C. The generator set and supplied accessories shall meet all applicable Environmental Protection Agency (EPA) TIER Emission Level or Emission Certification requirements

and any local requirements in effect at the time the generator set is ordered (for the proposed location of the generator).

- D. The control system for the generator set shall comply with the following requirements.
  - 1. CSA C22.2, No. 14 – M91 Industrial Control Equipment.
  - 2. EN50082-2, Electromagnetic Compatibility – Generic Immunity Requirements, Part 2: Industrial.
  - 3. EN55011, Limits and Methods of Measurement of Radio Interference Characteristics of Industrial, Scientific and Medical Equipment.
  - 4. FCC Part 15, Subpart B.
  - 5. IEC8528 part 4. Control Systems for Generator Sets
  - 6. IEC Std 801.2, 801.3, and 801.5 for susceptibility, conducted, and radiated electromagnetic emissions.
  - 7. UL508. The entire control system of the generator set shall be UL508 listed and labeled.
  - 8. UL1236 –Battery Chargers.
- E. The generator set manufacturer shall be certified to ISO 9001 International Quality Standard and shall have third party certification verifying quality assurance in design/development, production, installation, and service, in accordance with ISO 9001.

### 1.3 ACCEPTABLE MANUFACTURERS

- A. Caterpillar
- B. Cummins/Onan
- C. Generac
- D. Kohler

## PART 2 PRODUCTS

### 2.1 GENERATOR SET

- A. Ratings
  - 1. The generator set assembly (including both the motor/engine assembly and the generator assembly) shall operate at 1800 rpm, and the generator shall produce a 60 Hz waveform.
  - 2. Voltage and phase ratings shall be as shown on plans.
  - 3. Minimum kW rating (and associated alternator sizing) shall be the greater of the following:
    - a. Minimum kW rating listed on plans.
    - b. Ratings required to provide skVA as follows (shall be documented with reports in submittals using generator sizing software described in Part 3 below):
      - 1) If so listed on plans, the step loads fed by the generator at voltage/frequency dip criteria specified.
      - 2) If so listed on plans, the skVA rating specified.

- 3) If neither of the above are listed on plans, generator shall be sized to accommodate a block load of 100% of the Total Demand Load listed on plans, with a maximum voltage dip of 20% and a maximum frequency dip of 10%.
  4. kVA rating shall be 1.25 times the kW rating (based on .8 PF).
  5. Unless shown otherwise on plans, the generator set shall be rated based on the following site conditions:
    - a. Altitude of project site.
    - b. Ambient temperatures up to 120 degrees F.
  6. The generator set rating shall be based on emergency/standby service unless noted otherwise.
- B. Performance
1. Voltage regulation shall be plus or minus 0.5 percent for any constant load between no load and rated load. Random voltage variation with any steady load from no load to full load shall not exceed plus or minus 0.5 percent.
  2. Frequency regulation shall be isochronous from steady state no load to steady state rated load. Random frequency variation with any steady load from no load to full load shall not exceed plus or minus 0.5%.
  3. The engine-generator set shall be capable of accepting a single step load of 100% nameplate kW and power factor, less applicable derating factors, with the engine-generator set at operating temperature.
  4. Minimum motor starting capability shall be as shown on plans. The generator set shall be capable of recovering to a minimum of 90% of rated no load voltage following the application of the specified skVA load at near zero power factor applied to the generator set. Maximum voltage dip on application of this load, considering both alternator performance and engine speed changes shall not exceed 20% unless shown otherwise on plans.
  5. The alternator shall produce a clean AC voltage waveform, with not more than 5% total harmonic distortion at full linear load, when measured from line to neutral, and with not more than 3% in any single harmonic, and no 3<sup>rd</sup> order harmonics or their multiples. Telephone influence factor shall be less than 40.
  6. The generator set shall be certified by the engine manufacturer to be suitable for use at the installed location and rating, and shall meet all applicable exhaust emission requirements at the time of commissioning.
- C. Construction
1. The engine-generator set shall be mounted on a heavy-duty steel base to maintain alignment between components. The base shall incorporate a battery tray with hold-down clamps within the rails.
  2. The engine-generator set shall be rated for the seismic conditions for the installation location as mapped by the US Geological Survey and required by local building codes.
  3. All switches, lamps, and meters in the control system shall be oil-tight and dust-tight. All active control components shall be installed within a UL/NEMA 3R enclosure. There shall be no exposed points in the control (with the door open) that operate in excess of 50 volts.
- D. Connections

1. The generator set load connections shall be composed of silver or tin plated copper bus bars, drilled to accept compression terminations of the number and size as shown on the drawings. Sufficient lug space shall be provided for use with cables of the number and size as shown on the drawings.
2. Power connections to auxiliary devices shall be made at the devices, with required overcurrent protection located at panelboard(s) external to the generator set unless shown otherwise on plans. Where a load center or panelboard is shown within the generator enclosure on the plans, this load center/panelboard shall be furnished with the generator and shall comply with the applicable panelboard and identification sections of this specification.
3. Generator set control interfaces to other system components shall be made on a permanently labeled terminal block assembly. Labels describing connection point functions shall be provided.

## 2.2 ENGINE AND ENGINE EQUIPMENT

- A. The engine shall be diesel, 4 cycle, radiator and fan cooled. The horsepower rating of the engine at its minimum tolerance level shall be sufficient to drive the alternator and all connected accessories. Two cycle engines are not acceptable. Engine accessories and features shall include:
1. An electronic governor system shall provide automatic isochronous frequency regulation. The governing system dynamic capabilities shall be controlled as a function of engine coolant temperature to provide fast, stable operation at varying engine operating temperature conditions. The control system shall actively control the fuel rate and excitation as appropriate to the state of the generator set. Fuel rate shall be regulated as a function of starting, accelerating to start disconnect speed, accelerating to rated speed and operating in various isochronous or parallel states. The governing system shall include a programmable warm up at idle and cooldown at idle function. While operating in idle state, the control system shall disable the alternator excitation system.
  2. Skid-mounted radiator and cooling system rated for full load operation in 120 degrees F (49 degrees C) ambient as measured at the generator air inlet. Radiator fan shall be suitable for use in a system with 0.5 in H<sub>2</sub>O restriction. Radiator shall be sized based on a core temperature that is 20F higher than the rated operation temperature, or prototype tested to verify cooling performance of the engine/radiator/fan operation in a controlled environment. Radiator shall be provided with a duct adapter flange. The equipment manufacturer shall fill the cooling system with a 50/50-ethylene glycol/water mixture prior to shipping. Rotating parts shall be guarded against accidental contact.
  3. Electric starter(s) capable of three complete cranking cycles without overheating.
  4. Positive displacement, mechanical, full pressure, lubrication oil pump.
  5. Full flow lubrication oil filters with replaceable spin-on canister elements and dipstick oil level indicator.
  6. An engine driven, mechanical, positive displacement fuel pump. Fuel filter with replaceable spin-on canister element. Fuel cooler, suitable for operation of the generator set at full rated load in the ambient temperature specified shall be provided if required for operation due to the design of the engine and the installation.
  7. Replaceable dry element air cleaner with restriction indicator.
  8. Flexible supply and return fuel lines.



9. Engine mounted battery charging alternator and solid-state voltage regulator.
10. Block heater
  - a. Engine mounted, thermostatically controlled, block heater(s) for each engine. Heater voltage shall be as shown on the project drawings. The coolant heater shall be UL499 listed and labeled.
  - b. The block heater shall be installed on the engine with silicone hose connections. Steel tubing shall be used for connections into the engine coolant system wherever the length of pipe run exceeds 12 inches. The block heater installation shall be specifically designed to provide proper venting of the system. The block heaters shall be installed using quick disconnect couplers to isolate the heaters for replacement of the heater element without draining the coolant from the generator set. The quick disconnect/automatic sealing couplers shall allow the heater element to be replaced without draining the engine cooling system or significant coolant loss.
  - c. The block heater shall be provided with a DC thermostat, installed at the engine thermostat housing. An AC power connection box shall be provided for a single AC power connection to the block heater system.
  - d. The block heater(s) shall be sized as recommended by the engine manufacturer to warm the engine to a minimum of 104F (40C) in a 40F (4C) ambient, in compliance with NFPA110 requirements, or the temperature required for starting and load pickup requirements of this specification. If the heater quantities or wattage ratings are different than shown on plans, contractor shall be responsible for providing the properly-rated circuits (with circuit breakers) as required to the heater(s).
11. Provide vibration isolators, spring & pad type, quantity as recommended by the generator set manufacturer. Isolators shall include seismic restraints if required by site location.
12. Starting and Control Batteries shall be calcium/lead antimony type, 24 volt DC, sized as recommended by the engine manufacturer, complete with battery cables and connectors. The batteries shall be capable of a minimum of three complete 15-second cranking cycles at 40F ambient temperature when fully charged.
13. Provide critical-grade exhaust silencer(s) for each engine of size and type as recommended by the generator set manufacturer and approved by the engine manufacturer. Exhaust system shall be installed according to the engine manufacturer's recommendations and applicable codes and standards.
14. A UL listed/CSA certified voltage regulated battery charger shall be provided for each engine-generator set. The charger shall be located at the generator unless shown otherwise on plans. Output amperage, Input AC voltage and DC output voltage shall be as required. Chargers shall be equipped with float, taper and equalize charge settings. Charger shall include an Analog DC voltmeter and ammeter, 12 hour equalize charge timer, and AC and DC fuses. Operational monitors shall provide visual output along with individual form C contacts rated at 4 amps, 120 VAC, 30VDC for remote indication of:
  - a. Loss of AC power - red light
  - b. Low battery voltage - red light
  - c. High battery voltage - red light
  - d. Power ON - green light and N.O. relay contact

## 2.3 FUEL TANK

- A. Refer to “Sub-Base Fuel Tank” Paragraph below for fuel tank requirements.

## 2.4 AC GENERATOR

- A. The AC generator shall be; synchronous, four pole, 2/3 pitch, revolving field, drip-proof construction, single pre-lubricated sealed bearing, air cooled by a direct drive centrifugal blower fan, and directly connected to the engine with flexible drive disc. All insulation system components shall meet NEMA MG1 temperature limits for Class H insulation system and shall be UL1446 listed. Actual temperature rise measured by resistance method at full load shall not exceed 105 degrees Centigrade.
- B. The generator shall be capable of delivering rated output (kVA) at rated frequency and power factor, at any voltage not more than 5 percent above or below rated voltage.
- C. A permanent magnet generator (PMG) shall be included to provide a reliable source of excitation power for optimum motor starting and short circuit performance. The PMG and controls shall be capable of sustaining and regulating current supplied to a single phase or three phase fault at approximately 300% of rated current for not more than 10 seconds.
- D. AC generator shall be 12-lead reconnectable type to provide the following voltage output configurations:
  - 1. 277/480V-3Phase-4Wire
  - 2. 120/208V-3Phase-4Wire
  - 3. 120/240V-3Phase-4Wire
  - 4. 120/240V-1Phase-3Wire
- E. The subtransient reactance of the alternator shall not exceed 12 percent, based on the standby rating of the generator set.

## 2.5 GENERATOR SET CONTROL

- A. The generator set shall be provided with a microprocessor-based control system that is designed to provide automatic starting, monitoring, and control functions for the generator set. The control system shall also be designed to allow local monitoring and control of the generator set, and remote monitoring and control as described in this specification.
- B. The control shall be mounted on the generator set, or may be mounted in a free-standing panel next to the generator set if adequate space and accessibility is available. The control shall be vibration isolated and prototype tested to verify the durability of all components in the system under the vibration conditions encountered.
- C. The generator set mounted control shall include the following features and functions:
  - 1. Control Switches
    - a. Mode Select Switch. The mode select switch shall initiate the following control modes. When in the RUN or MANUAL position the generator set shall start, and accelerate to rated speed and voltage as directed by the operator. A separate push-button to initiate starting is acceptable. In the OFF position the generator set shall immediately stop, bypassing all time delays. In the AUTO position the generator set shall

- be ready to accept a signal from a remote device to start and accelerate to rated speed and voltage.
- b. The integrity of the generator remote start circuit shall be monitored for broken, disconnected or shorted wires. Loss of integrity shall start the generator.
  - c. EMERGENCY STOP switch. Switch shall be Red "mushroom-head" push-button. Depressing the emergency stop switch shall cause the generator set to immediately shut down, and be locked out from automatic restarting.
  - d. RESET switch. The RESET switch shall be used to clear a fault and allow restarting the generator set after it has shut down for any fault condition.
  - e. PANEL LAMP switch. Depressing the panel lamp switch shall cause the entire panel to be lighted with DC control power. The panel lamps shall automatically be switched off 10 minutes after the switch is depressed, or after the switch is depressed a second time.
2. Generator Set AC Output Metering. The generator set shall be provided with a metering set including the following features and functions:
    - a. Analog voltmeter, ammeter, frequency meter, power factor meter, and kilowatt (KW) meter. Voltmeter and ammeter shall display all three phases. Meter scales shall be color coded in the following fashion: green shall indicate normal operating condition, amber shall indicate operation in ranges that indicate potential failure, and red shall indicate failure impending. Metering accuracy shall be within 1% at rated output.
    - b. The control system shall monitor the total load on the generator set, and maintain data logs of total operating hours at specific load levels ranging from 0 to 110% of rated load, in 10% increments. The control shall display hours of operation at less than 30% load and total hours of operation at more than 90% of rated load.
    - c. The control system shall log total number of operating hours, total kWh, and total control on hours, as well as total values since reset.
  3. Generator Set Alarm and Status Display.
    - a. The generator set control shall include LED alarm and status indication lamps. The lamps shall be high-intensity LED type. The lamp condition shall be clearly apparent under bright exterior day lighting conditions.
    - b. The generator set control shall indicate the existence of the warning and shutdown conditions on the control panel. Conditions required to be annunciated shall include:
      - 1) low oil pressure (warning)
      - 2) low oil pressure (shutdown)
      - 3) oil pressure sender failure (warning)
      - 4) low coolant temperature (warning)
      - 5) high coolant temperature (warning)
      - 6) high coolant temperature (shutdown)
      - 7) high oil temperature (warning)
      - 8) engine temperature sender failure (warning)
      - 9) low coolant level (warning or shutdown - selectable)
      - 10) fail to crank (shutdown)
      - 11) fail to start/overcrank (shutdown)
      - 12) overspeed (shutdown)

- 13) low DC voltage (warning)
  - 14) high DC voltage (warning)
  - 15) weak battery (warning)
  - 16) low fuel (warning)
  - 17) high AC voltage (shutdown)
  - 18) low AC voltage (shutdown)
  - 19) under frequency (shutdown)
  - 20) over current (warning)
  - 21) over current (shutdown)
  - 22) short circuit (shutdown)
  - 23) ground fault (warning) (if genset breaker is rated 1000A or greater)
  - 24) over load (warning)
  - 25) Genset circuit breaker tripped (warning)
  - 26) emergency stop (shutdown)
4. Engine Status Monitoring.
    - a. The following information shall be available from an analog status panel on the generator set control :
      - 1) engine oil pressure (psi or kPA)
      - 2) engine coolant temperature (degrees F or C)
      - 3) battery voltage (DC volts)
  5. Engine Control Functions.
    - a. The control system provided shall include a cycle cranking system, which allows for user selected crank time, rest time, and # of cycles. Initial settings shall be for 3 cranking periods of 15 seconds each, with 15 second rest period between cranking periods.
    - b. The control system shall include an idle mode control, which allows the engine to run in idle mode in the RUN position only. In this mode, the alternator excitation system shall be disabled.
    - c. The control system shall include an engine governor control, which functions to provide steady state frequency regulation as noted elsewhere in this specification. The governor control shall include adjustments for gain, damping, and a ramping function to control engine speed and limit exhaust smoke while the unit is starting.
    - d. The control system shall include time delay start (adjustable 0-300 seconds) and time delay stop (adjustable 0-600 seconds) functions.
    - e. The control system shall include sender failure monitoring logic for speed sensing, oil pressure, and engine temperature which is capable of discriminating between failed sender or wiring components, and an actual failure conditions.
  6. Alternator Control Functions:
    - a. The generator set shall include an automatic digital voltage regulation system that is matched and prototype tested by the engine manufacturer with the governing system provided. It shall be immune from misoperation due to load-induced voltage waveform distortion and provide a pulse width modulated output to the alternator exciter. The voltage regulation system shall be equipped with three-phase RMS sensing and shall control buildup of AC generator voltage to provide a linear rise and limit overshoot. The system shall include a torque-matching characteristic, which shall reduce output voltage in proportion to frequency below an adjustable frequency threshold.

Torque matching characteristic shall be adjustable for roll-off frequency and rate, and be capable of being curve-matched to the engine torque curve with adjustments in the field. The voltage regulator shall include adjustments for gain, damping, and frequency roll-off. Adjustments shall be broad range, with local indication of setting level.

- b. Controls shall be provided to monitor the output current of the generator set and initiate an alarm (over current warning) when load current exceeds 110% of the rated current of the generator set on any phase for more than 60 seconds. The controls shall shut down and lock out the generator set when output current level approaches the thermal damage point of the alternator (over current shutdown). The protective functions provided shall be in compliance to the requirements of NFPA70 article 445.
  - c. Controls shall be provided to individually monitor all three phases of the output current for short circuit conditions. The control/protection system shall monitor the current level and voltage. The controls shall shut down and lock out the generator set when output current level approaches the thermal damage point of the alternator (short circuit shutdown). The protective functions provided shall be in compliance to the requirements of NFPA70 article 445. This protection may be provided using a microprocessor-based programmable relay system designed to protect the alternator system from damage, or using programmable electronic-trip LSI breaker(s), programmed/set by the generator supplier to ensure full protection of the alternator system.
  - d. Controls shall be provided to monitor the KW load on the generator set, and initiate an alarm condition (over load) when total load on the generator set exceeds the generator set rating for in excess of 5 seconds. Controls shall include a load shed control, to operate a set of dry contacts (for use in shedding customer load devices) when the generator set is overloaded.
  - e. An AC over/under voltage monitoring system that responds only to true RMS voltage conditions shall be provided. The system shall initiate shutdown of the generator set when alternator output voltage exceeds 110% of the operator-set voltage level for more than 10 seconds, or with no intentional delay when voltage exceeds 130%. Under voltage shutdown shall occur when the output voltage of the alternator is less than 85% for more than 10 seconds.
  - f. When required by National Electrical Code or indicated on project drawings, the control System shall include a ground fault monitoring relay. The relay shall be adjustable from 3.8-1200 amps, and include adjustable time delay of 0-10.0 seconds. The relay shall be for indication only, and not trip or shut down the generator set. Note bonding and grounding requirements for the generator set, and provide relay that will function correctly in system as installed.
7. Other Control Functions
- a. The generator set shall communicate with the Automatic Transfer Switch via hardwired control connections as required.
  - b. The integrity of the generator remote start circuit shall be monitored for broken, disconnected or shorted wires. Loss of integrity shall start the generator.

- c. A battery monitoring system shall be provided which initiates alarms when the DC control and starting voltage is out of acceptable limits. During engine cranking (starter engaged), the low voltage limit shall be disabled, and DC voltage shall be monitored as load is applied to the battery, to detect impending battery failure or deteriorated battery condition.
- 8. Dry Contacts/Relays for Remote Monitoring:
  - a. The control system shall provide ten (10) programmable output relays. These relay outputs shall be configurable for any alarm, shutdown, or status condition monitored by the control. Five (5) of these relays shall be preconfigured (and labeled accordingly) to indicate:
    - 1) generator set operating at rated voltage and frequency
    - 2) common warning
    - 3) common shutdown
    - 4) load shed command and
    - 5) low fuel warning.
  - b. A fused 20 amp 24VDC power supply circuit shall be provided for customer use. DC power shall be available from this circuit at all times from the engine starting/control batteries.

## 2.6 GENERATOR REMOTE MANUAL STOP STATION

- A. Each generator set shall be furnished with a remote manual stop station of a type to prevent inadvertent or unintentional operation per NFPA 110 requirements.
- B. Stop station pushbutton shall be red, non-illuminated, push-pull, mushroom-type, maintained-contact, 1 5/8" diameter, 30mm base, heavy-duty, oil-tight, water-tight unit) mounted within guarded enclosure to prevent inadvertent operation and labeled with engraved nameplate (white letters on red background) to read: "GENERATOR EMERGENCY STOP" (or similar with specific generator name where so identified on drawings).
- C. Exact stop station type shall be coordinated with generator controls supplier to ensure a fully-functional system per NFPA 110 requirements.

## 2.7 GENERATOR MAIN LINE CIRCUIT BREAKER(S)

- A. The generator set shall be provided with a mounted main line circuit breaker(s), sized as shown on plans. The circuit breaker(s) shall incorporate an electronic trip unit that operates to protect the alternator under all overcurrent conditions, or a thermal-magnetic trip with other overcurrent protection devices that positively protect the alternator under overcurrent conditions. The supplier shall submit time overcurrent characteristic curves and thermal damage curve for the alternator, demonstrating the effectiveness of the protection provided.
- B. The main line circuit breaker(s) shall be provided with auxiliary contacts to indicate trip/off alarm conditions to the generator set control system.

## 2.8 OUTDOOR WEATHER-PROTECTIVE ENCLOSURE

- A. The generator set shall be provided with a weatherproof, sound-attenuated, outdoor enclosure, with the entire package listed under UL2200. The package shall comply with the requirements of the National Electrical Code for all wiring materials and component spacing. The total assembly of generator set, enclosure, and sub-base fuel tank (if applicable) shall be designed to be lifted into place using spreader bars. Housing shall provide ample airflow for generator set operation at rated load in an ambient temperature of 100F. The housing shall have hinged access doors as required to maintain easy access for all operating and service functions. All doors shall be lockable, and include retainers to hold the door open during service. Enclosure roof shall be cambered to prevent rainwater accumulation. Openings shall be screened to limit access of rodents into the enclosure. All electrical power and control interconnections shall be made within the perimeter of the enclosure.
- B. The enclosure shall reduce the sound level of the generator set while operating at full rated load to a maximum of 76 dBA (including exhaust noise) at any location 7 meters from the generator set in a free field environment:
- C. The enclosure shall include vertical air discharge hoods as required to redirect discharge air upwards and reduce noise accordingly.
- D. The enclosure shall be insulated with non-hydroscopic materials.
- E. The enclosure shall be rated for the wind and seismic conditions for the installation location as mapped by the US Geological Survey and required by local building codes.
- F. All sheet metal shall be primed for corrosion protection and finish painted with the manufacturers standard color using a two step electrocoating paint process, or equal meeting the performance requirements specified below. All surfaces of all metal parts shall be primed and painted. The painting process shall result in a coating that meets the following requirements:
  - 1. Primer thickness, 0.5-2.0 mils. Top coat thickness, 0.8-1.2 mils.
  - 2. Gloss, per ASTM D523-89, 80% plus or minus 5%. Gloss retention after one year shall exceed 50%.
  - 3. Crosshatch adhesion, per ASTM D3359-93, 4B-5B.
  - 4. Impact resistance, per ASTM D2794-93, 120-160 inch-pounds.
  - 5. Salt Spray, per ASTM B117-90, 1000+ hours.
  - 6. Humidity, per ASTM D2247-92, 1000+ hours.
  - 7. Water Soak, per ASTM D2247-92, 1000+ hours.
- G. Painting of hoses, clamps, wiring harnesses, and other non-metallic service parts shall not be acceptable. Fasteners used shall be corrosion resistant, and designed to minimize marring of the painted surface when removed for normal installation or service work.
- H. Enclosure shall be constructed of minimum 12 gauge steel for framework and 14 gauge steel for panels. All hardware and hinges shall be stainless steel.
- I. A factory-mounted critical exhaust silencer shall be installed inside the enclosure. The exhaust shall exit the enclosure through a rain collar and terminate with a rain cap. Exhaust connections to the generator set shall be through seamless flexible connections.

- J. The enclosure shall include the following maintenance provisions:
  - 1. Flexible coolant and lubricating oil drain lines, that extend to the exterior of the enclosure, with internal drain valves
  - 2. External radiator fill provision.

## 2.9 SUB-BASE FUEL TANK

- A. Provide a sub-base fuel tank for the generator set, sized to allow for full load operation of the generator set for 24 hours. The sub-base fuel tank shall be UL142 listed and labeled. Installation shall be in compliance to NFPA37. The fuel tank shall be a double-walled, steel construction and include the following features:
  - 1. Emergency tank and basin vents.
  - 2. Mechanical level gauge.
  - 3. Fuel supply and return lines, connected to generator set with flexible fuel lines as recommended by the engine manufacturer and in compliance to UL2200 and NFPA 37 requirements.
  - 4. Leak detection provisions, wired to the generator set control for local and remote alarm indication.
  - 5. High and low level float switches to indicate fuel level. Wire switches to generator control for local and remote indication of fuel level
  - 6. Basin drain.
  - 7. Integral lifting provisions.
- B. The equipment, as installed, shall meet all local and regional requirements for above ground tanks.
- C. Where the generator design/layout, sub-base fuel tank height, and/or concrete housekeeping pad for the generator set causes any circuit breaker handle, control device, metering display or other similar item to be located higher than 6'-7" above finished floor, the supplier shall provide an aluminum grating platform complete with stairs and handrails meeting all applicable code requirements for proper access to these items. The platform and stairs shall be permanently mounted to a concrete base as recommended by the system supplier. Alternatively, the supplier may relocate (at the factory) these items to be below 6'-7" above finished floor.

## 2.10 SEQUENCE OF OPERATION

- A. The maximum elapsed time allowed from loss of normal power to restoration of power to emergency circuits from generator through transfer switch shall be 10 seconds.
- B. Generator set shall start upon receipt of a start signal from remote equipment. The start signal shall be via hardwired connection to the generator set control.
  - 1. The integrity of the generator remote start circuit shall be monitored for broken, disconnected or shorted wires. Loss of integrity shall start the generator.
- C. The generator set shall complete a time delay start period as programmed into the control.
- D. The generator set control shall initiate the starting sequence for the generator set. The starting sequence shall include the following functions:
  - 1. The control system shall verify that the engine is rotating when the starter is signaled to operate. If the engine does not rotate after two attempts, the control



- system shall shut down and lock out the generator set, and indicate “fail to crank” shutdown.
2. The engine shall fire and accelerate as quickly as practical to start disconnect speed. If the engine does not start, it shall complete a cycle cranking process as described elsewhere in this specification. If the engine has not started by the completion of the cycle cranking sequence, it shall be shut down and locked out, and the control system shall indicate “fail to start”.
  3. The engine shall accelerate to rated speed and the alternator to rated voltage. Excitation shall be disabled until the engine has exceeded programmed idle speed, and regulated to prevent over voltage conditions and oscillation as the engine accelerates and the alternator builds to rated voltage.
  4. On reaching rated speed and voltage, the generator set shall operate as dictated by the control system in isochronous, synchronize, load share, load demand or load govern state.
- E. When all start signals have been removed from the generator set, it shall complete a time delay stop sequence. The duration of the time delay stop period shall be adjustable by the operator.
- F. On completion of the time delay stop period, the generator set control shall switch off the excitation system and shall shut down.
- G. Any start signal received after the time stop sequence has begun shall immediately terminate the stopping sequence and return the generator set to isochronous operation.

## **PART 3 EXECUTION**

### **3.1 SUBMITTALS.**

- A. Within 10 days after award of contract, provide six sets of the following information for review:
1. Manufacturer’s product literature and performance data, sufficient to verify compliance to specification requirements.
  2. A paragraph by paragraph specification compliance statement, describing the differences between the specified and the proposed equipment.
  3. Manufacturer's certification of prototype testing.
  4. Manufacturer's published warranty documents.
  5. Shop drawings showing plan and elevation views with certified overall dimensions, as well as wiring interconnection details.
  6. Interconnection wiring diagrams showing all external connections required; with field wiring terminals marked in a consistent point-to-point manner.
  7. Generator sizing software report(s) showing compliance with all specification requirements and any additional motor starting requirements indicated in contract documents.
  8. Time-current-curves demonstrating that the generator alternator relaying or breaker protective device(s) provide proper protection for the alternator by a comparison of the trip characteristic of the breaker with the thermal damage characteristic of the alternator.
  9. Manufacturer's installation instructions.

### 3.2 FACTORY TESTING.

- A. The generator set supplier shall perform a complete operational test on the generator set prior to shipping from the factory. A certified test report shall be provided. Equipment supplied shall be fully tested at the factory for function and performance.
- B. Factory testing may be witnessed by the owner and consulting engineer. Costs for travel expenses will be the responsibility of the owner and consulting engineer. Supplier is responsible to provide two weeks notice for testing.
- C. Generator set factory tests on the equipment shall be performed at rated load and rated power factor. Generator sets that have not been factory tested at rated power factor will not be acceptable. Tests shall include: run at full load, maximum power, voltage regulation, transient and steady-state governing, single step load pickup, and function of safety shutdowns.

### 3.3 INSTALLATION

- A. Equipment shall be installed by the contractor in accordance with final submittals and contract documents. Installation shall comply with applicable state and local codes as required by the authority having jurisdiction. Install equipment in accordance with manufacturer's instructions and instructions included in the listing or labeling of UL listed products.
- B. Installation of equipment shall include furnishing and installing all interconnecting wiring, fuel lines, etc. between all major equipment provided for the on-site power system. The contractor shall also perform interconnecting wiring between equipment sections (when required), under the supervision of the equipment supplier.
- C. Generator equipment shall be installed on concrete housekeeping pads. Equipment shall be permanently fastened to the pad in accordance with manufacturer's instructions and seismic requirements of the site.
- D. Remote stop station type, labeling and location shall be submitted by contractor to engineer and local fire marshal for approval prior to rough-in. Location shall be outside the room housing the prime mover (where so installed within a room) or elsewhere on the premises where the prime mover is located outside the building. Contractor shall provide all interconnections from remote stop station to generator set as required by generator set supplier for a fully-functional system.
- E. Equipment shall be initially started and operated by representatives of the manufacturer.
- F. All equipment shall be physically inspected for damage. Scratches and other installation damage shall be repaired prior to final system testing. Equipment shall be thoroughly cleaned to remove all dirt and construction debris prior to initial operation and final testing of the system.

### 3.4 ON-SITE ACCEPTANCE TEST:

- A. The complete installation shall be tested for compliance with the specification following completion of all site work. Testing shall be conducted by representatives of the

manufacturer, with required fuel supplied by Contractor. The Engineer shall be notified in advance and shall have the option to witness the tests.

- B. Installation acceptance tests to be conducted on-site shall include the following (performed in accordance with NFPA 110):
  - 1. "Cold start" test.
  - 2. Four (4) hour full load test. Provide resistive load banks and make temporary connections as required.
  - 3. One step rated load pickup test.
  - 4. Power failure test on the entire installed system. This test shall be conducted by opening the power supply from the utility service, and observing proper operation of the system for at least 2 hours. Coordinate timing and obtain approval for start of test with site personnel.
- C. Upon completion of the manufacturer's site start-up and checkout, the contractor shall leave the diesel tank half full of fuel for use by the owner.

### 3.5 TRAINING

- A. The equipment supplier shall provide training for the facility operating personnel covering operation and maintenance of the equipment provided. The training program shall be not less than 4 hours in duration and the class size shall be limited to not less than 5 persons. Training date shall be coordinated with the facility owner.

### 3.6 SERVICE AND SUPPORT

- A. The manufacturer of the generator set shall maintain service parts inventory at a central location which is accessible to the service location 24 hours per day, 365 days per year.
- B. The generator set shall be distributed and serviced by a local service organization that is trained and factory certified in generator set service. The supplier shall maintain an inventory of critical replacement parts at the local service organization, and in service vehicles. The service organization shall be on call 24 hours per day, 365 days per year.
- C. The manufacturer of the generator set shall own, maintain and make available (to engineer, free of charge) generator set sizing software that calculates voltage dip, frequency dip, THDI and THDV of proposed generator/alternator set using the following inputs:
  - 1. Summary of step loads including load type (across-the-line motor, VFD, Fire Pump, Fluorescent Lighting, UPS, etc.).
  - 2. Generator Set Duty (Standby, Prime, Continuous).
  - 3. Maximum Ambient Temperature.
  - 4. Project site altitude.
  - 5. Generator Fuel type.
  - 6. Voltage/Phase/Frequency.
- D. The manufacturer shall maintain model and serial number records of each generator set provided for at least 20 years.

### 3.7 WARRANTY

- A. The generator set and associated equipment shall be warranted for a period of not less than 2 years from the date of commissioning against defects in materials and workmanship.
- B. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc.

END OF SECTION 16231

## SECTION 16289

### SURGE PROTECTIVE DEVICES

#### PART 1 GENERAL

##### 1.1 RELATED DOCUMENTS

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

##### 1.2 SUMMARY

- A. Section includes field-mounted SPDs for low-voltage (<1000 V) power distribution and control equipment.
- B. The specified unit(s) shall provide effective high energy transient voltage surge suppression, surge current diversion and high frequency noise attenuation in all electrical modes for equipment connected downstream from the facility's meter or load side of the main overcurrent device. The unit(s) shall be connected in parallel with the facility's wiring system.
- C. The unit(s) shall be designed and manufactured in North America by a qualified manufacturer of suppression filter system equipment. The qualified manufacturer shall have been engaged in the commercial design and manufacturer of such products for minimum of ten (10) years.
- D. All products that are submitted according to these specification will be required to meet this specification in it's entirety for both service and distribution TVSS systems. Any product that is submitted and does not comply with all parts of this specification will be subject to rejection.

##### 1.3 DEFINITIONS

- A. VPR: Voltage Protection Rating.
- B. SPD: Surge Protective Device(s)
- C.  $I_{(n)}$ : Nominal Discharge Current

##### 1.4 SUBMITTALS

- A. See specification section 16050.
- B. Product Data: For each type of product indicated. Include:
  - 1. Maximum Single Impulse Surge Current Rating.
  - 2. Surge Life (Repetitive Surge) Rating.
  - 3. UL1449 (Latest Edition) Voltage Protection Ratings (VPR).
  - 4. UL1449 (Latest Edition) Nominal Discharge Current ( $I_n$ ).
  - 5. Product dimensions and weights.
  - 6. Furnished specialties and accessories.

- C. Qualification Data:
- D. Safety Agency File Number.
- E. ISO 9001-2008 Certification.
- F. ISO 1401-2001 Certification.
- G. Operation and Maintenance Data: For SPDs to include all submittal data and any applicable operation and maintenance manuals.
- H. Warranties: Sample of special warranties.

#### 1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a testing agency, and marked for intended location and application.
- B. The unit shall be UL 1449 Listed and CUL Approved as a Surge Protective Device and UL 1283 Listed as an Electromagnetic Interference Filter
- C. Provide 2<sup>nd</sup> party certified data demonstrating SPD response to ANSI/IEEE C62.41.2-2002 standard waveforms when tested according to IEEE C62.45.
- D. Comply with NFPA 70.
- E. All SPDs provided within this project at the service entrance, distribution panels, and sub-panels shall be from the same manufacturer.

#### 1.6 PROJECT CONDITIONS

- A. Service Conditions: Rate SPDs for continuous operation under the following conditions unless otherwise indicated:
  - 1. Maximum Continuous Operating Voltage: Not less than 115 percent of nominal system operating voltage.
  - 2. Operating Temperature: 30 to 150 deg F.
  - 3. Humidity: 0 to 95 percent, non-condensing.
  - 4. Altitude: Less than 13,000 feet above sea level.

#### 1.7 COORDINATION

- A. Where field-mounted SPD's are specifically shown on plans, coordinate locations of field-mounted SPDs to allow adequate clearances for maintenance.

#### 1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of surge suppressors that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: 10 years from date of Substantial Completion.

#### 1.9 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Replaceable Protection Modules: 1 of each size and type installed, where field-replaceable modular SPDs are provided.
  - 2. Fuses: 1 of each size and type installed, where field-replaceable fuses are provided.

## **PART 2 PRODUCTS**

### **2.1 SURGE PROTECTIVE DEVICES**

- A. Manufacturer:
  - 1. Integral Devices: Surge Protective Devices shall be as manufactured by the distribution equipment manufacturer (Square D, etc.), or by Surge Suppression Inc. if all of the performance of this specification are met and all UL listing of the equipment manufacturer are met.
  - 2. External Devices (where specifically specified on plans): Surge Protective Devices shall be as manufactured by the distribution equipment manufacturer (Square D, etc.) or Surge Suppression Inc.
- B. Each Surge Protective Device shall:
  - 1. Be internal to the associated distribution equipment (without violating any applicable UL listings) unless specifically shown otherwise on plans.
  - 2. Be UL 1449 (Latest Edition) listed.
  - 3. Have short-circuit current rating complying with UL 1449 (Latest Edition), that matches or exceeds the short-circuit rating of the associated distribution equipment.
  - 4. Be designed to withstand a maximum continuous operating voltage (MCOV) of not less than 115% of nominal RMS voltage.
  - 5. Have fuses, rated at 200-kA interrupting capacity.
  - 6. Have a minimum UL 1449 Nominal Discharge Current ( $I_n$ ) Rating of 20kA.
  - 7. Be fabricated using bolted compression lugs.
  - 8. Provide suppression for all ten (10) modes of protection.
  - 9. Have LED indicator lights for power and protection status of each phase.
  - 10. Have audible alarm, with silencing switch, to indicate when protection has failed.
  - 11. Have form-C contacts rated at 2 A and 24-V ac minimum, one normally open and one normally closed, for remote monitoring of protection status. Contacts shall reverse on failure of any surge diversion module or on opening of any current-limiting device. Coordinate with facility monitoring and control system if monitoring by that system is required by plans or other specifications.
  - 12. Have six-digit transient-event counter, mounted to front of equipment door, set to totalize transient surges (externally mounted SPD's may have the transient – event counter mounted on the visible face of the SPD).
  - 13. Meet all UL 96A requirements (for Lightning Protection Systems) where the device is installed at a service entrance of the facility. At a minimum, these devices shall:
    - a. Be marked as Type 1 or Type 2 SPDs with product Identity consisting of “Surge Protective Device” or “SPD”, and identifying all ratings so required by UL96A and the 4 digit alpha numeric Control Number.

- b. Have a minimum UL 1449 Nominal Discharge Current ( $I_n$ ) Rating of 20kA.
  - c. Be UL listed and labeled with holographic label.
- C. Peak Single-Impulse Surge Current Rating shall be meet the following minimums unless specifically shown otherwise on plans:

<b>Application</b>	<b>Per Phase</b>	<b>Per Mode</b>
<b>Service Entrance Devices</b>	240 kA	120 kA
<b>Downstream Devices</b>	160 kA	80 kA

- D. The ANSI/UL 1449 voltage protection rating (VPR) in grounded wye circuits, the SPDs shall not exceed the following:

<b>Modes</b>	<b>208Y/120V</b>	<b>480Y/277V</b>	<b>600Y/347V</b>
<b>L-N,L-G, N-G</b>	800	1200	1500
<b>L-L</b>	1200	2000	2500

- E. The ANSI /UL 1449 VPR for 240/120 V, 3-wire or 4-wire circuits with high leg shall not exceed the following:

<b>Modes</b>	<b>240/120V</b>
<b>L-N,L-G, N-G</b>	1200/800

## 2.2 ENCLOSURES

- A. Where external units are specifically specified on plans, units not mounted within electrical distribution equipment (such as switchboards, MCC's, etc.) shall be provided in enclosures with NEMA enclosure ratings that match or exceed the NEMA enclosure ratings of the equipment from which the units are fed. For example, a unit fed from a NEMA 4X stainless steel panelboard shall also be mounted within a NEMA 4X stainless steel enclosure.

## PART 3 EXECUTION

### 3.1 INSTALLATION

- A. All SPD's shall be integrally-mounted within the associated distribution equipment unless specifically shown otherwise on plans.
- B. Install SPDs at service entrance on load side, with ground lead bonded to service entrance ground.



- C. Install SPDs downstream of the service entrance with conductors or buses between suppressor and points of attachment as short and straight as possible. The lead lengths between the TVSS unit and the equipment being protected shall not exceed fourteen (14) inches without approval from the engineer. Do not bond neutral and ground. Leads shall be as straight as possible with no sharp bends.
- D. Where externally-mounted SPD's are specifically shown on plans, provide circuit breaker as directed by the SPD supplier as a dedicated disconnecting means for SPD unless otherwise indicated.

### 3.2 FIELD QUALITY CONTROL

- A. Ensure that interiors are free of foreign materials and dirt.
- B. Check and test switches, pushbuttons, meters for proper operation.
- C. Check and test indicating lights for proper operation and color.
- D. Perform manufacturer's on site field test procedures.

### 3.3 STARTUP SERVICE

- A. Do not perform insulation resistance (MEGGER) tests of the distribution wiring equipment with the SPDs installed. Disconnect all wires, including neutral, before conducting insulation resistance tests, and reconnect immediately after the testing is over.

### 3.4 SYSTEM WARRANTY

- A. The SPD system manufacturer shall warranty the entire SPD system against defective materials and workmanship for a period of ten (10) years from the date of substantial completion. This warranty is in effect as long as the unit is installed in compliance with the manufacturer's installation, operation, and maintenance manual, UL Listing requirements, and any applicable national or local electrical codes.
- B. Any SPD device which shows evidence of failure or incorrect operation, including damage as the result of lightning strikes, during the warranty period shall be replaced by the manufacturer at no charge to the owner. Warranty will provide for multiple exchanges of any inoperable devices at any time during the warranty period which starts at the date of substantial completion of the system to which the surge suppressor is installed.
- C. The manufacturer is required to have a nationwide network of factory-authorized local service representatives for repair and service of this product. The manufacturer shall have a dedicated 1-800 telephone number for service problems and questions. This number shall be manned by a knowledgeable factory employee to ensure prompt response to any emergency situation that may arise.

END OF SECTION 16289

## SECTION 16410

### SAFETY SWITCHES AND FUSES

#### PART 1 GENERAL

##### 1.1 DESCRIPTION

- A. Safety Switches
- B. Fuses
- C. Branch Feeders
- D. Feeders

#### PART 2 PRODUCTS

##### 2.1 SAFETY SWITCHES

- A. Safety switches shall be quick-make, quick-break, NEMA heavy duty type HD, fused or nonfused as shown. Switch blades shall be fully visible in the off position.
- B. Safety switches shall be furnished with transparent internal barrier kits to prevent accidental contact with live parts. Barriers shall provide finger-safe protection when the switch door is open and shall allow use of test probes and removal of fuses without removing barrier.
- C. Fused switches shall have provisions for class R, rejection type fuses.

##### 2.2 FUSES (600V)

- A. Fuses for all branch switches shall be Bussman Mfg. Co., Dual Element, Class "R" Fusetron.
- B. Fuses for main switch/switches shall be Bussman Mfg. Co. Hi-Cap.

##### 2.3 MANUFACTURER

- A. Safety switches shall be as manufactured by Square 'D' or Cutler Hammer.
- B. Fuses shall be as manufactured by Bussman Mfg. Co. or equal.

#### PART 3 EXECUTION

##### 3.1 SAFETY SWITCHES

- A. Safety switches shall be installed as shown on the plans and in accordance with N.E.C.
- B. Locations shown for safety switches on plans are diagrammatical only. Exact locations shall be field coordinated by contractor as required to provide code-required clearances.

- C. Switch enclosures shall be rated NEMA I indoors in dry locations and NEMA 4X stainless steel outdoors and in wet or process areas.
- D. Adequate support shall be provided for mounting safety switches. Safety switches shall not be mounted to the associated equipment (unless the safety switch is furnished with the equipment).

### 3.2 FUSES

- A. Fuses shall be sized as shown on drawings, unless a smaller size is required by the associated equipment supplier, in which case the contractor shall provide fuses sized as directed by the associated equipment supplier at no additional cost.
- B. Provide not less than one spare set of fuses for each size used. Provide an additional spare set for each five sets of same size fuses used.

END OF SECTION 16410

## SECTION 16415

### AUTOMATIC TRANSFER SWITCHES

#### PART 1 GENERAL

##### 1.1 SCOPE

- A. Provide complete factory assembled power transfer equipment with field programmable digital electronic controls designed for fully automatic operation and including: voltage sensors on all phases of both sources, power switch mechanism, permanently attached manual operation provisions, positive mechanical and electrical interlocking, and mechanically held contacts for both sources.
- B. The generator set manufacturer shall warrant transfer switches to provide a single source of responsibility for all the products provided. Technicians specifically trained to support the product shall service the transfer switches.

##### 1.2 CODES AND STANDARDS

- A. The automatic transfer switch installation and application shall conform to the requirements of the following codes and standards:
  - 1. CSA 282, Emergency Electrical Power Supply for Buildings
  - 2. NFPA70 – National Electrical Code. Equipment shall be suitable for use in systems in compliance to Article 700, 701, and 702.
  - 3. NFPA99 – Essential Electrical Systems for Health Care Facilities
  - 4. NFPA110 – Emergency and Standby Power Systems. The transfer switch shall meet all requirements for Level 1 systems.
  - 5. IEEE446 – Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications.
  - 6. NEMA ICS10-1993 – AC Automatic Transfer Switches.
- B. The transfer switch assembly shall comply with the following standards:
  - 1. CSA C22.2, No. 14 – M91 Industrial Control Equipment.
  - 2. EN55011, Class B Radiated Emissions
  - 3. EN55011, Class B Conducted Emissions
  - 4. IEC 1000-4-5 (EN 61000-4-5); AC Surge Immunity.
  - 5. IEC 1000-4-4 (EN 61000-4-4) Fast Transients Immunity
  - 6. IEC 1000-4-2 (EN 61000-4-2) Electrostatic Discharge Immunity
  - 7. IEC 1000-4-3 (EN 61000-4-3) Radiated Field Immunity
  - 8. IEC 1000-4-6 Conducted Field Immunity
  - 9. IEC 1000-4-11 Voltage Dip Immunity.
  - 10. IEEE 62.41, AC Voltage Surge Immunity.
  - 11. IEEE 62.45, AC Voltage Surge.
  - 12. UL1008 – Transfer Switches. Transfer switches shall be UL1008 (latest edition) listed. UL1008 transfer switches may be supplied in UL891 enclosures if necessary to meet the physical requirements of the project.
- C. The transfer switch manufacturer shall be certified to ISO 9001 International Quality Standard and shall have third party certification verifying quality assurance in design/development, production, installation, and service, in accordance with ISO 9001.

### 1.3 ACCEPTABLE MANUFACTURERS

- A. Cummins/Onan
- B. Caterpillar
- C. Generac
- D. Kohler
- E. Zenith
- F. Russelectric
- G. ASCO
- H. Eaton

## **PART 2 PRODUCTS**

### 2.1 POWER TRANSFER SWITCH

- A. Ratings
  1. Refer to the project drawings for specifications on the sizes and types of transfer switch equipment, withstand and closing ratings, voltage and ampere ratings, enclosure type, and accessories.
  2. Main contacts shall be rated for 600 Volts AC minimum.
  3. Transfer switches shall be rated to carry 100 percent of rated current continuously in the enclosure supplied, in ambient temperatures of -40 to +60 degrees C, relative humidity up to 95% (non-condensing), and altitudes up to 10,000 feet (3000M).
  4. Transfer switch equipment shall have withstand and closing ratings (WCR) in RMS symmetrical amperes equal to or greater than the required ratings shown on the drawings (at the specified voltage). The transfer switch shall be third party listed and labeled for use with the specific protective device(s) (both normal and emergency) installed in the application. All rating information including associated overcurrent devices shall be submitted with shop drawings. Where WCR is dependent on setting of upstream overcurrent device, transfer switch shall be field marked with the required settings of the associated device. When a power distribution system electrical study (including short circuit stud, etc.) is a part of the project, contractor shall further verify that all proposed equipment is properly rated (per the results of the study) prior to submitting shop drawings. The transfer switch and its upstream protection shall be coordinated.
- B. Construction
  1. Transfer switches shall be double-throw, electrically and mechanically interlocked, and mechanically held in the source 1 and source 2 positions. The transfer switch shall be specifically designed to transfer to the best available source if it inadvertently stops in a neutral position.

2. Transfer switches shall be of the Programmed (Delayed) Transition type. Transfer switches rated through 1000 amperes shall be equipped with permanently attached manual operating handles and quick-break, quick-make over-center contact mechanisms. Transfer switches over 1000 amperes shall be equipped with manual operators for service use only under de-energized conditions.
3. The switch shall completely disconnect the load from both sources for an adjustable period of time to allow regenerative voltage to decay to a safe level prior to connecting to the new source.
4. Main switch contacts shall be high-pressure silver alloy. Contact assemblies shall have arc chutes for positive arc extinguishing. Arc chutes shall have insulating covers to prevent inter-phase flashover.
5. All wiring shall be UL listed 105 degree C, 600 volt rated, and sized as required. Each wire, device or function shall be identified with a source and destination by silk-screen or similar permanent identification. Circuit boards shall be connected wiring harnesses by means of locking disconnect plug(s), to allow the control system to be easily disconnected and serviced without disconnecting power from the transfer switch mechanism.
6. Bus structures shall be constructed from silver plated copper or tin plated aluminum with bolted joints for all three phases, with a full neutral, and a 1/4 x 2 inch ground bus extending through all sections.
7. The framework and all other sheet metal components of the system shall be primed with a rust-inhibiting primer, and finished with two coats of satin finish ANSI 61 gray enamel, or manufacturer's standard color.
8. All door mounted control components shall be industrial type oil-tight devices with contact ratings a minimum of twice the maximum circuit ampacity they are controlling. Toggle switches and other light duty and durability control devices are not acceptable. Indicator lamps shall be high intensity LED type devices. Indicator lamp condition (on or off) shall be easily visible in bright room lighting conditions.
9. Power transfer switch shall be provided with flame retardant transparent covers to allow viewing of switch contact operation or shall be indicated by mechanical flags. Barriers shall be provided to prevent inadvertent contact with any voltage of greater than 50VDC.
10. Transfer switches shall be 3-pole with a solid neutral bus and lugs. The neutral bus shall be sized to carry 100% of the current designated on the switch rating.

C. Connections

1. Field control connections shall be made on a common terminal block that is clearly and permanently labeled.
2. Transfer switch shall be provided with AL/CU compression lugs suitable for the quantities and sizes of power conductors required.

2.2 TRANSFER SWITCH CONTROL

- A. Operator Panel. Each transfer switch shall be provided with a control panel to allow the operator to view the status and control operation of the transfer switch. The operator panel shall be permanently labeled for switch and control functions. The operator panel shall be provided with the following features and capabilities.

1. High intensity LED lamps to indicate the source that the load is connected to (source 1 or source 2); and which source(s) are available. Source available LED indicators shall operate from the control microprocessor to indicate the true condition of the sources as sensed by the control.
2. High intensity LED lamps to indicate that the transfer switch is “not in auto” (due to control being disabled or due to bypass switch (when used) enabled or in operation) and “Test/Exercise Active” to indicate that the control system is testing or exercising the generator set.
3. “OVERRIDE” pushbutton to cause the transfer switch to bypass any active time delays for start, transfer, and retransfer and immediately proceed with its next logical operation.
4. “TEST” pushbutton to initiate a preprogrammed test sequence for the generator set and transfer switch. The transfer switch shall be programmable for test with load or test without load.
5. “RESET/LAMP TEST” pushbutton that will clear any faults present in the control, or simultaneously test all lamps on the panel by lighting them.
6. The control system shall continuously log information on the number of hours each source has been connected to the load, the number of times transferred, and the total number of times each source has failed. This information shall be available via an operator display panel.
7. Vacuum fluorescent alphanumeric display panel with push-button navigation switches. The display shall be clearly visible in both bright (sunlight) and no light conditions. It shall be visible over an angle of at least 120 degrees. The Alphanumeric display panel shall be capable of providing the following functions and capabilities:
  - a. Display source condition information, including AC voltage for each phase of normal and emergency source, frequency of each source. Voltage for all three phases shall be displayed on a single screen for easy viewing of voltage balance. Line to neutral voltages shall be displayed for 4-wire systems.
  - b. Display source status, to indicate source is connected or not connected.
  - c. The display panel shall allow the operator to view and make the following adjustments in the control system, after entering an access code:
    - 1) Set nominal voltage and frequency for the transfer switch.
    - 2) Adjust voltage and frequency sensor operation set points.
    - 3) Set up time clock functions.
    - 4) Set up load sequence functions.
    - 5) Enable or disable control functions in the transfer switch, including program transition.
    - 6) Set up exercise and load test operation conditions, as well as normal system time delays for transfer time, time delay start, stop, transfer, and retransfer.
  - d. Display Real time Clock data, including date, and time in hours, minutes, and seconds. The real time clock shall be incorporate provisions for automatic daylight savings time and leap year adjustments. The control shall also log total operating hours for the control system.
  - e. Display service history for the transfer switch. Display source connected hours, to indicate the total number of hours connected to each source.

Display number of times transferred, and total number of times each source has failed.

- f. Display fault history on the transfer switch, including condition, and date and time of fault. Faults to include controller checksum error, low controller DC voltage, ATS fail to close on transfer, ATS fail to close on retransfer, battery charger malfunction, network battery voltage low, network communications error.

B. Internal Controls

1. The transfer switch control system shall be configurable in the field for any operating voltage level up to 600VAC. Provide RMS voltage sensing and metering that is accurate to within plus or minus 1% of nominal voltage level. Frequency sensing shall be accurate to within plus or minus 0.2%. Voltage sensing shall be monitored based on the normal voltage at the site. Systems that utilize voltage monitoring based on standard voltage conditions that are not field configurable are not acceptable.
2. Transfer switch voltage sensors shall be close differential type, providing source availability information to the control system based on the following functions:
  - a. Monitoring all phases of the normal service (source 1) for under voltage conditions (adjustable for pickup in a range of 85 to 98% of the normal voltage level and dropout in a range of 75 to 98% of normal voltage level).
  - b. Monitoring all phases of the emergency service (source 2) for under voltage conditions (adjustable for pickup in a range of 85 to 98% of the normal voltage level and dropout in a range of 75 to 98% of pickup voltage level).
  - c. Monitoring all phases of the normal service (source 1) and emergency service (source 2) for voltage imbalance.
  - d. Monitoring all phases of the normal service (source 1) and emergency service (source 2) for loss of a single phase.
  - e. Monitoring all phases of the normal service (source 1) and emergency service (source 2) for phase rotation.
  - f. Monitoring all phases of the normal service (source 1) and emergency service (source 2) for over voltage conditions (adjustable for dropout over a range of 105 to 135% of normal voltage, and pickup at 95-99% of dropout voltage level).
  - g. Monitoring all phases of the normal service (source 1) and emergency service (source 2) for over or under frequency conditions.
3. The transfer control shall incorporate a series of diagnostic LED lamps.
4. The transfer switch shall be configurable to control the operation time from source to source (program transition operation). The control system shall be capable of enabling or disabling this feature, and adjusting the time period to a specific value. A phase band monitor or similar device is not an acceptable alternate for this feature. The program/delayed transition time setting (time in which load is not connected to either source during transfer) shall be initially set at 10 seconds to allow motors to properly decay per MG-1 standard
5. The transfer switch shall incorporate adjustable time delays for generator set start (adjustable in a range from 0-15 seconds); transfer (adjustable in a range from 0-120 seconds); retransfer (adjustable in a range from 0-30 minutes); and generator stop (cooldown) (adjustable in a range of 0-30 minutes).



6. The transfer switch shall be configurable to accept a relay contact signal from an external device to prevent transfer to the generator service.
  7. The control system shall be designed and prototype tested for operation in ambient temperatures from -40C to +70C. It shall be designed and tested to comply with the requirements of the noted voltage surge and RFI/EMI standards.
  8. The control shall have optically isolated logic inputs, high isolation transformers for AC inputs, and relays on all outputs, to provide optimum protection from line voltage surges, RFI and EMI.
- C. Control Interface
1. The transfer switch shall provide an isolated relay contact for starting of a generator set. The relay shall be normally held open, and close to start the generator set. Output contacts shall be form C, for compatibility with any generator set.
  2. The integrity of the generator remote start circuit shall be monitored for broken, disconnected or shorted wires. Loss of integrity shall start the generator.
  3. Provide one set Form C auxiliary contacts on both sides, operated by transfer switch position, rated 10 amps 250 VAC.
  4. The transfer switch shall provide additional relay contacts to indicate the following conditions: Utility Source Available, Load Connected to Utility, Generator Source Available, Load Connected to Generator, Pre-Transfer Warning (adjustable 0-59 second time delay).

## 2.3 ENCLOSURE

- A. Enclosures shall be UL listed. The enclosure shall provide wire bend space in compliance to the latest version of NFPA70. The cabinet door shall include permanently mounted key type latches.
- B. If not specifically indicated otherwise on plans, transfer switch equipment enclosures shall meet the following minimum requirements:
  1. For dry interior locations: NEMA 1 or better (unless shown otherwise on plans).
  2. For wet interior (pump stations, etc.) or exterior locations: NEMA 3R or better (unless shown otherwise on plans).
- C. The cabinet shall provide code-required wire bend space at point of entry as shown on the drawings. Manual operating handles and all control switches (other than key-operated switches) shall be accessible to authorized personnel only by opening the key-locking cabinet door. Transfer switches with manual operating handles and/or non key-operated control switches located on outside of cabinet do not meet this specification and are not acceptable.
- D. Note size and access requirements for the transfer switch (and associated equipment) and provide equipment that will fit into the space allowed and comply with code-specified access requirements.

## 2.4 BATTERY CHARGING

- A. The transfer switch/generator set combination shall be provided with a battery charger for the generator set starting batteries. Refer to Generator Sets Specification Section 16231

for specific requirements. Supply power failed indication shall be displayed on the ATS control panel.

## 2.5 SEQUENCE OF OPERATION

### A. Programmed (Delayed) Transition Sequence of Operation

1. Normal State:
  - a. Transfer switch normally connects an energized utility power source (source 1) to loads and a generator set (source 2) to the loads when normal source fails. The normal position of the transfer switch is connected to source 1 (connected to the utility), and no start signal is supplied to the genset.
2. Normal Power Failure and Restoration:
  - a. When the transfer switch senses a power failure on source 1, it shall complete a pre-programmed time delay start sequence, and then send a start signal to the generator set.
  - b. The generator set shall immediately start and accelerate to rated voltage and frequency.
  - c. The transfer system shall complete a programmable time delay sequence, and then transfer to source 2 by delayed (programmed) transition. The transfer switch shall accomplish this by opening the normal source contacts, and closing the alternate source contacts a predetermined time period later (to allow motor loads to decay per NEMA MG-1 standard).
  - d. On return of source 1 to acceptable voltage and frequency levels, the control system shall initiate a time delay retransfer sequence. On completion of the time delay sequence, the transfer switch shall operate to connect the loads to the normal source by opening the alternate source contacts, and closing the normal source contacts a predetermined time period later (to allow motor loads to decay per NEMA MG-1 standard). The timing sequence for the contact operation shall be programmable in the controller. The control system shall transfer loads back to source 1 in the reverse sequence to that which was used to connect loads to source 2.
  - e. If the generator set fails during this period and normal source is available, the transfer switch shall automatically reconnect the system loads to the normal service.
  - f. The transfer switch shall operate the generator set unloaded for a cooldown period, and then remove the start signal from the generator set.
3. Generator Set Exercise (Test) With Load Mode (Delayed (programmed) Transition). The control system shall be configurable to test the generator set under load. In this mode, the transfer switch shall control the generator set in the following sequence:
  - a. Transfer switch shall initiate the exercise sequence at a time indicated in the exercise timer program, or when manually initiated by the operator.
  - b. The transfer switch shall issue a compatible start command to the generator set as follows:
    - 1) On generators rated 50kW and greater, the transfer switch shall cause the generator set to start and run at idle until it has reached normal operating temperature. When the generator set has reached normal operating temperature or after an adjustable time period (whichever

- is shorter), the control system shall accelerate the generator set to rated voltage and frequency.
- 2) On generators rated less than 50kW, the generator set shall immediately start and accelerate to rated voltage and frequency.
- c. When the control systems senses the generator set at rated voltage and frequency, it shall operate to connect the loads to the generator set by opening the normal source contacts, and closing the alternate source contacts a predetermined time period later (to allow motor loads to decay per NEMA MG-1 standard). The timing sequence for the contact operation shall be programmable in the controller.
  - d. The generator set shall operate connected to the load for the duration of the exercise period.
  - e. On completion of the exercise period, the transfer switch shall operate to connect the loads to the normal source by opening the alternate source contacts, and closing the normal source contacts a predetermined time period later (to allow motor loads to decay per NEMA MG-1 standard). The timing sequence for the contact operation shall be programmable in the controller.
  - f. The transfer switch shall operate the generator set unloaded for a cooldown period, and then remove the start signal from the generator set.
  - g. If the normal power fails at any time when the generator set is running, the transfer switch shall immediately connect the system loads to the generator set.
  - h. If the generator set fails during the exercise period and normal source is available, the transfer switch shall automatically reconnect the system loads to the normal service.
4. Generator Set Exercise (Test) Without Load Mode. The control system shall be configurable to test the generator set without transfer switch load connected. In this mode, the transfer switch shall control the generator set in the following sequence:
- a. Transfer switch shall initiate the exercise sequence at a time indicated in the exercise timer program, or when manually initiated by the operator.
  - b. The transfer switch shall issue a compatible start command to the generator set as follows:
    - 1) On generators rated 50kW and greater, the transfer switch shall cause the generator set to start and run at idle until it has reached normal operating temperature. When the generator set has reached normal operating temperature or after an adjustable time period (whichever is shorter), the control system shall accelerate the generator set to rated voltage and frequency.
    - 2) On generators rated less than 50kW, the generator set shall immediately start and accelerate to rated voltage and frequency.
  - c. When the control systems senses the generator set at rated voltage and frequency, it shall operate the generator set unloaded for the duration of the exercise period.
  - d. At the completion of the exercise period, the transfer switch shall remove the start signal from the generator set. If the normal power fails at any time when the generator set is running, the transfer switch shall immediately connect the system loads to the generator set.

## **PART 3 EXECUTION**

### **3.1 POWER COMPANY APPROVAL**

- A. The transfer switch shall be designed to meet all applicable power company requirements for connection to the power company's system, and if applicable, shall be on the power company's approved list of automatic transfer switches. Contractor shall ensure that transfer switch is specifically approved by power company for connection to their system prior to purchasing the transfer switch.

### **3.2 FACTORY TESTING**

- A. The transfer switch manufacturer shall perform a complete operational test on the transfer switch prior to shipping from the factory. A certified test report shall be submitted. Test process shall include calibration of voltage sensors.

### **3.3 SERVICE AND SUPPORT**

- A. The manufacturer of the transfer switch shall maintain service parts inventory at a central location which is accessible to the service location 24 hours per day, 365 days per year.
- B. The transfer switch shall be serviced by a local service organization that is trained and factory certified in both generator set and transfer switch service. The supplier shall maintain an inventory of critical replacement parts at the local service organization, and in service vehicles. The service organization shall be on call 24 hours per day, 365 days per year.
- C. The manufacturer shall maintain model and serial number records of each transfer switch provided for at least 20 years.
- D. After generator set installation, the generator set supplier shall conduct a complete operation, basic maintenance, and emergency service seminar for up to 5 persons employed by the facility owner. The seminar shall include instruction on operation of the transfer equipment, normal testing and exercise, adjustments to the control system, use of the PC based service and maintenance tools provided under this contract, and emergency operation procedures. The class duration shall be at least 4 hours in length, and include practical operation with the installed equipment.

### **3.4 WARRANTY**

- A. The automatic transfer equipment shall be warranted (by the generator supplier when a generator is supplied within the project) for a period of not less than 2 years from the date of commissioning against defects in materials and workmanship.
- B. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc.

END OF SECTION 16415

## SECTION 16442

### LIGHTING PANELBOARDS

#### PART 1 GENERAL

##### 1.1 GENERAL

- A. The work under this section includes but is not limited to the following:
  - 1. Lighting Panelboards
  - 2. Circuit Breakers

#### PART 2 PRODUCT

##### 2.1 PANELBOARDS

- A. Enclosure:
  - 1. Panelboards shall be dead front type and shall be in accordance with Underwriter's Laboratories, Inc., standard of panelboards and enclosing cabinets and so labeled.
  - 2. Panelboards installed in dry locations shall have enclosures fabricated from sheet steel and shall be finished in ASA #49. Panelboards installed in corrosive, exterior or wet locations shall have NEMA 4 stainless steel enclosures.
  - 3. The door shall have a cylinder type lock. Lock shall be held in place by concealed screw to a captive nut, welded to inside of door. All locks shall be keyed alike.
  - 4. A metal framed circuit directory card holder with clear plastic covering shall be factory-mounted on the inside of door.
  - 5. Panels for 20 or more circuits, including spares and spaces, shall be 20 inches wide.
  - 6. Panelboards enclosures shall be as shown on panel schedule on plans for surface, flush or motor control center mounting.
  - 7. Provide hinged trim with piano-hinge down full length of one side to allow access to wiring without complete removal of outer trim.
  - 8. Each section of multi-section panelboards shall be of matching heights and depths.
- B. Bussing/Lugs:
  - 1. Ampacity and service voltage of main buss, lugs or main breakers and branch circuit breakers shall be as shown on drawings.
  - 2. All bussing and associated connectors shall be tin-plated copper.
  - 3. All panelboards shall contain ground buss.
  - 4. Entire panelboard shall be capable of withstanding a short circuit not less than the interrupting capacity of any breaker in the panel. When a power distribution system electrical study (including short circuit stud, etc.) is a part of the project, contractor shall further verify that all proposed equipment is properly rated (per the results of the study) prior to submitting shop drawings. Interrupting ratings shall be full ratings. Series ratings will not be allowed unless shown otherwise on drawings.
  - 5. Buss connectors shall be for distributed phase arrangement.

6. Main and sub-feed lugs shall be provided with AL/CU compression lugs suitable for the quantities and sizes of conductors required.
  7. Top/bottom feed arrangement and lug sizes/quantities shall be coordinated by the contractor.
  8. Entire panelboard assembly, including all bussing, shall have SCCR ratings meeting or exceeding the minimum AIC ratings listed on the plans for the panel. When a power distribution system electrical study (including short circuit stud, etc.) is a part of the project, contractor shall further verify that all proposed equipment is properly rated (per the results of the study) prior to submitting shop drawings. All ratings shall be full ratings. Series ratings will not be allowed unless shown otherwise on drawings.
  9. Service entrance panelboards shall be provided with barrier such that no uninsulated, ungrounded service busbar or service terminal is exposed to inadvertent contact by persons or maintenance equipment while servicing load terminations
- C. Breaker arrangement and numbering:
1. Panelboards shall be factory assembled with branch breakers arranged exactly as indicated on plans.
  2. Breakers shall be numbered vertically beginning top left. Multi-section panelboards shall be numbered consecutively through all sections.
  3. Breaker numbers shall be permanently attached to trim.
  4. Main breakers shall be vertically-mounted (branch-mounted or back-fed main breakers will not be acceptable unless specifically so shown on plans).

## 2.2 CIRCUIT BREAKERS

- A. Circuit breakers shall be quick break, quick make, thermal magnetic type, for alternating current. Breakers shall trip free for the handle and tripping shall be indicated by the handle assuming a position between OFF and ON.
- B. Circuit breakers shall be of the bolt-on type.
- C. Multi-pole breakers shall be internal common trip with single operating handle; external handle ties are not acceptable, unless specifically noted otherwise (such as for multi-wire branch circuits described below).
- D. Circuit breakers feeding multiwire branch circuits (as defined by NEC) consisting of separate single phase loads sharing a common neutral shall be provided with multi-pole breakers or handle ties to simultaneously disconnect all ungrounded conductors per NEC Article 210.4(B). The necessary locations of these multi-pole breakers or handle ties shall be coordinated by the contractor. Where necessary, the contractor may rearrange circuit breakers (as minimally as possible) as required to meet this requirement.
- E. All breakers shall meet the minimum RMS symmetrical interrupting capacity ratings shown on plans for the associated panel. All interrupting ratings shall be full ratings. Series ratings will not be allowed unless shown otherwise on drawings.
- F. All branch circuit breakers shall be listed to UL489 or shall be specially-tested to be HACR listed.

### 2.3 SPECIAL REQUIREMENTS

- A. Any special requirements on the drawings, such as for increased interrupting rating, ground fault protection, etc., shall supersede these specifications, but only insofar as that particular requirement is concerned.
- B. Lighting panels larger than 400A shall conform to the requirements for power panels.

### 2.4 MANUFACTURER

- A. Panelboards shall be as manufactured by Square 'D' or Cutler Hammer.

## **PART 3 EXECUTION**

### 3.1 INSTALLATION

- A. All panelboard dimensions and clearances shall be carefully checked and coordinated with the proper trades to insure proper mounting space and support prior to roughing in equipment. In no case shall any circuit breaker be located above 6'-7" A.F.F..
- B. Wiring in panelboard wireways shall be done in a neat and workmanlike manner. Wiring shall be grouped into neat bundles and secured with approved tie wraps.
- C. For all flush-mounted panelboards, a minimum of three (3) one-inch empty conduits shall be stubbed out above the nearest accessible ceiling space for future use.

### 3.2 PANEL IDENTIFICATION

- A. Refer to Specification Section 16075.

END OF SECTION 16442

## SECTION 16480

### MANUFACTURED CONTROL PANELS

#### PART 1 GENERAL

##### 1.1 SCOPE

- A. This section describes control stations, PLC panels, motor control panels, manufactured control panels, and other similar panels specified herein. Specifications herein are intended as an extension of requirements in other Divisions of these specifications where reference is made to Electrical Specifications.

##### 1.2 DEFINITIONS

- A. "Control Stations": Enclosures (with all required accessories) containing only door-mounted pushbuttons, indicator lights and/or selector switches (no electronic components or starter/controller equipment).
- B. "Control Panels": Enclosures (with all required accessories) containing equipment/devices other than door-mounted pushbuttons, indicator lights and/or selector switches (such as electronic components, starter/controller equipment, etc.).

##### 1.3 SUBMITTALS

- A. Provide the following for each control panel:
  - 1. A job-specific, custom wiring diagram
    - a. The wiring diagram shall clearly show all components (whether the components are mounted internal or external to the control panel enclosure).
    - b. All wires and terminal blocks shall be clearly labeled.
    - c. Diagram shall be in accordance with NEMA/ICS standards.
  - 2. Size, type and rating of all system components.
  - 3. Unit frontal elevation and dimension drawings.
  - 4. Internal component layout diagrams.
  - 5. Manufacturer's product data sheets for all components.
- B. A Bill of Materials shall be included with catalog information on all components.
- C. Information shall be included on any proprietary logic component sufficient to demonstrate its ability to perform the required functions.
- D. The following calculations shall be submitted:
  - 1. Thermal calculations showing amount of air conditioning or ventilation and heating required for each control panel, per ambient requirements listed below and operating temperature limitations of all equipment/devices within each control panel. Where possible, forced air ventilation shall be utilized rather than air conditioning. Panel shall be oversized, interior equipment/devices shall be derated, and solar shielding shall be provided as required to allow the use of forced air ventilation as the cooling method. Air conditioning, ventilation, and/or



heating equipment shall each have ratings/capacities at least 20% larger than required by calculations below unless noted otherwise:

- a. Thermal calculations used for sizing cooling/ventilation systems for each control panel located in exterior or non-conditioned spaces shall assume:
    - 1) Ambient exterior air temperature ranges of -5 degrees F to 105 degrees F.
    - 2) Full solar contact where applicable (not applicable where enclosures are fully protected from solar contact using solar shields separated from panel enclosure with standoffs or similar).
    - 3) No wind.
    - 4) Heat loss from interior equipment (electronics, etc.) per equipment supplier's information.
  - b. Thermal calculations used for sizing heating systems for each control panel shall assume:
    - 1) Ambient exterior air temperature ranges of -5 degrees F to 105 degrees F.
    - 2) No heat loss by interior components of control panel.
    - 3) No solar gain on exterior of control panel.
    - 4) Doubling of heating wattage required to account for wind where control panels are located outdoors.
    - 5) Minimum temperature difference (due to heating) of 10 degrees F to prevent condensation, regardless of equipment temperature limitations.
2. Load calculations showing the sizing of all power supplies provided (with spare capacity as specified). Power supplies shall each have ratings/capacities at least 20% larger than required by load calculations unless noted otherwise.
  3. Load calculations showing the sizing and anticipated runtime of all Uninterruptible Power Supply systems provided (with spare capacity as specified).

## **PART 2 PRODUCTS**

### **2.1 GENERAL**

- A. Control panels shall be Underwriters' Laboratories labeled by the panel manufacturer. Control panel manufacturers not capable of applying the U.L. label to their products are unacceptable.
- B. All human interface equipment/devices (indicator lights, selector switches, pushbuttons, time switches, displays, keypads, and other similar items used for control, adjustments or monitoring) shall be mounted on the non-energized side of enclosure door(s) in such a way as to be accessible without exposing the user to energized parts.

### **2.2 RATINGS**

- A. All Control Panels shall have short circuit current ratings at least equal to the lesser of the following, unless noted otherwise on plans:
  1. The short circuit current rating of the electrical distribution equipment that feeds the Control Panel.

2. 150% of the available fault current at the Control Panel as determined by a Short Circuit Current study prepared by a licensed professional electrical engineer.
- B. All equipment/devices installed within control panels shall be rated to operate in ambient temperatures of 50 degrees C (122 degrees F) or higher.

### 2.3 ENCLOSURES

- A. All enclosures (with any required accessories or auxiliary items) shall fit within the space shown on the Plans. Any costs associated with furnishing equipment which exceeds the available space shall be borne by the Contractor.
- B. Enclosures (with any required accessories or auxiliary items) shall be suitable for the environment where installed.
- C. Enclosure materials shall be as follows unless noted otherwise:
1. Control Stations:
    - a. Where located in extremely corrosive areas (chlorine rooms, fluoride rooms, etc.): NEMA 4X of non-metallic construction (with non-metallic hardware) compatible with the associated chemical(s).
    - b. Where located in other wet, process or outdoor areas: NEMA 4X of type 304 stainless steel construction (with stainless steel hardware).
    - c. Where located in dry, non-process, indoor areas (such as electrical rooms): NEMA 1 of die cast zinc/aluminum construction.
  2. Control Panels:
    - a. Where located in extremely corrosive areas (chlorine rooms, fluoride rooms, etc.): NEMA 4X of non-metallic construction (with non-metallic hardware) compatible with the associated chemical(s).
    - b. Where located in other wet, process or outdoor areas: NEMA 4X of type 304 stainless steel construction (with stainless steel hardware).
    - c. Where located in dry, non-process, indoor areas (such as electrical rooms): NEMA 1 or 12.
- D. Control Panel Enclosure Construction:
1. Non-metallic control panel enclosure material, where specified, shall be reinforced polyester resin or equivalent, with a minimum thickness of 3/16 inch for all surfaces except those requiring reinforcement. Panels shall be precision molded to form a one piece unit with all corners rounded. Exterior surfaces shall be gel-coated to provide a corrosion-resistant maintenance-free satin finish which shall never need painting. Color pigments shall be molded into the resin. Color shall be grey.
  2. Metallic control panel enclosures, where specified, shall be fabricated using a minimum of 14 gauge steel for wall or frame mounted enclosures and a minimum of 12 gauge for freestanding enclosures. Continuously weld all exterior seams and grind smooth. Reinforce sheet steel with steel angles where necessary support equipment and ensure rigidity and preclude resonant vibrations.
  3. Use pan-type construction for doors.
  4. Door widths shall not exceed 36-inches.
  5. Mount doors with full length, heavy duty piano hinge with hinge pins.

6. Provide gasket completely around each door opening.
  7. Mount and secure all internal components to removable back plate assembly.
  8. For NEMA 1 or 12 enclosures, provide handle-operated key-lockable three point stainless steel latching system for each door.
  9. For NEMA 4X enclosures, provide provisions for padlocking all doors and provide clamps on three (3) sides of each door.
- E. Control panel enclosures (and associated backpanels and other similar accessories) shall be manufactured by Hoffman Engineering Co., or Saginaw Control & Engineering.

#### 2.4 CONTROL PANEL ACCESSORIES:

- A. Cooling systems shall be provided if so required by the application to maintain temperatures within the acceptable ranges of the interior equipment. In no case (regardless of temperature ratings of internal equipment) shall maximum temperatures within control panels be allowed to exceed 50 degrees C (122 degrees F). Thermostats shall be provided to control cooling without need of manual operation. Thermostat setpoints shall be as per recommendations of the equipment suppliers. See above for thermal calculation requirements. Cooling units shall be as manufactured by Hoffman Engineering Co., Rittal or approved equal and shall be thermostatically controlled.
- B. Space heaters shall be provided for condensation and temperature control. Thermostats AND hygrostats (or combination hygrotherm controllers) shall be provided to control heating requirements (based on temperature and relative humidity within enclosure) without need of manual operation. Setpoints shall be as per recommendations of the equipment suppliers. See above for thermal calculation requirements. Space heaters and associated control devices shall be as manufactured by Hoffman Engineering Co., Rittal, Stego or approved equal.
- C. NEMA 4X control panels shall be provided with vapor-phase corrosion inhibitor(s) (chemical combinations that vaporize and condense on all surfaces in the enclosed area, to protect metal surfaces/devices within the enclosed area from corrosion). Corrosion inhibitor shall be Hoffman #AHCI series (sized as required by the enclosure volume to be protected) or equal.
- D. For outdoor panels, stainless steel solar shields for front, top and each side of panel, supported to associated panel face with standoffs as required (to allow free air flow between solar shield and panel enclosure), shall be provided where required to limit solar loading on panel to allow use of a ventilated panel design rather than an air-conditioned panel design.
- E. Provide a sun shield over all LCD displays in exterior-mounted panels. Sun shield shall be collapsible to fully protect LCD display from UV light when not in use, shall provide side and top shielding when in use, shall be constructed of stainless steel and shall be installed such as to maintain NEMA 4X ratings of enclosures.
- F. Provide a clear polycarbonate gasketed hinged door or window to encompass all indicators, controllers, recorders, etc. mounted on NEMA 4 and 4X enclosures.

- G. Provide interior mounting panels and shelves constructed of minimum 12 gauge steel with white enamel finish. Provide metal print pocket with white enamel finish on inside of door.
- H. Provide interior LED light kit, mounted at top of interior of panel, and switched to turn “ON” when door is opened for the following control panels:
  - 1. Control panels with outer dimensions greater than 20” wide or 30” high.
  - 2. Control panels containing PLCs or other similar programmable devices.
- I. Control panels containing VFDs or Reduced Voltage Soft Starters shall include a door mounted digital keypad for adjusting the starter parameters and viewing process values and viewing the motor and starter statuses without opening the enclosure deadfront door.

## 2.5 CONTROL COMPONENTS

- A. General:
  - 1. All pushbuttons, pilot lights, selector switches and other control devices shall be separate, standard size (full 30mm) and shape, heavy duty oil-tight units.
    - a. Devices in extremely corrosive areas (chlorine rooms, fluoride rooms, etc.) shall be of non-metallic construction.
    - b. Devices in other areas shall be of chrome-plated construction.
  - 2. All components and devices so that connection can be easily made and so there is ample room for servicing each item.
  - 3. Door-mounted indicators, recorders, totalizers and controllers shall be located between 48” and 72” above finished floor level.
  - 4. Door-mounted indicator lights, selector switches and pushbuttons shall be located between 36” and 80” above finished floor level.
  - 5. All devices and components shall be adequately supported to prevent movement. Mounting strips shall be used to mount relays, timers and other devices suitable for this type of mounting.
- B. Pilot Lights:
  - 1. All pilot lights to be cluster LED type & push to test.
- C. Pushbuttons:
  - 1. All STOP operators within control stations located at equipment shall be provided with lockout provisions and a minimum of two (2) sets of contact blocks.
  - 2. Emergency shutoff pushbutton devices shall be as follows unless noted otherwise:
    - a. 2 ¼” diameter, mushroom-style, maintained contact push buttons
    - b. With a minimum of one (1) normally open dry contact and three normally closed dry contacts.
    - c. Connections made such that pushing “in” the button will shutoff the associated equipment.
    - d. Provided with a red engraved nameplate with ½” lettering to read “Emergency Shutoff”.
- D. Relays:
  - 1. Control relays shall have the following characteristics, unless noted otherwise:

- a. General purpose, plug-in type.
  - b. Minimum mechanical life of 10 million operations.
  - c. Coil voltage as indicated or required by application.
  - d. Single-break contacts rated 12 amperes, resistive at 240 volts.
  - e. Contacts as shown on wiring diagrams plus a minimum of one (1) spare N.O. contact and one (1) spare N.C. contact. At a minimum, each individual relay shall have 3PDT contacts. Where required, multiple control relays shall be provided (to provide the required quantities of contacts) for each "relay" function shown on plans/diagrams.
  - f. Furnished with RC transient suppressor to suppress coil-generated transients to 200% of peak voltage.
  - g. LED on/off indicator light and manual operator.
  - h. Industry standard wiring and pin terminal arrangements.
  - i. Equal to Square D 8501KP series with matching plug-in socket.
2. Interposing/isolation relays used to isolate discrete output field wiring (and where required for voltage translation for other discrete signals) to/from PLC inputs/outputs shall be terminal-block style. Terminal-block style relays shall have the following characteristics, unless noted otherwise:
- a. Minimum mechanical life of 10 million operations.
  - b. Single-break contacts rated 6 amperes, resistive at 120 volts.
  - c. One (1) N.O. contact per relay.
  - d. Furnished with integral transient protection.
  - e. LED on/off indicator light.
  - f. DIN-rail mounted.
  - g. Equal to Square D type Zelio RSL.
3. Timer relays shall be electronic, adjustable plug-in devices meeting the following characteristics, unless noted otherwise:
- a. General purpose, plug-in type.
  - b. Minimum mechanical life of 10 million operations.
  - c. Single-break contacts rated 10 amperes, resistive at 240 volts.
  - d. Contacts as shown on wiring diagrams plus a minimum of one (1) spare N.O. contact and one (1) spare N.C. contact. At a minimum, each relay shall have DPDT contacts (2 N.O. & 2N.C.). Where required, multiple timer or control relays shall be provided (to provide the required quantities of contacts) for each "relay" function shown on plans/diagrams.
  - e. Rotary-thumbwheel adjustments for time value, timing range and function.
  - f. Time value adjustments from .05 seconds to 999 hours
  - g. Selectable Timing Functions, including the following:
    - 1) On Delay
    - 2) Interval
    - 3) Off Delay
    - 4) One Shot
    - 5) Repeat Cycle-Off
    - 6) Repeat Cycle-On
    - 7) On/Off Delay
    - 8) One Shot Falling Edge
    - 9) Watchdog
    - 10) Trigger On Delay

- h. Accuracy shall be  $\pm 2\%$  and repeatability shall be  $\pm 0.1\%$ .
- i. Furnished with integral transient protection.
- j. LED indicator light(s) for “timing” and “on/off status”
- k. Held in place with hold-down spring
- l. Equal to Square D type JCK with matching plug-in socket.

## 2.6 CONFORMAL COATINGS

- A. All printed circuit boards within electronic devices (PLCs, RTUs, controllers, I/O modules, power supplies, touchscreens, Ethernet switches, radios, etc.) installed in panels located in non-conditioned or exterior/process areas shall be conformal-coated for harsh environments.

## 2.7 DC POWER SUPPLIES

- A. DC Power supplies shall be provided where specified elsewhere, or as required by design of system. Power supplies shall be industrial type, AC-to-DC switching, output voltage as required, 120vac input, size as required for the initial application plus 50% spare capacity.
- B. Redundant power supplies with diode isolation shall be provided so that the loss of one power supply does not affect system operation. The back-up supply systems shall be designed so that either the primary or the back-up supply can be removed, repaired, and returned to service without disrupting the system operation.
- C. Power supply output shall be protected by secondary overcurrent protection device(s).
- D. The power distribution from multiloop supplies shall be selectively fused so that a fault in one instrument loop will be isolated from the other loops being fed from the same supply.
- E. Each power supply shall meet the following requirements.
  - 1. Regulation, line: 0.4% for input from 105 to 132vac.
  - 2. Regulation, load: 0.8%
  - 3. Ripple/Noise: 15mV RMS / 200 mV peak to peak
  - 4. Operating temperature range: 0 deg C - 60 deg C
  - 5. Overvoltage protection
  - 6. Overload Protection
  - 7. Output shall remain within regulation limits for a least 16ms after loss of AC power at full load.
  - 8. Output status indicator.
  - 9. UL listing
- F. Power supplies shall be manufactured by Puls, Sola, Phoenix Contact or equal.

## 2.8 UNINTERRUPTIBLE POWER SUPPLIES

- A. Uninterruptible power supplies (UPSs) shall be provided where specified elsewhere, or as required by design of system. Power supplies shall be industrial type, size as required for the initial application plus 50% spare capacity unless noted otherwise.

- B. Battery runtime shall be as specified elsewhere. If no other specification for battery runtime is specified, battery runtime shall be 12.5 minutes at full load.
- C. UPSs shall be double-conversion, on-line type.
- D. UPSs shall be rated for operation in -20 degrees C to 55 degrees C ambient temperatures.
- E. UPS batteries shall be hot-swappable and 12-year rated when installed in 25 degrees C environment and 4-year rated when installed in 50 degrees C environment.
- F. UPSs shall include dry contacts for the following alarm points:
  1. Loss of Input Power Alarm
  2. Low Battery Alarm
- G. UPSs shall be manufactured by Falcon UPS or approved equal.

## 2.9 DISCONNECTS

- A. A main disconnect switch or circuit breaker shall be supplied integral to all control panels. The main disconnect or circuit breaker shall be accessible/operable without exposing the operator to energized sections of the control panel(s), and shall be lockable in the open/off position.
- B. Individual circuit breakers shall be provided integral to the manufactured control panel for each separate power circuit originating within the control panel.
- C. Where the highest continuous current trip setting for which the actual overcurrent device installed in a circuit breaker is rated (or can be adjusted to is 1200A or higher, breakers shall be electronic trip and shall be provided with arc energy-reducing maintenance switching (with local status indicator) to reduce arc flash energy per NEC 240.87 requirements.
- D. Manufacturers:
  1. Square 'D' or Cutler Hammer.

## 2.10 COMBINATION STARTERS

- A. All combination starters shall utilize a unit disconnect. Magnetic starters shall be furnished in all combination starter units unless specifically shown otherwise. All starters shall utilize full NEMA/EEMAC rated contactors (size 1 minimum).
- B. Starters shall be provided with a three-pole, external (door mounted) manual reset, solid state overload relay. Solid state overload relay shall have switch-selectable trip class and shall provide protection from:
  1. Overload.
  2. Phase Unbalance.
  3. Phase Loss.
  4. Ground Fault (Class II detection).
- C. Unless specifically shown otherwise, each combination starter or each group of starters shall be furnished with a control circuit transformer including two primary protection

fuses and one secondary fuse (in the non-ground secondary conductor). The transformer shall be sized to accommodate the contactor(s) and all connected control circuit loads (including motor space heaters and other similar loads where specified). The transformer rating shall be fully visible from the front when the unit door is opened. Unless otherwise indicated, control voltage shall be 120V AC. Control power shall be provided by individual unit control power transformers.

- D. When a unit control circuit transformer is not provided, the disconnect shall include an electrical interlock for disconnection of externally powered control circuits.
- E. Auxiliary control circuit interlocks shall be provided where indicated. Auxiliary interlocks shall be field convertible to normally open or normally closed operation.
- F. NEMA/EEMAC Size 1-4 starters shall be mounted directly adjacent to the wireway so that power wiring (motor leads) shall connect directly to the starter terminals without the use of interposing terminals. Larger starters shall be arranged so that power wiring may exit through the bottom of the starter cubical without entering the vertical wireway.
- G. Each starter shall be equipped with a minimum of the following control devices:
  - 1. Door-mounted reset button.
  - 2. Two (2) field-reversible (N.O./N.C.) auxiliary contacts
  - 3. For reversing and two-speed starters: Four (4) field-reversible (N.O./N.C.) auxiliary contacts
  - 4. Additional control devices as indicated on plans.
- H. Control Wiring Terminal Blocks
  - 1. Terminal blocks shall generally be:
    - a. Feed-thru, screw-in type
    - b. DIN rail mounted
    - c. Furnished with the stationary portion of the block secured to the unit bottom plate
    - d. Furnished with unit-mounted control terminal blocks for each field wire.
    - e. Rated for the voltage and current of the proposed application per UL/NEC standards.
    - f. Sized (by supplier) for the associated wire gauges/types/quantities.
    - g. Phoenix Contact UT-4 series, Weidmuller WDU-4 series (or equivalent) unless required otherwise by application.
- I. Nameplates
  - 1. Each unit shall be properly labeled with an engraved phenolic nameplate with a white background and black letters.
  - 2. Each pilot device shall be properly labeled with a legend plate or an engraved phenolic nameplate.
- J. Manufacturers:
  - 1. Square 'D' or Cutler Hammer.

## 2.11 WIRING

- A. Refer to Section 16120 for all wiring types/applications.



- B. All wiring shall be identified on each end with hot stamped, shrink tube type, or self-laminating vinyl permanent wire markers to correspond with numbering shown on wiring diagrams.
- C. All connections shall be made on terminals with no splices.
- D. All wiring runs shall be along horizontal or vertical routes to present a neat appearance. Angled runs will not be acceptable. Group or bundle parallel runs of wire in plastic wire duct where practical.
- E. All wiring runs shall be securely fastened to the panel or wire duct by means of plastic wire ties. Adequately support and restrain all wire runs to prevent sagging or movement.
- F. AC power wiring and instrumentation/analog wiring shall be run separate.
- G. Color code all internal wiring (not field wiring) as follows:
  - 1. Line and load circuits: Black (B)
  - 2. AC control wiring: Red (R)
  - 3. Externally-Powered control wiring: Yellow (Y)
  - 4. Neutral wiring: White (W)
  - 5. Low voltage DC(+)pos: Blue (BL)
  - 6. Low voltage DC(-)neg: Blue/White Tracer (BL/W)
  - 7. Grounding: Green (G)
- H. Terminal strips shall be provided for all input and output wiring. No more than two (2) wires shall be connected to one (1) terminal block.

## 2.12 ELECTRICAL SURGE AND TRANSIENT PROTECTION

- A. General
  - 1. Function: Protect the system against damage due to electrical surges.
- B. Application: As a minimum, provide surge and transient protection (with proper grounding) at the following locations as described below:
  - 1. Power Input High Frequency Noise Filtering:
    - a. 120VAC Control panels with integral UPSs, PLCs, or other electronic/microprocessor equipment that is susceptible to failure or improper operation due to high frequency/harmonic input transients shall be provided with series-connected high-frequency noise filters on the line input (downstream of any panel main disconnects/breakers). Filters shall be as manufactured by Edco/Emerson/Islatrol or equal (exact type(s) as required by application).
  - 2. Power Input Surge Protection:
    - a. Provide surge protection device at any connection of 120VAC power to panels containing programmable logic controllers, remote I/O equipment, UPS's, transmitters, radios, VFDs, Reduced Voltage Soft Starters or other electronic equipment. Device shall:
      - 1) Be mounted internal to the associated panel, with dedicated overcurrent protection.
      - 2) Be of two-part (base and SPD), DIN-rail mountable construction.

- 3) Have 15kA total nominal discharge current per line (based on 8/20 $\mu$ s waveform).
  - 4) Have maximum continuous operating voltage (MCOV) rating as required by the associated circuit voltage.
  - 5) Visually indicate operational status.
  - 6) Be Dehn DEHNguard series or equal by MTL Technologies, or may be combined with the High Frequency Noise Filtering device required above.
- b. Provide surge protection device at any connection of multi-pole AC power to panels containing programmable logic controllers, remote I/O equipment, UPS's, transmitters, radios, VFDs, Reduced Voltage Soft Starters or other electronic equipment. Device shall:
- 1) Be mounted internal to the associated panel, with dedicated overcurrent protection.
  - 2) Provide protection for all phases.
  - 3) Have 40kA (per phase) peak surge current rating.
  - 4) Have maximum continuous operating voltage (MCOV) rating as required by the associated circuit voltage.
  - 5) Visually indicate operational status.
  - 6) Be Square D SDSA or HWA series or equal.
3. Analog I/O Panel Terminations Surge Protection:
- a. Provide surge protection device at the PLC (or similar) panel connection of each analog I/O signal. Device shall:
- 1) Be mounted internal to the associated panel.
  - 2) Be of two-part (base and SPD), DIN-rail mountable construction.
  - 3) Have 10kA total nominal discharge current per line (based on 8/20 $\mu$ s waveform).
  - 4) Have maximum continuous operating voltage (MCOV) rating as required by the associated signal.
  - 5) Be Dehn Blitzductor XT series or equal by MTL Technologies.
4. Discrete I/O Panel Terminations Surge Protection:
- a. Provide isolation relay at the PLC (or similar) panel connection of each discrete output signal (within the associated panel). See above for isolation relay requirements.
5. Low Voltage Power Supply Load Side Surge Protection:
- a. Provide surge protection device at the PLC (or similar) panel on the load side of each low voltage power supply that has low voltage connections extending external to the panel. Device shall:
- 1) Be mounted internal to the associated panel.
  - 2) Be of two-part (base and SPD), DIN-rail mountable construction.
  - 3) Have 10kA total nominal discharge current per line (based on 8/20 $\mu$ s waveform).
  - 4) Have maximum continuous operating voltage (MCOV) rating as required by the associated utilization voltage.
  - 5) Be as manufactured by Dehn, MTL Technologies, or Phoenix Contact.
6. Network Panel Terminations Surge Protection:
- a. Provide surge protection device at the PLC (or similar) panel connection of each network cable. Device shall:
- 1) Be mounted internal to the associated panel.

- 2) Be of DIN-rail mountable construction.
  - 3) Have 1kA total nominal discharge current per line (based on 8/20 $\mu$ s waveform).
  - 4) Be designed specifically for the associated network connection type (Ethernet, RS485, RS232, etc.).
  - 5) Be MTL Zonebarrier series or equal.
7. Antenna Cable Terminations Surge Protection:
- a. Provide surge protection device at the connection of antenna cable to the radio panel. Device shall:
    - 1) Be mounted internal to the associated panel.
    - 2) Provide coarse protection via replaceable gas-filled surge voltage arrestor
    - 3) Be Phoenix Contact CN-LAMBDA series or equal.
- C. Installation and grounding of suppressor: As directed by manufacturer. Provide coordination and inspection of grounding.

## **PART 3 EXECUTION**

### **3.1 INSTALLATION**

- A. Provide enclosure mounting supports as required for floor, frame or wall mounting. All supports in exterior, wet or process areas shall be stainless steel unless noted otherwise. All floor-mounted panels or other similar distribution equipment shall be mounted on 6" concrete housekeeping pads unless specifically shown otherwise.
- B. All enclosures used outside shall be solid bottom unless otherwise specified. All cable and piping openings shall be sealed watertight. Cable and piping shall enter the enclosure as shown on drawings or specified herein.
- C. All equipment and components shall be solidly grounded to the control panel. One grounded terminal unit shall be provided in each control panel for connection to plant ground system. Grounding digital and analog components shall be performed in accordance with the instrument supplier's installation recommendations. Signal ground shall be solidly connected to the ground system so as to prevent ground loops

### **3.2 PAINTING**

- A. For enclosures other than NEMA 4X stainless steel or fiberglass:
  1. Completely clean all surfaces so that they are free of corrosive residue. Then, phosphatize all surfaces for corrosion protection.
  2. Prime with two (2) coats and finish with one coat of factory finish textured polyurethane. Paint shall be Sherwin-Williams Polane "T" or approved equal.
  3. Color to be selected during shop drawing review phase.

### **3.3 IDENTIFICATION & DOCUMENTATION**

- A. Refer to specification section 16075 for additional requirements.

- B. Control panel power supply source, type, voltage, number or circuit ratings shall be identified inside control panels and on drawings.
- C. All interior devices and components shall be identified with thermal transfer labels with black letters on white background. Labels shall be placed on the subpanel and not the component. Marking system shall be a Brother "PTouch II" or equal. Lettering shall be 1/4" high.
- D. All front panel mounted devices such as push buttons shall be identified by the use of engraved bakelite nameplates or legend plates. Nameplates shall be 1/8" thick, white with black core.
- E. Where a panel includes a PLC or other network-connected device that is intended to be connected to another system (such as a plant SCADA system) via a network connection, the panel supplier shall provide an Interface Control Document (ICD) to the other system supplier (such as the SCADA Integrator). This document shall itemize the following for each networked parameter that is capable of being monitored or controlled by the other system:
  1. Parameter Name/Function (ex: Pump No. 1 On/Off Status)
  2. Parameter Type (discrete or analog, input or output)
  3. Parameter register ID/location
- F. Where a panel includes a touchscreen or other programmable HMI display and is to be monitored by another system (such as a plant SCADA system), the panel supplier shall provide copies of the HMI display code and screenshots of all proposed HMI screens to the other system supplier (such as the SCADA Integrator) for their use in duplicating the associated HMI.
- G. A job-specific, custom wiring diagram for each control panel (not including control stations without relays) shall be provided to the contractor prior to installation for making the appropriate electrical connections. The wiring diagram shall clearly show all control components connected to the panel (whether the components are mounted internal or external to the enclosure). All wires and terminal blocks shall be clearly labeled. A laminated copy of the final wiring diagram for each unit shall be installed inside the door of the associated panel, and submitted to the owner with the as-built documentation.

### 3.4 OWNER TRAINING

- A. Fully train the owner in the proper operation of all control panels/equipment, describing and demonstrating full operation, including function of each door-mounted device.

### 3.5 SPARE EQUIPMENT

- A. Provide the following spare equipment:
  1. Fuses: 10% (minimum of 3) of each size and type utilized, mounted within a pocket within the associated control panel.
  2. Where control panel contains programmable controller (or similar equipment): Flash drive containing copies of all final programs utilized within the control panel, with provisions/cable assemblies as required to connect the flash drive provided to the controller to download the programs. Flash drive shall be

attached to retractable cord (long enough to reach the associated port) attached to the inside of the panel door.

END OF SECTION 16480

## SECTION 16491

### FUSES

#### PART 1 GENERAL

##### 1.1 GENERAL

- A. THE WORK UNDER THIS SECTION INCLUDES BUT IS NOT LIMITED TO THE FOLLOWING:
  - 1. Fuses

#### PART 2 PRODUCTS

##### 2.1 FUSES

- A. Fuses - 600 volts and less - shall be furnished and installed by electrical contractor who will maintain fuses in original new condition until installed. Fuses shall not be installed until equipment is ready to be energized.
- B. Fuses 601 to 6000 amperes shall be time-delay, Class L type with an "O" ring to provide seal between the end bells and the glass melemine fuse barrel. Terminals shall be panned. Fuses must hold 500% rating for a minimum of 4 seconds and clear 20 times rated current in .01 seconds or less. Fuses shall be current-limiting and be listed by Underwriters Laboratories, Inc. with an interrupting rating of 200,000 amperes r.m.s. symmetrical. Bussmann Hi-Cap, time-delay, Class L fuses.
- C. All other fuses for power, light and motor circuits shall be dual-element, Class RK5 type with separate overload and short-circuit elements. The overload element shall incorporate a spring activated thermal unit having a 284 Degree Fahrenheit melting point alloy and with a heat sink that will provide time-delay of a minimum of 10 seconds at 500% rating. Fuses shall be current-limiting and be listed by Underwriters Laboratories, Inc. with an interrupting rating of 200,000 amperes r.m.s. symmetrical. Bussmann Low-Peak, dual-element, Class RK5 fuses.
- D. Fuses shall be installed in fluorescent fixtures on the line side of the ballast by the fixture manufacturer who will size the fuses for each application. Bussmann GLR fuses installed in HLR fuseholder.
- E. Fuses for all other ballast-controlled lighting fixtures shall have fuses installed on the line side of the ballast either in the housing or handhole of lighting standards for easy access. Bussmann FNQ fuse with HPF holder for all applications. Bussmann FNQ fuse with HPF holder for all applications except lighting Standards where Bussmann HEB-JJ holder with FNQ fuse will be used.

##### 2.2 MANUFACTURER

- A. Fuses shall be as manufactured by Bussmann Manufacturing or approved equal. Approved substitutions will be allowed that provide required electrical safety overload and short-circuit performance. Electrical contractor shall submit one copy each of fuse

and fuse holder manufacturers bulletins that fully describe performance for substitution approval consideration. The bulletins shall be submitted to the Electrical Design Engineer at time of bid submittal.

### **PART 3 EXECUTION**

#### **3.1 SPARE FUSES**

- A. Spare fuses shall be provided by the electrical contractor. 10% (minimum of 3) of each size and type will be placed in a Spare Fuse Cabinet mounted on the wall of the electrical room.

END OF SECTION 16491

## SECTION 16511

### LIGHTING MATERIALS AND METHODS

#### PART 1 GENERAL

##### 1.1 DESCRIPTION

- A. Lighting Fixtures
- B. Drivers

##### 1.2 SUBMITTALS

- A. Complete submittals shall be provided identifying all lighting fixture types and options, all lamp types (where applicable) and compliance with all contract requirements. The absence of clear submittal information specifically listing exceptions/deviations from detailed contract requirements will be understood to indicate that the contractor/supplier intends to meet all contract requirements. Refer to specification section 16050 for additional requirements.

#### PART 2 PRODUCTS

##### 2.1 GENERAL

- A. Lighting fixtures shall be furnished as shown on plans and specified herein. It shall specifically be the responsibility of Contractor to verify exact types ceilings, walls, etc. and recessing depth of all recessed fixtures and furnish the specific mounting trims and accessories of the specified and/or accepted fixture specifically for the ceiling, wall etc. in which each fixture is to be installed.
- B. Base bid manufacturers are listed on the lighting fixture schedule. Manufacturers listed without accompanying catalog numbers are responsible for meeting the quality standards, efficiency, maximum wattages and photometric distributions set by the specified product.
- C. All lighting fixtures shall be so designed and shall have drivers and other similar items so installed as to function without interruptions or failures when operating in the environment in which they are proposed to be installed. Special attention shall be given to environments with potentially high ambient temperatures such as attic spaces, exterior soffits, confined interior soffits, coves, unconditioned spaces, etc. and shall be addressed by providing fixtures with suitable high ambient temperature ratings, remote mounting of drivers/ballasts, providing approved ventilation, etc. as directed by fixture manufacturer and approved by engineer, at contractor's expense.
- D. All fixtures installed such as to create penetrations through fire rated ceiling or wall assemblies shall be labeled as suitable for that purpose or installed with covers, tenting or other means as required to maintain the fire rating of the assembly.

##### 2.2 LED LUMINAIRES



- A. For the purpose of these specifications, LED Luminaires shall be defined as the entire LED fixture assembly including LED array, drivers, housing, electronics, etc. that compose the lighting fixture.
- B. Furnish and install LED Luminaire of proper size, type, efficacy, delivered lumen output, color temperature, distribution pattern, operational life, and CRI as shown on drawings.
- C. LED Luminaires shall be tested in accordance with LM-79 and LM-80 standards.
- D. LED drivers shall comply with NEMA 410 standards for inrush current, etc.
- E. Exterior, pole mounted LED Luminaires shall be provided with an easily-serviceable, UL recognized surge protection device that meets a minimum 10kA Category C Low operation (IECC C62.41.2-2002). Device shall be wired in front of light engine(s) and driver(s) and shall fail "open" such as to prevent fixture operation after a surge protection failure.
- F. LED Luminaires shall have a guarantee-warranty of at least five years unless specifically noted otherwise on contract documents.
- G. LED Luminaire assembly shall comply with ambient temperature requirements specified in General section above.

### 2.3 STEMS/PENDANTS

- A. Hangers shall be approved ball aligner type swivel, 30 degrees from vertical with swivel below canopy.
- B. Stems/Pendants shall be rigid conduit unless specified otherwise on plans. Proposed stem/pendant types shall be submitted for review prior to shipment of light fixtures from factory.
- C. Stems/Pendants shall be provided as required to prevent swaying of fixtures due to HVAC system airflow or other similar occurrences.
- D. Shall be painted the same color as the fixture trim unless noted otherwise.

### 2.4 MANUFACTURER

- A. Fixtures and stems shall be manufactured as shown in fixture schedule or approved equals.
- B. Drivers shall be as manufactured by Philips/Advance, GE, Lutron, Magnatec, Motorola, EldoLED or approved equal.

## PART 3 EXECUTION

### 3.1 INSTALLATION OF LIGHTING FIXTURES

- A. Support:

1. Support of all lighting fixtures shall be responsibility of electrical contractor. All lighting fixture supports shall be installed in accordance with lighting fixture supplier's recommendations.
- B. Coordination:
1. Contractor shall coordinate all dimensions & locations of light fixtures prior to rough-in to insure proper fit and coordination with other trades.
  2. Contractor shall verify exact ceiling types being installed and shall adjust fixture trim types accordingly (prior to submitting light fixture shop drawings).

END OF SECTION 16511

## SECTION 16850

### ELECTRICAL HEAT TRACING SYSTEMS

#### PART 1 GENERAL

##### 1.1 SCOPE

- A. This specification covers the requirements of materials and support services for heat-tracing systems. Heat tracing systems (including insulation and all accessories) shall be provided on all piping installed exposed in exterior locations or where otherwise indicated on plans unless noted otherwise.

##### 1.2 CODES, APPROVALS, AND STANDARDS

- A. The electric heat-tracing system shall conform to this specification. It shall be designed, manufactured, and tested in accordance with the applicable requirements of the latest edition of the following codes and standards.
  - 1. ANSI American National Standards Institute
  - 2. CEC Canadian Electrical Code
  - 3. CSA CSA International
  - 4. FM FM Approvals
  - 5. IEC International Electro-Mechanical Commission
  - 6. IEEE Institute Of Electrical and Electronics Engineers
  - 7. ITS Intertek Testing Services (Intertek ETL SEMKO)
  - 8. NEC U.S. National Electrical Code (NFPA 70)
  - 9. NEMA National Electrical Manufacturers Association
  - 10. NESC National Electrical Safety Code
  - 11. UL Underwriters' Laboratories, Inc.

#### PART 2 PRODUCTS

##### 2.1 ACCEPTABLE MANUFACTURERS

- A. Heat Tracing:
  - 1. Raychem/Tyco Thermal Controls.
  - 2. Thermon.
  - 3. Nelson Heat Tracing.
  - 4. Chromalox.
- B. Insulation:
  - 1. Armstrong World Industries, Inc.
  - 2. Babcock & Wilcox; Insulation Products Division
  - 3. CertainTeed Corporation
  - 4. Knauf Fiber Glass GmbH
  - 5. Manville Products Corp.
  - 6. Owens-Corning Fiber Glass Corp.
  - 7. Pittsburg Corning Corp.
  - 8. Rubatex Corp.

## 2.2 SELF-REGULATING HEATING CABLES

- A. All heat-tracing applications with continuous exposure (maintain) temperatures from 150°F (65°C) to 250°F (121°C) or intermittent exposure temperatures from 185°F (85°C) to 420°F (215°C) shall use self-regulating cables.
1. Self-regulating heating cable shall vary its power output relative to the temperature of the surface of the pipe or the vessel. The cable shall be designed such that it can be crossed over itself and cut to length in the field.
  2. Self-regulating heating cable shall be designed for a useful life of 20 years or more with “power on” continuously, based on the following useful life criteria:
    - a. Retention of at least 75 percent of nominal rated power after 20 years of operation at the maximum published continuous exposure (maintain) temperature.
    - b. Retention of at least 90 percent of nominal rated power after 1000 hours of operation at the maximum published intermittent exposure temperature. The testing shall conform to UL 746B, IEC 216-1 Part 1.
  3. A warranty against manufacturing defects for a period of 10 years shall be available.
  4. All cables shall be capable of passing a 2.5 kV dielectric test for one minute (ASTM 2633) after undergoing a 0.5 kg-m impact (BS 6351, Part 1, 8.1.10).

## 2.3 FREEZE-PROTECTION SYSTEMS

- A. The heating cable shall consist of two 16 AWG or larger nickel-plated copper bus wires, embedded in a self-regulating polymeric core that controls power output so that the cable can be used directly on plastic or metallic pipes. Cables shall have a temperature identification number (T-rating) of T6 (185°F or 85°C) without use of thermostats.
- B. The heating cable shall have a tinned copper braid with a resistance less than the heating cable bus wire resistance as determined in type test (ASTM, B193, Sec. 5). The braid shall be protected from chemical attack and mechanical abuse by a modified polyolefin or fluoropolymer outer jacket.
- C. In order to provide rapid heat-up, to conserve energy, and to prevent overheating of fluids and plastic pipe, the heating cable shall have the following minimum self-regulating indices:

1. Table K.1 Minimum Self-Regulating Indices

Heating cable	S.R. index (W/°F)	S.R. Index (W/°C)
3 W/ft	0.038	0.068
5 W/ft	0.060	0.108
8 W/ft	0.074	0.133
10 W/ft	0.100	0.180

- D. The self-regulating index is the rate of change of power output in watts per degree Fahrenheit or watts per degree Celsius, as measured between the temperatures of 50°F (10°C) and 100°F (38°C) and confirmed by the type test and published data sheets.
1. In order to ensure that the self-regulating heating cable does not increase power output when accidentally exposed to high temperatures, resulting in thermal runaway and self-ignition, the cable shall produce less than 0.5 watts per foot (1.64 watts per meter) when energized and heated to 350°F (177°C) for 30

minutes. After this test, if the cable is reenergized, it must not have an increasing power output leading to thermal runaway.

2. In order to confirm 3.1B, the self-regulating heating cable shall retain at least 90 percent of its original power output after having been cycled 300 times between 50°F (10°C) and 210°F (99°C), allowing at least six minutes of dwell time at each temperature.
3. The heating cable shall be Raychem® BTV-CT or BTV-CR self-regulating heater, with continuous exposure (maintain) capability up to 150°F (65°C) and intermittent exposure capability up to 185°F (85°C), as manufactured by Tyco Thermal Controls.

## 2.4 SYSTEMS FOR DIVISION 1 HAZARDOUS LOCATIONS

- A. The following requirements shall apply in addition to the criteria specified above:
  1. The self-regulating heating cable shall be specifically FM Approved or CSA Certified for use in Division 1 locations.
  2. A ground-fault protection device set at 30 mA, with a nominal 100 ms response time, shall be used to protect each circuit.
  3. The temperature identification number (T-rating) of the cable used shall comply with FM and CSA requirements as applicable.
  4. Connection methods used with the cable shall be compatible and approved as a part of the system manufactured and supplied by the heating cable vendor for use in the Division 1 location.
  5. For plastic pipe and vessel applications, the heating cable shall be Raychem HBTV-CT or Raychem BTV-CT self-regulating heaters, with continuous exposure capability up to 150°F (65°C) and intermittent exposure capability up to 185°F (85°C), as manufactured by Tyco Thermal Controls.
  6. The heating cable shall be Raychem HQTV-CT or Raychem QTVR-CT self-regulating heaters, for continuous and intermittent exposure capability up to 225°F (110°C), as manufactured by Tyco Thermal Controls.
- B. Terminations for nonhazardous And hazardous class 1, div 2 locations
  1. All connection components used to terminate heating cables, including power connectors, splices, tees, and connectors shall be approved for the respective area classification and approved as a system with the particular type of heating cable in use. Under no circumstances shall terminations be used which are manufactured by a vendor other than the cable manufacturer.
  2. In order to keep connections dry and corrosion resistant, components shall be constructed of nonmetallic, electrostatic, charge-resistant, glass-filled, engineered polymer enclosure rated NEMA 4X. The component stand shall allow for up to four inches (100 mm) of thermal insulation.
  3. Terminals shall be spring clamp wire connection type to provide reliable connection, maintenance-free operation, and ease of reentry.
  4. Heating cable terminations shall use cold-applied materials and shall not require the use of a heat gun, torch, or hot work permit for installation.
  5. Components shall be rated to a minimum installation temperature of -40°F (-40°C), minimum usage temperature of -75°F (-60°C), and maximum pipe temperature of 500°F (260°C).

6. The component system shall be Raychem JBM-100-L-A connection kit complete with integral LED power indicating light to serve as complete power, splice, or tee connection for up to three Raychem BTV, QTVR, or XTV industrial parallel heating cables as manufactured by Tyco Thermal Controls.

## 2.5 THERMOSTATS AND CONTACTORS

- A. Freeze protection systems shall operate using self-regulating control or with the DigiTrace AMC-1A or DigiTrace AMC-F5 thermostat and the DigiTrace E104-100A or DigiTrace E304-40A contactor in nonhazardous locations, and DigiTrace AMC-1H thermostat with DigiTrace E307-40A contactor in hazardous locations, as supplied by Tyco Thermal Controls.
- B. Where heat tracing is applied to emergency showers and/or emergency eye wash systems (or other systems where the heated piping system provides water that may be applied to persons in emergency or non-emergency situations), the sensor (that determines whether the heat tracing system is ON or OFF) shall be placed on the associated pipe or tank wall rather than in ambient air (such as to prevent the heat tracing system from overheating the associated liquid).

## 2.6 END SEAL

- A. An above-insulation, lighted end seal kit shall be provided for each heat trace circuit termination as per the manufacturer's installation details. The kit shall be E-100-LBTV2 as supplied by Tyco Thermal Controls.

## 2.7 INSULATION

- A. All components of the insulation, including covering, mastics and adhesives shall have a flame-spread rating of not over 25, and a smoke development rating of not over 50. Ratings shall be as established by tests in accordance with ASTM E 84 and Federal Specification standards. The integrated insulation assemblies shall also conform to the above specifications. Insulation shall be applied in strict accordance with the manufacturer's instructions.
- B. Description:
  1. This type of insulation shall be employed for process, cold-and hot water, steam, and condensate piping and equipment with surface temperatures up to 850 degrees F. Pipe insulation and jacketing shall be applied to piping where shown, and shall include fittings, flanges, and valves. Pipe insulation shall be molded-type pipe covering, made of fibrous glass with a minimum k-factor of 0.23 at 75 degrees F mean temperature. Unless otherwise specified the insulation thickness shall be 1" minimum.
  2. The insulation shall be oversized for installation over electric heating cable. Insulation shall have a factory-applied white fire-retardant vapor-barrier jacket of kraft paper and aluminum foil laminated together and reinforced with fiberglass yarn. Fittings and valves shall be covered with the same material as the pipe, cut in segments to fit snugly without open spaces, held in place with copper wire or cement, and then covered with the same jacketing material as the pipe. Insulated fittings adjacent to vapor-barrier insulation shall be sealed with an acceptable vapor-barrier cement before installation of the finish jacket. Pipe insulation and

vapor-barrier shall be continuous through hangers and supports. Insulation shall be coordinated with the pipe hangers and supports and where insulation protection shields are provided the top half section of pipe insulation at support locations shall be of the same specified density, and the bottom half insulation segments provided between the pipe and the insulation protection shields shall have a density of not less than 6 lb/cu ft. All insulation shall be covered with smooth aluminum weatherproof metal or plastic preformed jacketing with a factory attached moisture barrier. The jacket for the fittings shall consist of precision-formed smooth-sided sections and shall be sized to cover and protect the insulated fitting. Each section shall be manufactured from aluminum or PVC, and all joints shall be sealed with silicon mastic or solvent welding, to provide a continuous, air and weathertight joint. Strapping shall be 1/2-inch wide, Type 3003 aluminum or stainless steel.

## **PART 3 EXECUTION**

### **3.1 GENERAL**

- A. Heat tracing shall be provided along full length of all exposed piping or vessels located outside of buildings or in other areas designated on plans (such as by insulated piping in areas subject to cold temperature). Insulation shall be provided over all heat traced pipes.
- B. The vendor shall provide a detailed design utilizing standard heat-tracing design software, such as Tyco Thermal Controls TraceCalc® Pro design software or equal. At minimum, the design must provide the following:
  - 1. Circuit identification number
  - 2. Maintain temperature
  - 3. Line size and insulation
  - 4. Heat loss for pipe, valves, and supports
  - 5. Amount and type of heating cable required
  - 6. Spiral requirements
  - 7. Heating cable service voltage
  - 8. Heating cable power output at the maintain temperature
  - 9. Minimum and maximum maintain temperature vs. minimum and maximum ambient temperatures
  - 10. Circuit breaker and transformer sizing
- C. A ground-fault protection device set at 30 mA, with a nominal 100-ms response time, shall be used to protect each circuit.
- D. Install additional heating tape at bolted flanges, valves, pipe supports, and other fittings and fixtures as recommended by supplier, but not less than the following:
  - 1. Bolted flanges (per pair): Two times pipe diameter
  - 2. Valves: Four times valve length
  - 3. Pipe hanger or support penetrating insulation: Three times pipe diameter
- E. The entire system shall be installed in compliance with the manufacturer's recommendations for a fully-functional, code-compliant system.

- F. All insulation shall be installed by a qualified insulation contractor in strict accordance with the manufacturer's recommendations and the requirements of these specifications.
- G. All piping insulation shall be installed following required testing and approval of piping.

### 3.2 IDENTIFICATION

- A. Heat tracing systems shall be labeled at the field connection of power to the heat tracing equipment per the requirements for Utilization Equipment within Specification Section 16075.
- B. Heat traced piping, vessels, etc. shall be identified with appropriate caution signs or markings at intervals not exceeding 20 feet on center per NEC requirements.

### 3.3 TESTING

- A. Factory inspections and tests for self-regulating, power limiting, series constant wattage and constant wattage (MI) heater cables shall include but are not limited to the following:
  - 1. Testing shall be done per the latest IEEE Std. 515 test section and applicable manufacturer's standards.
  - 2. In the field, all heater cables shall be meggered. The following separate field megger readings shall be taken on each self-regulating and each M.I. heater cable:
    - a. Heater cable shall be meggered when received at jobsite before installation.
    - b. Heater cable shall be meggered after installation, but before insulation is applied.
    - c. Heater cable shall be meggered after insulation has been installed.
  - 3. All three of the above field megger readings shall be greater than 20 megohms. Otherwise, the heater cable is not acceptable and shall be replaced.
  - 4. Field megger tests shall be recorded for each heater cable, and certified reports shall be submitted to the user.

END OF SECTION 16850



## SECTION 16900

### SCADA SYSTEM

#### PART 1 GENERAL

##### 1.1 DESCRIPTION

- A. Work included: Provide a complete SCADA RTU System with appurtenant equipment and accessories as indicated, specified, and as necessary for a complete and proper operating system.
- B. Work includes, but not necessarily limited to, the following:
  - 1. All remote telemetry units (RTUs) and other appurtenances as indicated and specified herein and as required for a complete & fully functional SCADA system per JCESD standards.
  - 2. All engineering, hardware and software development, installation, startup, calibration services and supervision necessary.
  - 3. Mounting SCADA RTU and providing all required interconnections.
  - 4. Testing and operational demonstrations as specified.
  - 5. Training programs as specified.
  - 6. Preparation of manuals.
- C. Related work:
  - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Specifications, Special Provisions, and all other related Sections.
  - 2. Refer to plans for point lists and additional device requirements.

##### 1.2 QUALITY ASSURANCE

- A. RTU supplier shall be Mission. Type shall be Mission MyDro M850 series (to match owner's standards) with options/accessories as required.
- B. Contractor:
  - 1. Shall be fully and solely responsible for the work of the systems supplier and solely responsible to the Owner for having supplied to the Owner the complete integrated SCADA system.
  - 2. To provide personal superintendence and direction of the work, maintaining and supplying complete supervision over and coordination between all subcontractors employed by him and the Instrumentation and Control System Integrator.
  - 3. To be responsible for defining the limits of his subcontractor's work.
  - 4. To be responsible for setting of instruments (including alarms, etc. as provided under other sections).
- C. Operation and Maintenance Manuals
  - 1. Operating instructions shall incorporate a functional description of the entire system, including the system schematics which reflect "as-built" modifications.
  - 2. Special maintenance requirements particular to the system shall be clearly defined along with special calibration and test procedures.
  - 3. As part of the operation and maintenance manuals, provide one hard copy of the program used to program the programmable logic controller.

### 1.3 WARRANTY

- A. Systems supplier shall furnish a hardware and software warranty for the system starting at substantial completion and ending one year from this date.

### 1.4 REFERENCES

- A. Instrument Society of America (ISA) PR7. 1, Pneumatic Control Circuit Pressure Test, Tentative Recommendation Practice.
- B. Instrument Society of America (ISA) S5.4, Instrument Loop Diagrams, standard.
- C. National Electrical Manufacturers Association (NEMA) Publication, General Standards for Industrial and Control Systems, ICS 1 and Industrial Controls and Systems ICS2.

### 1.5 RADIO/WIRELESS SYSTEM PROPAGATION STUDIES

- A. The successful bidder of this project will be responsible for implementing a highly reliable wireless communication network to remote panels/devices as indicated on plans. The successful bidder shall provide these studies prior to preparing project submittals and shall implement radio/wireless networks with components/antennae/radios/mounting poles/etc. accordingly as required for a fully functional system.
- B. The propagation study will include running a computer model from topographical information. The propagation study will also include a site survey to test signal strength (with the actual equipment proposed) to confirm the computer analysis.
- C. The goal of the study is to produce a report that will specify the equipment that a supplier/integrator will need to install at each radio/wireless-connected device/panel to achieve acceptable communication for each radio/wireless link.
- D. The propagation study report shall include the following information:
  - 1. Location of each new station geographical coordinates – longitude, latitude and elevation.
  - 2. Type of wireless equipment/devices and wireless communication types proposed. Where applicable, frequencies used in system testing and proposed in final installation of radio systems shall specifically be noted.
  - 3. Tower/pole/mast mounting heights, types and installation requirements for all antennae.
  - 4. All antenna styles/types.
  - 5. Locations, types, mounting details, etc. for any required access points or repeaters required to achieve the required signal strengths. Note that, if possible, no intermediate access points or repeaters other than those specifically noted on contract documents should be provided. Any access points/repeaters required must be specifically approved by the engineer in writing prior to implementation. Any and all costs associated with furnishing or installing any required access points/repeaters (including material, power, mounting towers/poles, permitting, etc.) shall be fully included within the bid.
  - 6. Complete documentation from the computer analysis.

## 1.6 SUBMITTALS

- A. General/System submittal requirements:
  - 1. Provide submittal (quantity as required by contract) of:
    - a. Component manufacturing data sheets indicating pertinent data and identifying each component (including all components within PLC/control panel enclosures, instruments, computer systems, surge protection devices, antennae, radios, sun/rain shields, etc.) by tag number and nomenclature as indicated on drawings and in specifications.
    - b. Component drawing showing dimensions, mounting, and external connection details,
    - c. Propagation study results.
  - 2. Identify any specification section where exceptions are being taken or an "or equal" piece of hardware is being proposed.
  - 3. A Bill of Materials shall be included with catalog information on all components.
  - 4. Information shall be included on any proprietary logic component sufficient to demonstrate its ability to perform the required functions.
  
- B. Panel submittal requirements:
  - 1. Size, type and rating of all system components.
  - 2. Unit frontal elevation and dimension drawings.
  - 3. Manufacturer's product data sheets for all components.
  
- C. Instrumentation/Field Device submittal requirements:
  - 1. Manufacturer's product data sheets
  - 2. Job-specific model numbers for each instrument/field device
  - 3. Job-specific ranges/setpoints/etc. proposed for each instrument/field device

## 1.7 DELIVERY, STORAGE AND HANDLING:

- A. Packing and Labeling:
  - 1. Prior to shipment, each component shall be tagged to identify its' location, tag number, and system function. Identification shall be prominently displayed on the outside of the package.
  - 2. Firmly attach permanent, final labeling (as specified elsewhere) to all equipment, panels, instruments/field devices, etc. prior to installation.
  
- B. Delivery:
  - 1. Following completion of shop assembly, factory test, and approval of all equipment by the Engineer, the panels, cabinets, and consoles and equipment shall be shipped. Provide protection for equipment from handling and the environment.
  
- C. Receiving:
  - 1. The contractor is responsible for receiving and proper storage of equipment delivered to the job site.
  - 2. All received items shall be protected from the elements and where required stored in a low humidity environment.
  - 3. Protect materials and equipment against damage in storage and during construction.

## **PART 2 PRODUCTS**

### **2.1 GENERAL:**

- A. Specifications below identify general intent and major system components only. Supplier shall be responsible providing all system accessories, interconnections, installation, etc. and verifying compatibility of all system components as required to provide a fully-functional/coordinated system.
- B. System shall be furnished pre-packaged in a form that requires no owner programming.
- C. System shall provide highly flexible, customizable alarm scheduling.
- D. System shall provide data access via web-based HMI optimized for lift station monitoring.
- E. System shall utilized field-expandable RTUs.
- F. Supplier shall store all historical data/trending information (in form accessible to owner) for a minimum of twenty (20) years.
- G. Training, engineering, software updates and technical support provided by RTU/SCADA supplier, without additional expense.

### **2.2 COMMUNICATION:**

- A. Provide Data Cellular Radio/antenna system for each site, with cellular carrier selected for each specific site based on best available signal at the site. Communicate with central server location via cellular radio transmitting data through Transmission Control Protocol (TCP) socket connection, as follows:
- B. Provide encrypted and end-to-end acknowledged transmissions. Short Message Service (SMS), User Datagram Protocol (UDP), and satellite-based data transmission methods are not permitted.
- C. Accommodate radios from various cellular carriers; field-interchangeable within 10 minutes.
- D. Support LTE, 3GPP and 3GPP/2 technology for CDMA and HSPA+ networks.
  - 1. LTE: Quad Band LTE: 700/850/AWS (1700/2100)/1900 MHz; FDD-Band (17,5,4,2); Tri Band UMTS (WCDMA): 850/AWS (1700/2100)/1900 MHz; FDD-Band (5,4,2) Quad Band GSM/GPRS/EDGE: 850/900/1800/1900 MHz
  - 2. GSM: Quad-band (850/900/1800/1900 MHz) GSM/GPRS/EDGE, 3GPP release 99/4 improved SAIC.
  - 3. CDMA: Triple-band CDMA2000, Bands: BC0/BC1 & BC10 subclass 2+3 (800/1900 MHz), 3GPP2: 1xAdvanced, EV-DO Rev. A
- E. Capable of transmitting RTU Battery trouble/alarm status points internally (without using the I/O hardware summarized below).

- F. Alarm/Status Point Frequency:
1. Each RTU shall transmit Real-time alarms plus hourly discrete and analog status updates (“daily” updates are not acceptable)
  2. Each RTU shall be capable of being “pinged” for instantaneous on-demand status updates
  3. Each RTU shall be capable of being updated to a “streaming data” RTU remotely without replacement of hardware or any on-site modifications.
- G. Enclosure Type:
1. Provide NEMA 4X enclosure for each SCADA RTU. Mount such that LCD touchscreen and all pushbutton/etc. OIT devices are fully accessible with the control panel’s inner deadfront door closed.
- H. RTU Requirements:
1. I/O as required to monitor the following parameters:
    - a. Discrete inputs – fully wired/installed universal discrete inputs – to include the parameters indicated on point lists on plans.
    - b. Analog inputs – fully wired/installed analog inputs – to include the parameters indicated on point lists on plans.
  2. 12V, 3AH battery backup to provide up to 50 hour backup power
  3. -20 degrees C – 75 degrees C operating temperature range
  4. Omnidirectional antenna with encrypted TCP socket connections
  5. No owner/user programming required.
  6. Integral 120VAC power supply as required to be powered by an external 20A-120V-1phase power circuit.
  7. shall be furnished with additional I/O modules as required by point lists on plans
- I. SCADA/HMI package shall provide:
1. Map-based graphics screen for showing general status of each lift station within system.
  2. Table-type HMI interface screens for summarizing all status points.
  3. Flexible, customized alarm scheduling
  4. Data access via web-based HMI optimized for computers, smartphones and tablets
  5. Continuous, limitless cloud storage of historical data (for monitoring/trending of all discrete and analog parameters). Storage that is limited to a specific timeframe is not acceptable.
  6. Reports, graphs, table, and charts designed by manufacturer specifically for the proposed applications.

## **PART 3 EXECUTION**

### **3.1 GENERAL**

- A. SCADA RTU System shall:

1. Measure and monitor discrete and continuous process and process equipment variables (see SCADA Point List on contract plans).
  2. Effectively present the process and process equipment variables to the operators allowing them to accurately monitor the status of the processes. Screens/screen shots shall be detailed 2 dimensional.
  3. Provide historical data acquisition, storage, retrieval, processing, and report generation.
- B. The SCADA software shall be developed to include graphics for the proposed project scope. Human-Machine Interface (HMI) software as specified shall be supplied and fully configured by the System Integrator. Reports, graphics displays, real-time trends, historical trends, security, alarming, etc. shall be developed by the System Integrator through a collaborative effort between the Engineer, Owner, Contractor and Equipment Suppliers.
- C. Provide RTUs and HMI software/setup as summarized above.
- D. Provide Full installation (to include field wiring, mounting RTUs, programming/setup, etc.) and start-up assistance during construction (before acceptance by owner).
- E. Provide three (3) years Service Package (to include system monitoring, HMI, alarming, hardware/software updates, tech support, etc.) for all specified RTUs and I/O.
- F. Provide One (1) year “No Questions Asked” warranty from date of successful start-up on equipment covering all labor, parts, pieces, and performance. Warranty shall include all costs as required to furnish a fully-functional replacement RTU unit (should an RTU failure occur for any event other than lightning-related damage) to the owner within one (1) business day of notification of an RTU failure.
- G. Training: Once the system has been installed correctly, started, and is operating as intended, the service representative shall provide on-site start up training and assistance.

END OF SECTION 16900

# Appendix A



SUBSURFACE EXPLORATION AND  
GEOTECHNICAL ENGINEERING EVALUATION

**USDA WWTP and Collection System**

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December 2022

**PREPARED FOR**

Town of Kinsey  
6947 Walden Drive  
Kinsey, Alabama 36303

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**PREPARED BY**



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December 8, 2022

Town of Kinsey  
6947 Walden Drive  
Kinsey, Alabama 36303

Attention: Mayor Jason Reneau

Reference: **Report of Subsurface Exploration and  
Geotechnical Engineering Evaluation  
USDA WWTP and Collection System  
Kinsey, Alabama  
CDG Reference Number: R063519021**

Dear Mayor Reneau:

CDG, Inc. has completed the authorized subsurface exploration and geotechnical engineering evaluation for the proposed Wastewater Treatment Plant project in Kinsey, Alabama. Our services were performed in general conformance to the *Agreement for Professional Services* dated 12/14/20.

The purposes of this study were to determine general subsurface conditions at specific soil test boring locations and provide geotechnical recommendations relative to the site work and foundation phases of construction. This report presents the subsurface conditions encountered at the boring locations, laboratory test results of representative, on-site soil samples, and our recommendations associated with the proposed development.

We appreciate the opportunity to work with you and look forward to our continued involvement during the construction phase of the project. Please call if you have any questions or need additional information.

Respectfully Submitted,

CDG, Inc.

Tyler Lawrence, EI  
Project Engineer



Brooks Bennett, PE  
Senior Engineer

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### **Appendices**

Appendix A – Project Location Maps

Appendix B – Boring Location Plan

Appendix C – Boring Logs

Appendix D – Laboratory Test Data

## **1.0 SCOPE OF SERVICES**

In general, our services included performing a subsurface exploration, conducting field and laboratory soil tests, and preparing a geotechnical engineering report of our findings. Following is the specific scope of services performed for the USDA Wastewater Treatment Plant project:

- Site reconnaissance and soil test boring layout.
- Geologic map review.
- Mobilization of an ATV-mounted drilling rig and six (6) soil test borings in the proposed development area. Borings were performed on June 20, 2022, and contained Standard Penetration Tests (SPT) at 2½-foot intervals in the upper 10 feet and on 5-foot centers thereafter. The borings extended to approximately 25 feet below the existing ground surface at which depth the borings were terminated.
- Laboratory tests to determine site-specific soil classification characteristics. Tests included the following: Natural Moisture Content (14 tests), Grain Size Analysis (4 tests), and Atterberg Limits (4 tests).
- Evaluation of the information gathered during the subsurface exploration and laboratory testing program and preparation of this geotechnical engineering report. The report addresses the following items:
  - Site and project description;
  - Local geology and its implications for the planned development;
  - Subsurface conditions encountered in the borings;
  - Groundwater measurements at the time of the fieldwork;
  - Laboratory test results;
  - Earthwork recommendations including subgrade preparation, excavation and fill placement, treatment of unsuitable soils, and groundwater control;
  - Foundation recommendations including type, soil support parameters, expected total and differential settlements, and construction considerations; and
  - Slab-on-grade support and modulus of subgrade reaction recommendations.

The current geotechnical scope of services did not include an environmental assessment of the site to determine the presence of wetlands, hazardous materials, buried wastes, contaminated soil, etc. An environmental assessment can be provided if requested by the client.

## **2.0 SITE DESCRIPTION**

The proposed development is located in the northeastern quarter of Section 32, Township 4 North, Range 27 East in Kinsey, Houston County, Alabama. The site is located in an agricultural field and wooded area that is bounded to the north and east by agricultural fields and to the west and south by wooded areas. A *Site Vicinity Map* is included in **APPENDIX A**.

At the time of the field work (June 20, 2022), the proposed wastewater treatment plant site was undeveloped and utilized as an agricultural field. Evidence of current cultivation including terraces and peanut crops were observed. A steel probe rod was used to test the consistency of the exposed soils throughout the site. Based on hand probing, the site contained low-consistency, upper soils that ranged from  $\pm 1\frac{1}{2}$  feet to greater than 3 feet.

A drainage swale was observed along the western border of the property running from the northwestern corner of the site to the southern half where it enters the wood line. No above or below ground utilities were observed at the time of the field work.

Available topographic information (*Overall Site Plan*; dated 3/23/22; prepared by CDG) indicates that within the proposed development area, the point of highest elevation ( $\pm$ EL 301') occurs at the northwestern portion of the site. The point of lowest elevation (EL 293') occurs along the wood line at the southern side of the site. Therefore, the site generally slopes from the north to the south towards the wooded area. The following pictures indicate typical site conditions at the time of the fieldwork.



Northwest corner of property facing South



Northeast Corner of property facing Southwest

## **3.0 PROJECT DESCRIPTION**

The proposed improvements will include a package wastewater treatment equipment with new utilities and an access road. The wastewater treatment plant will consist of a package plant with various wastewater treatment equipment all positioned on a concrete slab. The roadway will be surfaced with crushed aggregate. Proposed structural loading and grading information were unavailable at the time of report preparation. For design purposes, we have assumed that the maximum column loads will be less than 100 kips.

An available plan (*USDA WASTEWATER TREATMENT PLANT; dated 3/23/22*) indicates that the finished floor elevations of the proposed package wastewater treatment facility will be ±EL 294.5' Based on the noted grading information, earthwork in the proposed development area is generally expected to consist of minor cuts and fills. Proposed grades are within approximately 2 feet of existing elevations. Additionally, excavation will be required for the headworks. The maximum excavation depth is approximately 5 to 10 feet.

## **4.0 FIELD AND LABORATORY TESTING**

### **4.1 Soil Test Borings**

The field investigation included performing six (6) soil test borings in the proposed development area. The sampling and penetration procedures of the soil test borings were performed in general accordance with ASTM D-1586, using an ATV-mounted drilling rig. Standard Penetration Tests (SPT) were performed in the soil borings by driving a standard 1⅜-inch inside diameter and 2-inch outside diameter split spoon sampler with a 140-pound hammer falling 30 inches.

The number of hammer blows required to drive the sampler a total of 18 inches, in 6-inch increments, were recorded. The penetration resistance, or "N" value, is the sum of the blows required to drive the sampler the final two 6-inch increments. The N-values are indicated on the boring logs in adjacent to their corresponding depths. The penetration resistance is used as an indicator of various soil parameters from empirical correlations.

### **4.2 Laboratory Testing**

During the field investigation, a representative portion of each recovered sample was sealed in plastic bags and transported to our laboratory for engineering classification (ASTM-2487) and laboratory testing. The description and stratification of the soil conditions, using the Unified Soil Classification System, are illustrated in the form of soil profiles on the *Boring Logs* in **APPENDIX C**. To aid in soil classification and determining site-specific soil characteristics, selected soil samples were tested for natural moisture content (ASTM D-2216), Particle Size Analysis (ASTM D-422), and Atterberg Limits (ASTM D-4318). Details of the laboratory testing are included in **APPENDIX D**.

## **5.0 LOCAL GEOLOGY**

A review of available geologic data (digital GIS data provided by the USGS) indicates that the site is located in the Coastal Plain Province. Soils of the Coastal Plain appear to have been deposited in an ancient marine environment, and the rock, where present, is relatively low-grade sedimentary (often soft, sandy limestone). Specifically, the site is underlain by residuum of the Claiborne/Jackson Group. A *Site Geology Map* is provided in **APPENDIX A**.

Residuum of the Claiborne/Jackson Group is described as white to moderately-reddish-orange sandy clay and clay with scattered layers of gravelly medium to coarse sand, fossiliferous chert and limestone boulders and limonitic (a group of widely occurring yellowish-brown to black iron oxide minerals) sand masses. The fossiliferous chert consists of a fine-grained, silica-rich sedimentary rock that may contain small fossils. It varies greatly in color (from white to black) but is most often gray, brown, grayish brown and light green to rusty red.

Clays in the Claiborne/Jackson can exhibit a high plasticity. Plasticity is a measure of a soil's potential for volume change. Plastic soils shrink and swell with variations in natural moisture content. Additionally, springs are often encountered in the geologic formation present at the site. Springs typically develop when water becomes trapped in the porous sands overlying relatively impermeable silts and clays. They can be present continually; however, additional springs and greater flow rates are generally present during periods of high rainfall.

Subsurface voids (dolines), depressions, and sinkholes occur in geologic formations containing soluble rock such as limestone. These formations are known as karst geologies. Circulating groundwater dissolves the carbonate portion of the limestone over geologic time. As the carbonate portion of the limestone dissolves, voids and caverns develop underground. The doline can propagate upward toward the ground surface and can result in subsidence or collapse of the overlying soil. Groundwater movement causing erosion of soil overburden is typically necessary for the formation of dolines in the karst geologies of Alabama. Available sinkhole maps (digital GIS data from the Geological Survey of Alabama) indicate that documented sinkholes have occurred within approximately 1½ mile of the site. A portion of the plan has been reproduced as the attached *Documented Sinkhole Location Map* in **APPENDIX A**.

Due to the geologic formation underlying the site and the presence of documented sinkholes within the site vicinity, there is a risk of future sinkhole activity at the site. However, no evidence of ground surface subsidence or dolines was observed at the site during the field work or in the borings. Therefore, the risk of sinkhole development appears to be no greater at the subject site than at surrounding locations.

We note that the action of sinkholes is irregular and cannot be precisely predicted. Therefore, the site should be carefully monitored for subsidence, depressions, and sinkholes. Additional engineering evaluation and remediation will be required should further evidence of sinkhole activity be observed at the site during or after construction.

## **6.0 SUBSURFACE CONDITIONS**

The subsurface exploration included six (6) soil test borings (B-1 through B-6) in the proposed development area. The boring locations were established in the field using hand-held GPS equipment and available site layout information from a KMZ drawing file provided by Carmen Chosie, PE. Therefore, the boring locations indicated on the *Boring Location Plan* (**Appendix B**) are approximate.

Details of the conditions encountered at the boring locations are contained on the *Boring Logs* in **Appendix C**. The stratification lines indicated on the logs represent the approximate boundaries between soil types. The actual transitions may be gradual. The soil conditions noted on the boring logs represent conditions encountered at the location and time tested. Significant changes in subsurface conditions can occur over a short distance or period of time. The general subsurface conditions encountered at the test locations are described below.

### **6.1 Topsoil**

The site was generally utilized for agriculture at the time of the visit. Therefore, topsoil had been blended with the upper soils at all test locations with the exception of B-3. At that location, vegetation consisting of short grass was present. Therefore, an upper zone of topsoil and rootmat was initially encountered at that boring location (B-3). The thickness of the upper, organic soil was approximately 3 inches at the tested location.

### **6.2 Cultivated Zone**

The site was currently and had been previously used for agricultural purposes. Therefore, the borings initially encountered an upper, cultivated zone of low-consistency soils. The cultivated zone extended to a depth of approximately 3½ feet below the ground surface at the boring locations. The cultivated zone soils encountered at the boring locations consisted of clayey, fine to medium-grained sand. Standard Penetration Test (SPT) N-values in the cultivated zone ranged from 4 to 12 blows per foot (bpf) and averaged 7 bpf, generally indicating a very loose to loose consistency.

The natural moisture contents of selected samples of the cultivated zone soils were 17% and 19%. A tested sample of the soil exhibited a moderate degree of plasticity with a Liquid Limit (LL) of 42 and a Plasticity Index (PI) of 22. The sample contained 46.4% fine-grained (silt and clay size) particles. Based on USCS classification guidelines, the tested soil sample is classified as clayey sand (SC).

### **6.3 Coastal Plain Deposits**

Coastal Plain Deposits are naturally occurring soils that appear to have formed by the gradual deposition of sediment in an ancient marine environment. Deposits associated with the residuum of the Claiborne/Jackson Groups were encountered underlying the cultivated zone at the boring locations. The deposits extended to the boring termination depth of approximately 25 feet below the existing ground surface.

The deposits encountered underlying the cultivated zone consisted of clayey and silty sand down and to 8 to 12 feet and then medium to high plasticity clays down to the termination of the boring excluding boring B-5. The sand ranged from fine to coarse-grained. SPT N-values in the deposits ranged from 4 to 43 bpf and averaged 18 bpf. Non-cohesive samples exhibited a medium dense to dense consistency. The unconfined compressive strength ( $PP_{qu}$ ) of cohesive samples was measured using a hand-held penetrometer.  $PP_{qu}$  values ranged from less than 0.25 to greater than 4.5 tons per square foot (tsf), indicating a very soft to very stiff consistency. Generally,  $PP_{qu}$  values were greater than 2.0 tsf. However; very soft material was measured in boring B-3 from approximately 20 to 25 feet.

The natural moisture contents of selected samples of the deposits ranged from 10% to 55%. Tested samples of the deposits exhibited a moderate degree of plasticity with LL values ranging from 38 to 49 and PI values ranging from 15 to 17. Tested samples contained between 25.1% and 39.2% fine-grained (silt and clay size) particles. Based on USCS classification guidelines, the tested soil samples are classified as clayey sand (SC).

#### **6.4 Groundwater**

Groundwater was not encountered in the borings at the time of drilling. The boreholes were backfilled upon completion of drilling operations.

The soils at the site contain a significant amount of fine-grained, plastic particles. The fine-grained soils exhibit a relatively low permeability. Therefore, long-term monitoring over several seasons would be required to evaluate the stabilized depth to groundwater. Groundwater depth is highly variable and will often fluctuate due to seasonal variations in precipitation.

## **7.0 EARTHWORK CONSIDERATIONS**

Mr. Scott Henderson (CDG, Inc.) indicated that preliminary plant finish grade was set at  $\pm$ EL 294.5'. Existing ground surface elevations within the footprint of the proposed package wastewater treatment plant range from  $\pm$ EL 293' to  $\pm$ EL 295'. Therefore, existing elevations are within  $\pm$ 2 feet of proposed grades. However, a maximum excavation depth of approximately 5 to 10 feet will be required for the headworks.

We are providing the following earthwork related recommendations based on the grading and site layout information available at the time of report preparation. If significant changes are made to the development plans or if the grading and site layout information is altered, CDG should be allowed to review our geotechnical recommendations in light of the changes to determine if additional testing and revised conclusions are needed. Following are our earthwork-related recommendations.

#### **7.1 Subgrade Preparation**

Prior to the start of excavation and fill placement, the proposed development area should be cleared of vegetation, topsoil, rootmat, and all organic materials. The topsoil depth, where present, at the tested locations was approximately 3 inches. However, deeper zones of topsoil and organics may be present. The site is also currently and has been historically used for agricultural purposes and contains an upper layer of very loose to loose, previously disturbed, clayey sand. Root systems and loose soils associated with prior cultivation may extend to depths of 3+ feet below the ground surface. Excavations resulting from site clearing should be backfilled in a controlled manner with structural fill.

Structures supported on low-consistency, previously cultivated soils are likely to experience differential settlement and resultant distress. Typical distress consists of cracking in rigid elements such as concrete floor slabs and masonry walls and misalignment of windows and doors. Therefore, it is our opinion that the low-consistency, cultivated zone soils are unsuitable for structural support of the proposed development in their current condition.



**Subgrade preparation should include complete over-excavation of the low-consistency, cultivated zone soils in the proposed structure areas. The excavation should extend to a minimum depth of 36 inches below the original ground surface.** The undercutting process should continue a minimum horizontal distance of 5 feet beyond the sides of the proposed structures as measured at the bottom of the excavation.

In addition to structure areas, low-consistency, upper soils are likely to be present in proposed drive and parking areas. Drives are typically considered less sensitive to differential settlements than structures. Therefore, it will be possible to limit over-excavation of the very low-consistency material. In proposed drive areas, existing soils should be over-excavated to a minimum depth of 24 inches below final subgrade elevation to ensure a 24-inch-thick cap of compacted, structural fill is placed beneath all drive and parking areas. The excavation should extend horizontally 5 feet beyond the edge of drive and parking areas.

## **7.2 Subgrade Compaction and Engineering Evaluation**

In all areas of the site, following excavation and prior to fill placement, the subgrade soils should be scarified to a depth of 8 inches, moisture conditioned to within -2% to +2% of the optimum moisture content, and recompacted to the project requirements. The exposed subgrade should then be evaluated by a representative of CDG to verify that the area is suitable to receive placement of structural fill. The evaluation typically includes proofrolling with a loaded dump truck or other equipment capable of applying a high pressure.

Soils exhibiting instability during proofrolling shall be scarified, moisture conditioned and recompacted or removed and replaced with structural fill. Placement of structural fill or base may proceed following demonstration of a stable and properly moisture conditioned subgrade.

**It will be critical that a representative of CDG be present during excavation and proofrolling to verify the extent of unsuitable soils and evaluate the stability of the subgrade. Excavations deeper than indicated above may be required to remove low-consistency soils based on the actual condition of the soils encountered at the time of construction.**

## **7.3 Treatment of Highly Plastic Soils**

The on-site, natural deposits contained zones of highly plastic soil. Plastic soils exhibit a high potential for volume change with variations in moisture content. Soil volume changes can cause differential movement in overlying structures. Based on the boring information, highly plastic soils were encountered at depths ranging from approximately 9 feet to the termination of the borings.

Therefore, it will be necessary to ensure that highly plastic clays be removed from beneath the proposed structure area, if encountered. Following excavation to final subgrade elevation, samples of the exposed materials should be tested to determine the soil's plasticity. **Highly plastic clays and silts should be excavated to a minimum depth of 36" below the final subgrade elevation.** Excavations should be backfilled in thin lifts with structural fill conforming to the project requirements.

## **7.4 Excavation Considerations**

The borings encountered cultivated soils and coastal plain deposits prior to boring termination at a depth of 25 feet. Auger refusal was not encountered. The on-site soils can typically be excavated during mass earthwork operations using conventional earthmoving equipment in good working order.

The soils encountered at the boring locations contained significant amounts of sand. Additionally, springs are frequently encountered in the geologic formation underlying the site. Due to the presence of non-cohesive soils and the potential for groundwater seepage, the sides of excavations made at the site are expected to be unstable and likely to cave. Therefore, benching, sloping, temporary bracing or other appropriate measures will be necessary when making excavations.

The contractor is responsible for designing and constructing stable, temporary excavations and should shore, slope, or bench the sides of the excavations as required to maintain stability of both the excavation sides and floor. This report is not intended to address safety issues related to excavations. Job site safety and conformance to applicable codes and guidelines is solely the responsibility of the contractor.

## **7.5 Fill Placement**

All material used as structural fill should be relatively free of organics and other deleterious materials. Structural fill should exhibit a Liquid Limit less than 50, a Plasticity Index less than 25, a minimum of 12% passing the #200 sieve, and a maximum dry density of at least 100 pcf. Soil fill should contain no more than 30% rock, and individual rock fragments in the fill should be less than 2 inches in largest dimension.

Soil fill must be placed in an environment free of excess water. Therefore, free-draining (<5% passing #200 sieve) granular material (such as ASTM C-33 #57 crushed aggregate or washed, angular, coarse sand) should be used as the initial lift(s) of fill in areas containing water seepage.

Structural fill should be placed in lifts not exceeding eight inches in loose measure. Individual lifts of fill should be moisture conditioned to within -2% to +2% of the optimum moisture content and compacted to a minimum of 98% of the Standard Proctor (ASTM D-698) maximum dry density. Soil may require wetting or drying to achieve proper compaction. Thinner lifts and manually operated equipment will be required to achieve proper compaction in limited access areas (utility trenches, manholes, inlets).

Soil compaction testing should be performed during fill placement. Testing will give an indication of the contractor's performance with regard to soil density and moisture content requirements established in the project specifications. Compaction testing should be performed at random locations on each lift of fill placed to provide statistically relevant testing data. The frequency of density testing should be at least one test per lift for every 2,500 square feet of fill. Each lift of fill placed in utility trenches should be tested on 50-foot centers. A minimum of 3 tests should be performed on all fill lifts.

## **7.6 Use of On-Site Soils as Structural Fill**

Site grading is expected to include excavation of cultivated soils and coastal plain deposits. Laboratory testing indicates that the tested, on-site soils consist of clayey sand underlain by sandy clay and highly plastic clay. In general, the on-site, clayey sands conformed to the requirements for structural fill. Therefore, they are suitable for reuse following proper moisture conditioning. However, soils consisting primarily of fine-grained silt and clay and exhibiting a high plasticity ( $LL > 50$  and/or  $PI > 25$ ) should not be reused as structural fill.

We note that tested, on-site soils exhibited natural moisture contents ranging from 10% to 21% in areas where grading is expected. Therefore, the on-site soils are expected to vary ( $\pm 5\%$ ) from their optimum moisture contents. If the on-site sands are to be reused as newly placed fill, the contractor should be prepared to moisture condition (dry or moisten) the soils, as necessary.

The contractor should expect to spend significant time reconditioning the existing soils if they are to be reused as structural fill. Due to the fine-grained particles in the soils, drying may require repeated disking and turning of the soil over several days of dry weather. The soils may require blending with water during the drier times of the year.

## **7.7 Water Control and Protection of the On-Site Soils**

Tested, on-site soils contained a significant amount (between 25.1% and 46.4%) of fine-grained, silt and clay particles. Silt and clay (and especially highly plastic clay) tend to lose strength when exposed to excess moisture. Additionally, fine-grained soil can become soft and disturbed due to repeated trafficking and twisting or turning of wheeled construction equipment. Due to the sensitive nature of the fine-grained soils, the extent of undercutting will depend on the care with which the contractor performs grading operations.

Therefore, the on-site soils should be protected from surface water and construction disturbance. Surface water from on and off the site should be intercepted and diverted away from the proposed development. During grading, it may be necessary for the earthwork contractor to use relatively light, tracked equipment or machinery that can operate outside the excavation to avoid disturbance to suitable soils. Soils that become too wet or are disturbed should be moisture conditioned and recompacted or removed and replaced with structural fill.

Springs are often encountered in the geologic formation present at the site. Therefore, it is possible that water seepage will be encountered during earthwork operations. The volume of water encountered during grading is expected to vary based on the depth of excavations and recent precipitation levels. Therefore, the extent and method of dewatering will depend on the time of year earthwork is performed and can be determined in the field on a case-by-case basis. In general, water seepage present in excavations should be collected and removed from the site in a controlled manner with temporary sump pits and pumps or drainage ditches.

Should areas of concentrated water seepage be encountered, it may be necessary to install a trench or blanket drain to permanently collect and remove the water in a controlled manner. The drain should consist of free-draining, coarse aggregate (ASTM C33 #57 or #67) encased in a non-woven geosynthetic (Mirafi 140 N or equivalent). Specific drain dimensions should be finalized in the field during construction as needed.

## **8.0 FOUNDATION RECOMMENDATIONS**

Based on the noted project information and the subsurface conditions encountered in the borings, it is our opinion that spread footings are an appropriate foundation alternative for support of the proposed structures. However, the cultivated zone present in the proposed development area should be excavated and replaced with compacted and tested, structural fill as previously described. The extent of undercutting should be field verified by CDG during grading.

Following proper subgrade preparation, foundations are expected to bear on newly placed, compacted and tested, structural fill. Footings bearing on the noted materials may be designed based on an allowable bearing pressure of 2,500 psf. A value of 0.35 is recommended for the coefficient of friction between the bottom of the footing and the bearing materials. Continuous and column footings should have minimum widths of 18 and 24 inches, respectively. Footings should bear a minimum of 24 inches below the lowest adjacent final subgrade elevation to provide confinement for the bearing soils. Footing depths will require adjustment should highly plastic clay be present within 36 inches of final subgrade elevation.

Our experience with similar soil conditions indicate that total and differential settlements are expected to be on the order of 1 inch and ½ inch, respectively. Foundations should be structurally isolated from ground-supported slabs to allow for differential movement associated with variable loading conditions. Alternatively, slabs should be jointed to prevent uncontrolled cracking at the interface with foundations. Additionally, flexible utility connections should be used to allow for the potential settlement of the basins relative to the surrounding grade.

Excavation for foundations often results in loosened or disturbed soils at the bearing elevation. Therefore, the bottom of footing trenches should be thoroughly compacted with a piston tamp following excavation. As previously described, water seepage may be encountered when making excavations. Foundation concrete must be placed in a relatively dry excavation; therefore, temporary dewatering may be required.

A representative of CDG should observe all foundation excavations prior to concrete placement to determine if the exposed materials conform to the design requirements. Subgrade preparation, as previously described, is expected to remove the previously cultivated zone from the proposed structure area. However, should the engineer identify remnant low-consistency materials present at the proposed bearing elevation, the excavation should be extended to a suitable bearing stratum. Excavations may be returned to the original planned bearing elevation with lean concrete.

Foundation bearing materials judged acceptable by the Engineer should be protected from disturbance, freezing, and excessive wetting or drying. Therefore, the footing should be constructed the same day as the excavation is made and evaluated by the Engineer. If the contractor's schedule requires a delay between excavation and foundation construction, the bearing materials should be protected with a thin seal of lean concrete.

Following construction, the foundations and underlying soils should be isolated from sources of excess water. Grades adjacent to the structure should be adjusted so that surface water flows away from the foundations. In no case should water be allowed to pond over newly constructed footings. Roof drains and downspouts from the new building should be directed away from the foundations. Additionally, soils adjacent to foundations should consist of properly compacted, structural fill to minimize water infiltration. The on-site soils contained fine-grained particles and will be adversely affected by excess water.

## **9.0 SLAB-ON-GRADE SUPPORT**

As previously outlined, the cultivated zone will require complete removal in the proposed structure area. Excavations should be backfilled with compacted and tested, structural fill. Provided the subgrade is prepared in accordance with our recommendations, the building slab will be supported on compacted and tested, structural fill. Ground supported slabs may be designed based on a modulus of subgrade reaction of 150 pci.

The on-site soils contain fine-grained particles and are sensitive to changes in moisture content. Soils that are wet and disturbed will lose strength and become unsuitable for slab support. Therefore, the contractor should exercise care when preparing the subgrade. Soils should be protected from disturbance caused by construction traffic. Water should not be allowed to pond on the subgrade, nor should the soils be allowed to become excessively dry.

Once final subgrade elevation is established in the floor slab area, the exposed soils should be evaluated by a representative of CDG. Proofrolling with a loaded dump truck should be performed to compact the upper soils and identify areas of instability. Unsuitable materials should be moisture conditioned and recompact or removed and replaced with compacted and tested, structural fill. Should the contractor's schedule delay floor slab construction after preparation of a suitable subgrade, the soils should be re-evaluated immediately prior to concrete placement. Drying or wetting and re-compaction of the soils will likely be required.

To reduce the potential for water migration through the floor slab, ground-supported slabs should be underlain by a capillary break consisting of a minimum of 6 inches of compacted, free-draining, coarse, granular material (such as ASTM C-33 #57 crushed aggregate). Depending on the type of floor coverings to be used, the owner may also elect to install a vapor barrier typically consisting of 6-mil polyethylene sheeting. The sheeting will reduce the infiltration of water vapor through the slab and the potential for damage to floor coverings. However, we note that the use of a vapor barrier will increase the potential for plastic shrinkage cracking during curing of the concrete slab.

## **10.0 CONSTRUCTION PHASE SERVICES**

We recommend that CDG be retained to provide observation and testing services during the construction phase of the project. Construction phase services typically include testing of materials such as soils and compacted fill and structural concrete. Additionally, engineering consultation and testing related to subgrade stabilization and foundation support are recommended.

A comprehensive testing program by the Geotechnical Engineer of Record is an essential element of the geotechnical evaluation for the project. Design assumptions were made based on widely spaced borings. Therefore, variations in soil properties should be expected and may only become apparent during construction. Testing and observation by the engineer of record is especially important during the earthwork and foundation phases of construction due to the high degree of variation in subsurface conditions typically present on a site in general, and due the low-consistency, cultivated zone present on this site in particular.

CDG cannot accept responsibility for the interpretation of the recommendations contained in this report nor for the application of the recommendations during construction of the project if not retained to provide a complete scope of construction observation and materials testing services.

## **11.0 GENERAL REMARKS AND CLOSING**

This report has been prepared for the exclusive use of Town of Kinsey for specific application to the Wastewater Treatment Plant project in Kinsey, Alabama and is not transferable to a third party. The recommendations in this report are intended for use on the stated project and should not be used for other purposes. It will be important for the geotechnical Engineer of Record to review the final project plans and specifications to provide the appropriate interpretation of the recommendations contained in this report.

The conclusions, analyses, and recommendations presented in this report are based upon currently accepted engineering principles, practices, and existing testing standards in the area where the services were provided. No other warranty, expressed or implied, is made.

The recommendations in this report were developed based on our understanding of the proposed construction and from the limited information obtained from the subsurface exploration and laboratory testing programs. If significant changes are made in the scope of the project, CDG should be allowed to review our recommendations in light of the changes to determine if additional testing and revised conclusions are needed.



## APPENDIX A

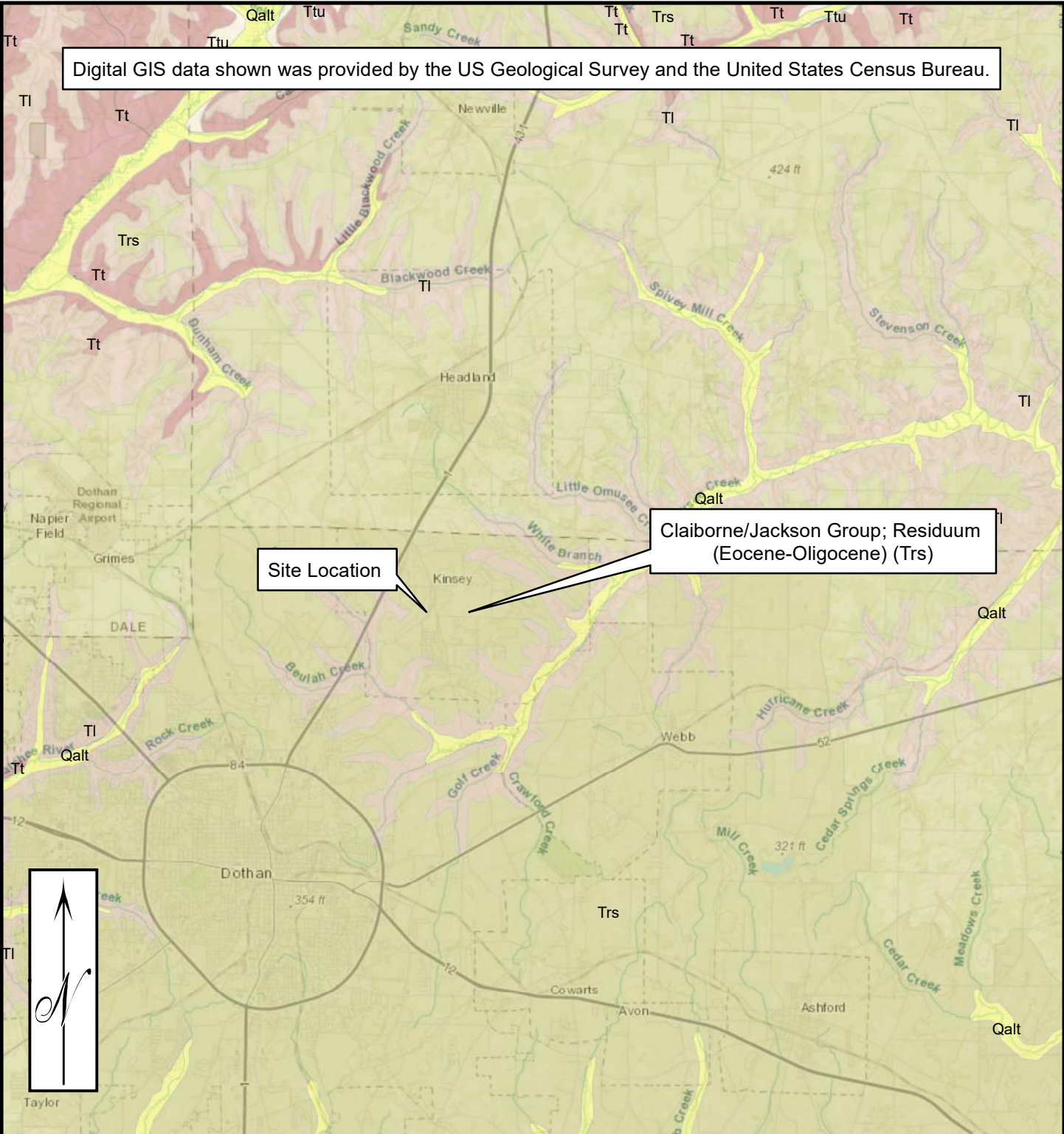
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### **Project Maps**





Digital GIS data shown was provided by the US Geological Survey and the United States Census Bureau.



Site Location

Claiborne/Jackson Group; Residuum (Eocene-Oligocene) (Trs)

Residuum - (Claiborne/Jackson Group), White to moderate-reddish-orange locally mottled sandy clay and residual clay with scattered layers of gravelly medium to coarse sand, fossiliferous chert and limestone boulders and limonitic sand masses. Derived from solution and collapse of limestone in the Jackson Group and Oligocene Series and the slumping of Pliocene and Miocene sediments.



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# Geology Map

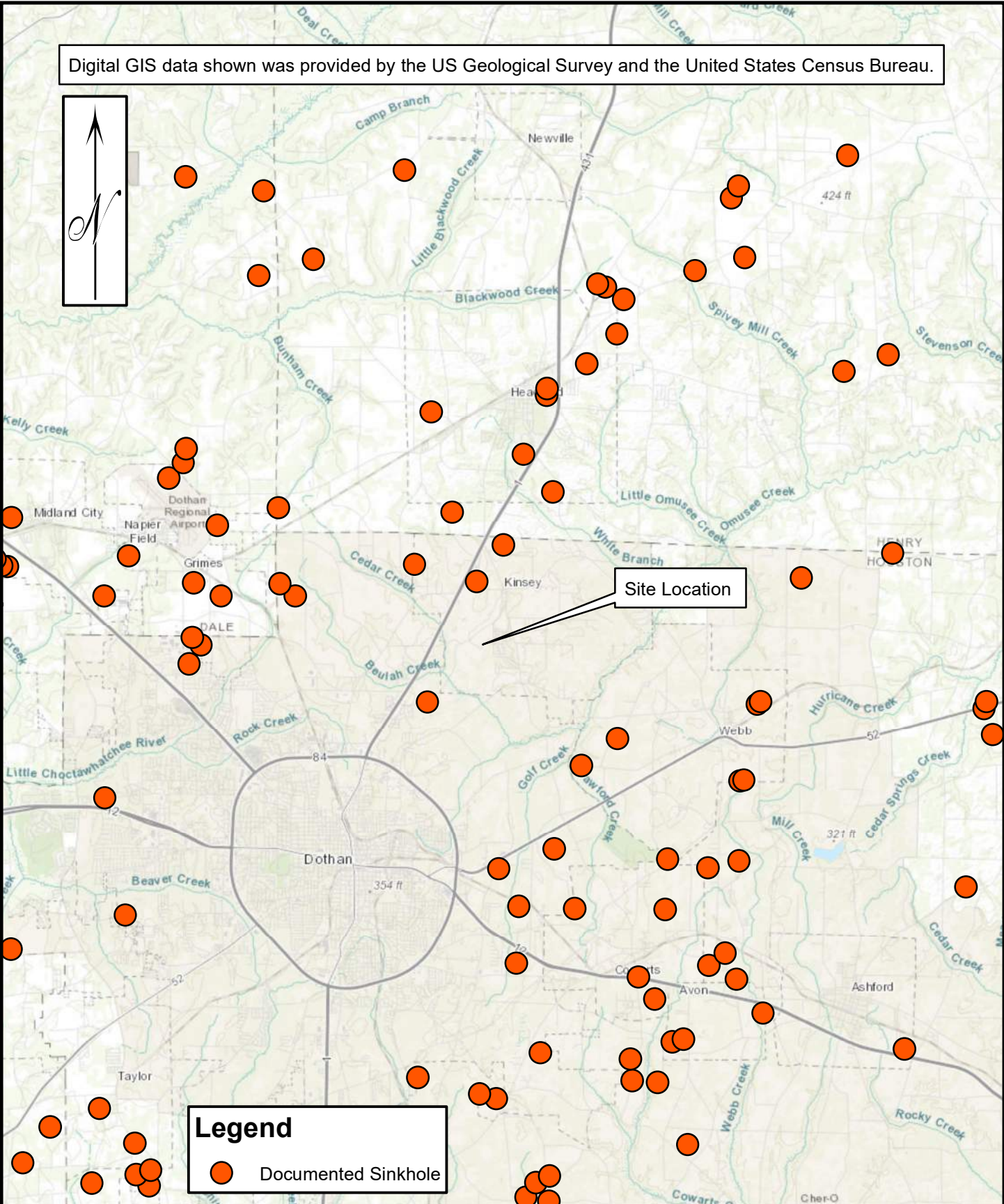
USDA WWTP and Collection System  
Kinsey, Alabama  
CDG Project No. R063519021

Drawn By: TL

Scale: 1" = 2.5 miles

Date: 2/2/2021

Digital GIS data shown was provided by the US Geological Survey and the United States Census Bureau.



**Legend**

● Documented Sinkhole

**CDG**  
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**Documented Sinkhole  
Location Map**

Drawn By: TL      Scale: 1" = 2.5 Miles      Date: 2/2/2021

USDA WWTP and Collection System  
Kinsey, Alabama  
CDG Project No. R063519021



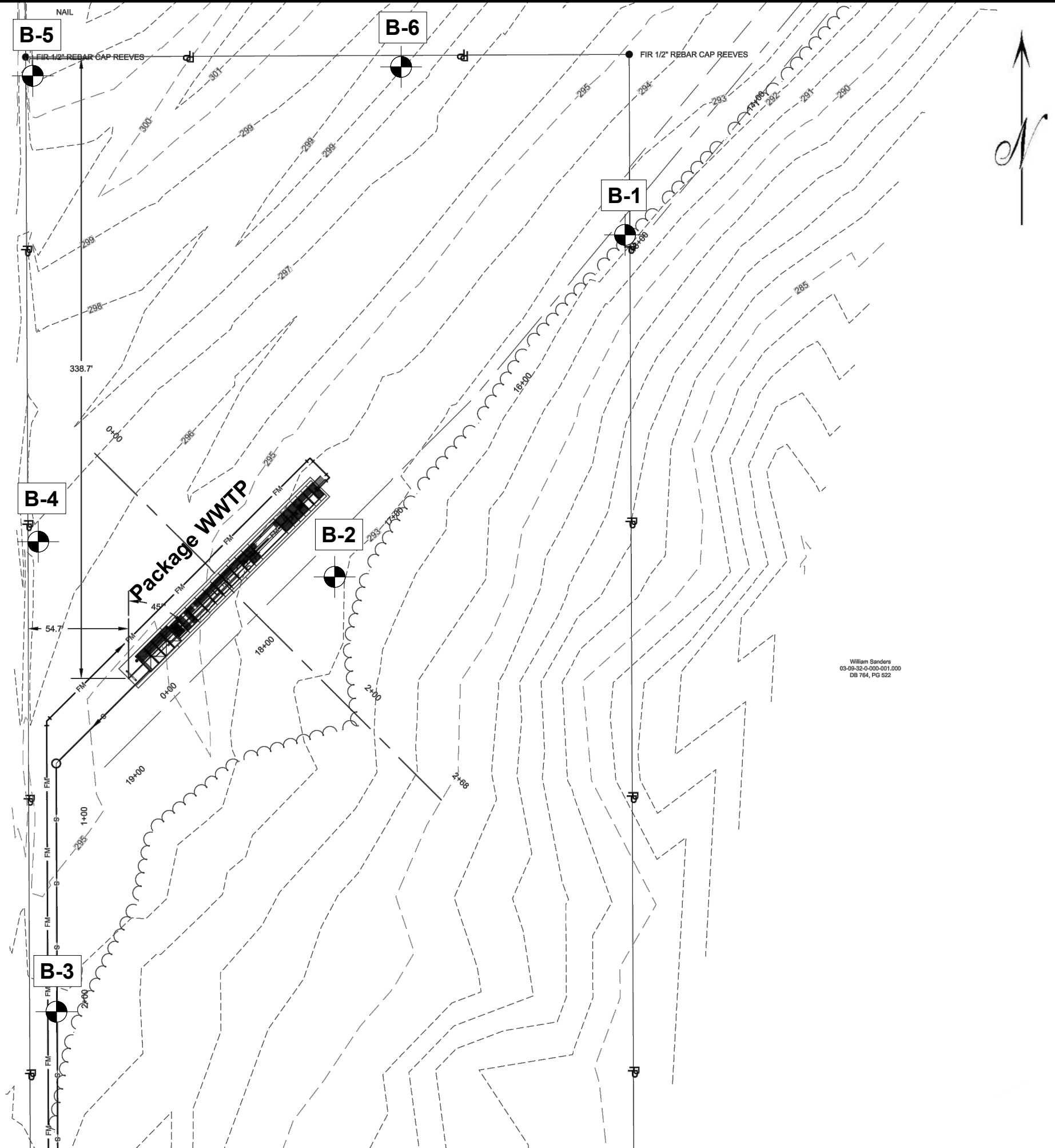
## APPENDIX B

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# **Boring Location Plan**

Legend

**B-1** Boring Location



Stephanie Lee  
03-09-32-0-000-002.005  
DB 795, PG 278

William Sanders  
03-09-32-0-000-001.000  
DB 764, PG 522

USDA WWTP and  
Collection System  
Kinsey, Alabama  
CDG Project No. R063519021

# Boring Location Plan

Date: 7/15/2022

Scale: 1" = 60 feet

Drawn By: TL



Notes:

Boring locations are approximate.

This plan was based on a plan sheet entitled "Overall Site Plan"; prepared by CDG, Inc.; dated 7/15/2022.



## APPENDIX C

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### **Boring Logs**



# Boring B-1

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Page 1 of 1

Project Name: USDA WWTP and Collection System  
 Project Location: Kinsey, Alabama Hammer Type: Automatic  
 CDG Project Number: R063519021 Method: Diedrich D-50 2 1/4" HSA  
 Date Drilled: 6/20/2022 Ground Elevation: Not Available

Notes:  
 No topsoil encountered at ground surface.

- Split Spoon Sample

Depth (ft.)	Approx. Elev. (ft.)	Graphic Log	Material Description	Type	Blows/6" (N-Value)	Rec. % (RQD)	LL	PL	PI	MC	Fines (%)	PPqu (tsf)	Remarks
5			Loose, tan, clayey fine to medium SAND (Cultivated Zone)		3-2-4 (6)								
			Medium dense, tan, clayey fine to medium SAND		4-7-10 (17)								
			...tan and red		5-7-12 (19)								
10			...red, tan and gray		4-8-11 (19)								
			Very stiff, red, tan and gray plastic CLAY		4-7-8 (15)							4+	
20			...same		3-6-8 (14)							4.0	
			...same (Coastal Plain Deposits)		5-7-13 (20)							3.0	
25			Boring terminated at 25.0 feet.										No groundwater encountered at time of drilling. Boring backfilled upon completion.



# Boring B-2

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Page 1 of 1

Project Name: USDA WWTP and Collection System  
 Project Location: Kinsey, Alabama Hammer Type: Automatic  
 CDG Project Number: R063519021 Method: Diedrich D-50 2 1/4" HSA  
 Date Drilled: 6/20/2022 Ground Elevation: Not Available

Notes:  
 No topsoil encountered at ground surface.

- Split Spoon Sample

Depth (ft.)	Approx. Elev. (ft.)	Graphic Log	Material Description	Type	Blows/6" (N-Value)	Rec. % (RQD)	LL	PL	PI	MC	Fines (%)	PPqu (tsf)	Remarks
5			Loose, clayey fine to medium SAND (Cultivated Zone)		2-2-4 (6)								
			Medium dense, red and tan, clayey fine to medium SAND		4-6-13 (19)								
			...same		4-7-13 (20)								
10			...red, tan and gray		3-6-14 (20)								
			Very stiff, red and tan, fine to medium sandy CLAY		6-10-13 (23)							4+	
20			Very stiff, dark red, tan and gray plastic CLAY		3-5-9 (14)							3.5	
			...same (Coastal Plain Deposits)		3-5-10 (15)								3.5
25			Boring terminated at 25.0 feet.										No groundwater encountered at time of drilling. Boring backfilled upon completion.



# Boring B-3

Engineering. Environmental. Answers.

Page 1 of 1

Project Name: USDA WWTP and Collection System  
 Project Location: Kinsey, Alabama Hammer Type: Automatic  
 CDG Project Number: R063519021 Method: Diedrich D-50 2 1/4" HSA  
 Date Drilled: 6/20/2022 Ground Elevation: Not Available

Notes:  
 ±3 inches of topsoil encountered at ground surface.

- Split Spoon Sample

Depth (ft.)	Approx. Elev. (ft.)	Graphic Log	Material Description	Type	Blows/6" (N-Value)	Rec. % (RQD)	LL	PL	PI	MC	Fines (%)	PPqu (tsf)	Remarks
5			Medium dense, red and tan, clayey fine to medium SAND (Cultivated Zone)		4-5-7 (12)		42	20	22	19	46.4		USCS = SC
			Dense, brown, red and tan, silty fine to medium SAND		15-20-23 (43)					16			
			...tan and red, fine to coarse-grained with numerous rock and root fragments		8-15-16 (31)		49	34	15	10	25.1		USCS = SM
10			Very stiff, dark red, light red and gray, highly plastic CLAY		6-9-19 (28)					21		4+	
15			...red, tan and gray		5-7-9 (16)					15		4+	
20			...soft, orange		2-2-2 (4)					55		0.25	
25			...very soft (Coastal Plain Deposits)		1-2-2 (4)					54		<0.25	
Boring terminated at 25.0 feet.													No groundwater encountered at time of drilling. Boring backfilled upon completion.





# Boring B-4

Engineering. Environmental. Answers.

Page 1 of 1

Project Name: USDA WWTP and Collection System  
 Project Location: Kinsey, Alabama Hammer Type: Automatic  
 CDG Project Number: R063519021 Method: Diedrich D-50 2 1/4" HSA  
 Date Drilled: 6/20/2022 Ground Elevation: Not Available

Notes:  
 No topsoil encountered at ground surface.

- Split Spoon Sample

Depth (ft.)	Approx. Elev. (ft.)	Graphic Log	Material Description	Type	Blows/6" (N-Value)	Rec. % (RQD)	LL	PL	PI	MC	Fines (%)	PPqu (tsf)	Remarks
5			Loose, brownish, tan clayey fine to medium SAND (Cultivated Zone)		1-3-4 (7)								
			Medium dense, brown and tan, clayey fine to medium SAND		3-6-8 (14)								
			...tan and gray		1-7-11 (18)								
10			...red and tan		6-7-9 (16)								
			Stiff, red and tan, fine to medium sandy CLAY		3-4-6 (10)							2.0	
20			...same		3-3-5 (8)							2.5	
			Very stiff, red, gray and tan, plastic CLAY (Coastal Plain Deposits)		3-6-10 (16)							4.0	
25			Boring terminated at 25.0 feet.										No groundwater encountered at time of drilling. Boring backfilled upon completion.



# Boring B-5

Engineering. Environmental. Answers.

Page 1 of 1

Project Name: USDA WWTP and Collection System  
 Project Location: Kinsey, Alabama Hammer Type: Automatic  
 CDG Project Number: R063519021 Method: Diedrich D-50 2 1/4" HSA  
 Date Drilled: 6/20/2022 Ground Elevation: Not Available

Notes:  
 No topsoil encountered at ground surface.

- Split Spoon Sample

Depth (ft.)	Approx. Elev. (ft.)	Graphic Log	Material Description	Type	Blows/6" (N-Value)	Rec. % (RQD)	LL	PL	PI	MC	Fines (%)	PPqu (tsf)	Remarks
5			Very loose, tan, clayey fine to medium SAND (Cultivated Zone)		2-1-3 (4)								
			Medium dense, red, tan and gray, clayey fine to medium SAND		4-7-15 (22)								
			...red and gray		4-8-11 (19)								
10			...same		3-8-10 (18)								
			Very stiff, gray, fine to medium sandy CLAY		6-9-12 (21)							4+	
20			Loose, red and gray, clayey fine to medium SAND		4-6-4 (10)								
			...medium dense (Coastal Plain Deposits)		7-8-9 (17)								
25			Boring terminated at 25.0 feet.										No groundwater encountered at time of drilling. Boring backfilled upon completion.



# Boring B-6

Engineering. Environmental. Answers.

Page 1 of 1

Project Name: USDA WWTP and Collection System  
 Project Location: Kinsey, Alabama Hammer Type: Automatic  
 CDG Project Number: R063519021 Method: Diedrich D-50 2 1/4" HSA  
 Date Drilled: 6/20/2022 Ground Elevation: Not Available

Notes:  
 No topsoil encountered at ground surface.

- Split Spoon Sample

Depth (ft.)	Approx. Elev. (ft.)	Graphic Log	Material Description	Type	Blows/6" (N-Value)	Rec. % (RQD)	LL	PL	PI	MC	Fines (%)	PPqu (tsf)	Remarks
5			Loose, tan, clayey fine to medium SAND (Cultivated Zone)		2-3-6 (9)					17			USCS = SC
			Medium dense, red and tan, clayey fine to medium SAND		5-8-10 (18)	38	22	16	17	39.2			
10			...same		3-7-9 (16)					18			USCS = SC
			...same		2-4-8 (12)	43	26	17	21	33.7			
15			Very stiff, red, tan and gray, fine to medium sandy CLAY		7-9-12 (21)					33		4+	
			...red and white		10-13-15 (28)					14		4.0	
25			Very stiff, white, tan and red, highly plastic CLAY (Coastal Plain Deposits)		4-7-8 (15)					28		3.0	Boring terminated at 25.0 feet.



## APPENDIX D

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# Laboratory Test Results



# Soil Classification Results

**Dothan**  
 170 E. Main Street  
 Dothan, AL 36301  
 Phone: 334-677-9431

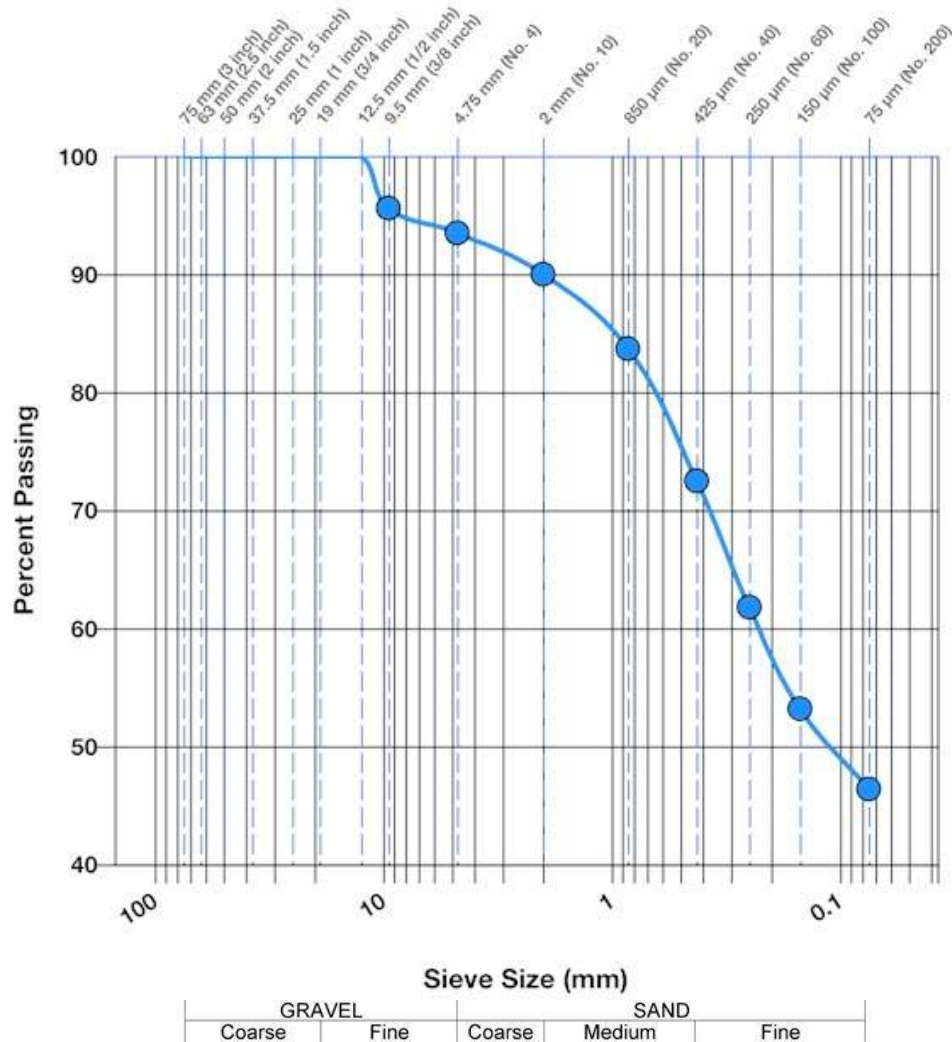
**Client:**  
 Town of Kinsey  
 6947 Walden Drive  
 Kinsey, AL 36303-9517

**Project:**  
 R063519021  
 Kinsey USDA WWTP and Collection System  
 Sanders Rd  
 Kinsey, AL

Sample and Test Information
<b>Boring No. / Sample #:</b> B-3 / 1760
<b>Location Details:</b> B-3 @ 1.5-3
<b>Sample Depth (ft.):</b> 1.5-3
<b>Sample Description:</b> Red and tan, clayey fine to medium SAND
<b>Date Sampled:</b> 06/20/2022
<b>Date Tested:</b> 07/01/2022
<b>Completed By:</b> Taylor Griffin
<b>Date Issued:</b> 07/05/2022

Report of Atterberg Limits (ASTM D4318)	
<b>Liquid Limit (LL):</b> 42	<b>Classifications</b> <b>USCS:</b> SC
<b>Plastic Limit (PL):</b> 20	
<b>Plasticity Index (PI):</b> 22	

Report of Sieve Analysis (ASTM D422)	
<b>Percent Gravel:</b> 6.5	<b>Soak Duration:</b> 24 hours
<b>Percent Sand:</b> 47.1	
<b>Percent Clay/Silt:</b> 46.4	





# Soil Classification Results

**Dothan**  
 170 E. Main Street  
 Dothan, AL 36301  
 Phone: 334-677-9431

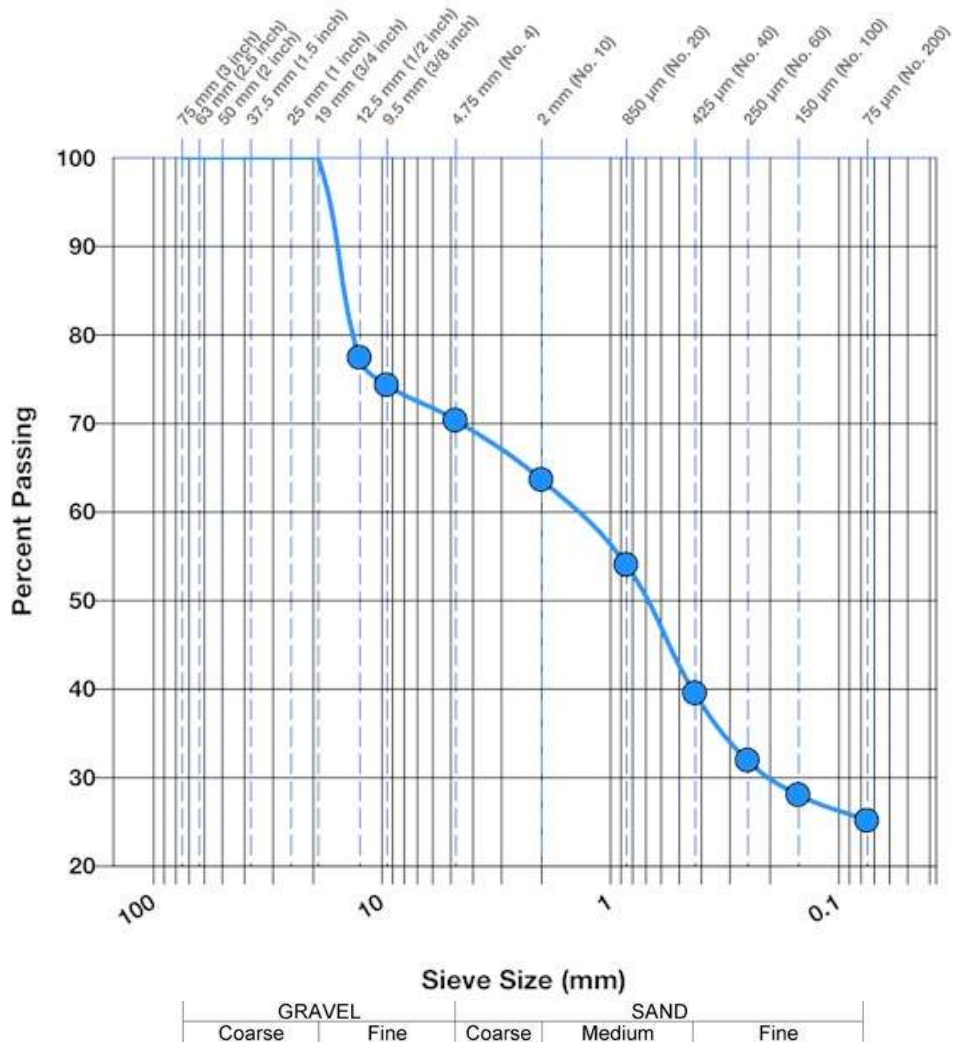
**Client:**  
 Town of Kinsey  
 6947 Walden Drive  
 Kinsey, AL 36303-9517

**Project:**  
 R063519021  
 Kinsey USDA WWTP and Collection System  
 Sanders Rd  
 Kinsey, AL

Sample and Test Information
<b>Boring No. / Sample #:</b> B-3 / 1762
<b>Location Details:</b> B-3 @ 6.5-8
<b>Sample Depth (ft.):</b> 6.5-8
<b>Sample Description:</b> Tan and red, silty fine to coarse SAND with numerous rock fragments
<b>Date Sampled:</b> 06/20/2022
<b>Date Tested:</b> 07/01/2022
<b>Completed By:</b> John Rhodus
<b>Date Issued:</b> 07/05/2022

Report of Atterberg Limits (ASTM D4318)	
<b>Liquid Limit (LL):</b> 49	<b>Classifications</b> <b>USCS:</b> SM
<b>Plastic Limit (PL):</b> 34	
<b>Plasticity Index (PI):</b> 15	

Report of Sieve Analysis (ASTM D422)	
<b>Percent Gravel:</b> 29.7	<b>Soak Duration:</b> 24 hours
<b>Percent Sand:</b> 45.2	
<b>Percent Clay/Silt:</b> 25.1	





# Soil Classification Results

**Dothan**  
 170 E. Main Street  
 Dothan, AL 36301  
 Phone: 334-677-9431

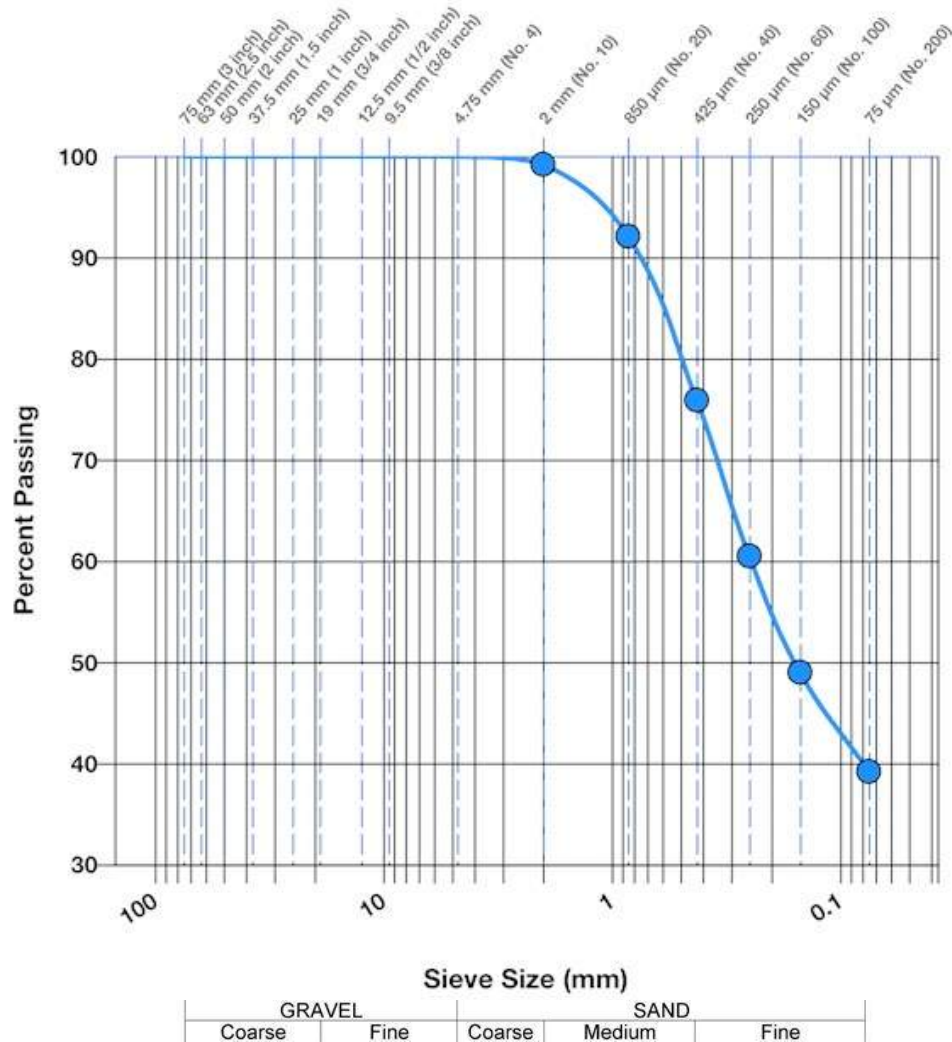
**Client:**  
 Town of Kinsey  
 6947 Walden Drive  
 Kinsey, AL 36303-9517

**Project:**  
 R063519021  
 Kinsey USDA WWTP and Collection System  
 Sanders Rd  
 Kinsey, AL

Sample and Test Information
<b>Boring No. / Sample #:</b> B-6 / 1768
<b>Location Details:</b> B-6 @ 4-5.5
<b>Sample Depth (ft.):</b> 4-5.5
<b>Sample Description:</b> Red and tan, clayey fine to medium SAND
<b>Date Sampled:</b> 06/20/2022
<b>Date Tested:</b> 07/01/2022
<b>Completed By:</b> John Rhodus
<b>Date Issued:</b> 07/05/2022

Report of Atterberg Limits (ASTM D4318)	
<b>Liquid Limit (LL):</b> 38	<b>Classifications</b> <b>USCS:</b> SC
<b>Plastic Limit (PL):</b> 22	
<b>Plasticity Index (PI):</b> 16	

Report of Sieve Analysis (ASTM D422)	
<b>Percent Gravel:</b> 0.0	<b>Soak Duration:</b> 24 hours
<b>Percent Sand:</b> 60.8	
<b>Percent Clay/Silt:</b> 39.2	





# Soil Classification Results

**Dothan**  
 170 E. Main Street  
 Dothan, AL 36301  
 Phone: 334-677-9431

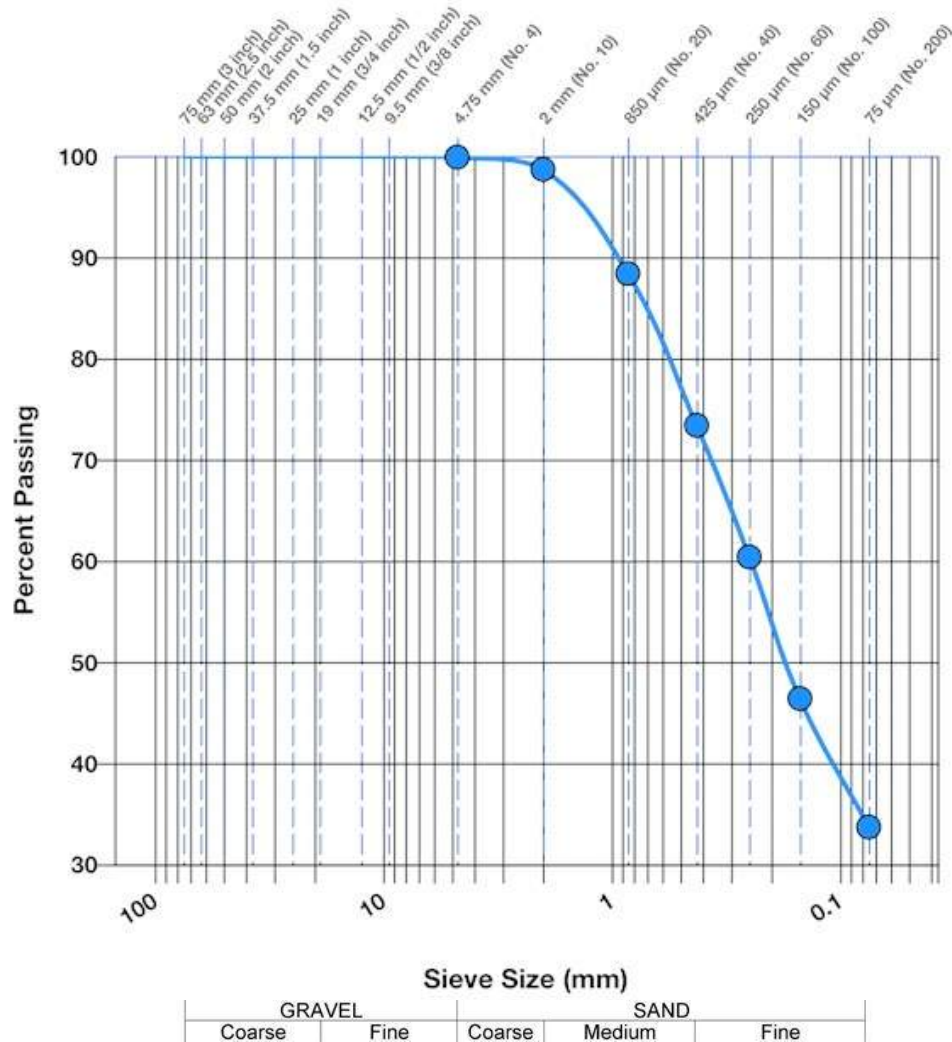
**Client:**  
 Town of Kinsey  
 6947 Walden Drive  
 Kinsey, AL 36303-9517

**Project:**  
 R063519021  
 Kinsey USDA WWTP and Collection System  
 Sanders Rd  
 Kinsey, AL

Sample and Test Information
<b>Boring No. / Sample #:</b> B-6 / 1770
<b>Location Details:</b> B-6 @ 9-10.5
<b>Sample Depth (ft.):</b> 9-10.5
<b>Sample Description:</b> Red and tan, clayey fine to medium SAND
<b>Date Sampled:</b> 06/20/2022
<b>Date Tested:</b> 07/01/2022
<b>Completed By:</b> John Rhodus
<b>Date Issued:</b> 07/05/2022

Report of Atterberg Limits (ASTM D4318)	
<b>Liquid Limit (LL):</b> 43	<b>Classifications</b> <b>USCS:</b> SC
<b>Plastic Limit (PL):</b> 26	
<b>Plasticity Index (PI):</b> 17	

Report of Sieve Analysis (ASTM D422)	
<b>Percent Gravel:</b> 0.1	<b>Soak Duration:</b> 24 hours
<b>Percent Sand:</b> 66.2	
<b>Percent Clay/Silt:</b> 33.7	





# Important Information about This

# Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

**The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.**

## Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

## Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer

will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

## Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

## You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept*

responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.

### Most of the “Findings” Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site’s subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

### This Report’s Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are not final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

### This Report Could Be Misinterpreted

Other design professionals’ misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals’ plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

### Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note*

*conspicuously that you’ve included the material for information purposes only.* To avoid misunderstanding, you may also want to note that “informational purposes” means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

### Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled “limitations,” many of these provisions indicate where geotechnical engineers’ responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

### Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a “phase-one” or “phase-two” environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

### Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer’s services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, *proper implementation of the geotechnical engineer’s recommendations will not of itself be sufficient to prevent moisture infiltration.* **Confront the risk of moisture infiltration** by including building-envelope or mold specialists on the design team. **Geotechnical engineers are not building-envelope or mold specialists.**



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e-mail: [info@geoprofessional.org](mailto:info@geoprofessional.org) [www.geoprofessional.org](http://www.geoprofessional.org)

