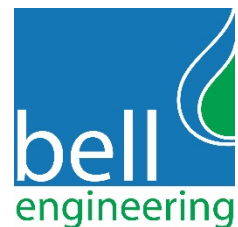
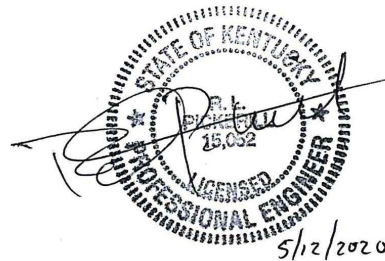


SPECIFICATIONS FOR  
CONTRACT 586-19-01

# HIGHWAY 139 NORTH WATER LINE UPGRADES AND MCUPTON BOOSTER PUMP STATION REPLACEMENT

*BARKLEY LAKE WATER DISTRICT  
TRIGG COUNTY, KENTUCKY*

*October 2019*



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2480 Fortune Drive  
Suite 350  
Lexington, KY 40509  
859/278-5412

107 Forbes Drive  
Hopkinsville, KY 42240  
270/886-5466

1278 Hendersonville Road  
Suite D  
Asheville, NC 28803  
828/774-5499

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**CONTRACT 586-19-01  
HIGHWAY 139 NORTH WATER LINE UPGRADES AND  
MCUPTON BOOSTER PUMP STATION REPLACEMENT  
BARKLEY LAKE WATER DISTRICT  
TRIGG COUNTY, KENTUCKY**

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**END**

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**SECTION 00010**

**ADVERTISEMENT FOR BIDS  
CONTRACT 586-19-01  
HIGHWAY 139 NORTH WATER LINE UPGRADES AND  
MCUPTON BOOSTER PUMP STATION REPLACEMENT  
BARKLEY LAKE WATER DISTRICT  
TRIGG COUNTY, KENTUCKY**

Sealed proposals for the following work will be received by the Barkley Lake Water District, Trigg County, Kentucky at the \_\_\_\_\_ until \_\_\_\_\_, local time, \_\_\_\_\_, \_\_\_\_\_, 2020, for furnishing labor and materials and performing all work as set forth by the Advertisement, General Conditions, Specifications and/or Drawings prepared by Bell Engineering. Immediately following the scheduled closing time for the reception of bids, all proposals which have been submitted in accordance with the above conditions will be publicly opened and read aloud.

The work to be bid is described as follows:

**CONTRACT 586-19-01**

Installation of approximately 7,677 L.F. of new 6-inch water lines and appurtenances. This Project also includes the replacement of the McUpton Booster Pump Station.

Drawings, Specifications and Contract Documents may be examined at the following places:

Barkley Lake Water District  
1420 Canton Road  
Cadiz, Kentucky 42211

Bell Engineering  
107 Forbes Drive  
Hopkinsville, Kentucky 42240

Associated Builders and Contractors of  
Kentuckiana, Inc.  
1333 Magnolia Street  
Bowling Green, Kentucky 42104

or may be obtained from **Lynn Imaging, 328 E. Vine Street, Lexington, Kentucky 40507, phone 859/255-1021**, upon receipt of non-refundable deposit as follows:

CONTRACT 586-19-01--\$170.00

Sealed proposals for this Contract shall be clearly marked on the outside of the envelope as follows:

“Sealed Proposal for Contract 586-19-01, Highway 139 North Water Line Upgrades and McUpton Booster Pump Station Replacement. Not to be opened until \_\_\_\_\_, local time, \_\_\_\_\_, \_\_\_\_\_, 2020.”

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If forwarded by mail, the sealed envelope containing the proposal must be enclosed in another envelope and mailed to the Barkley Lake Water District, 1420 Canton Drive, Cadiz, Kentucky 42211, allowing sufficient time for such mailing to reach this address prior to the scheduled closing time for receipt of proposals.

Bids security shall be furnished in accordance to the Instructions to Bidders.

The attention of all contractors is called to the fact that any contract awarded under this Advertisement for Bids is expected to be funded in part by a loan from the Rural Economic and Community Development formerly Farmers Home Administration.

The OWNER's share will be provided from current funds on hand and/or from revenue bonds.

Work to be performed by contractors involved in this project is subject to the minimum wage rates established by the U.S. Department of Labor under the provisions of the Davis-Bacon Act and the Kentucky Department of Labor, as set forth in Chapter 337 of the Kentucky Revised Statutes (per amendments adopted by the 1970 General Assembly). Contractors will be required to pay whichever minimum wage rate is higher for the individual crafts.

Bidders must comply with the President's Executive Order Nos. 11246 and 11375, which prohibit discrimination in employment regarding race, creed, color, sex or national origin. Where the President's Executive Order No. 11246 is shown, Executive Order No. 11375 also applies.

Bidders must make positive efforts to secure small or minority owned business enterprise participation in this Project.

Bidders must comply with Title VI of the Civil Rights Act of 1964, the Anti-Kickback Act, the Contract Work Hours Standard Act, and the Davis-Bacon Act.

Bidders must certify that they do not and will not maintain or provide for their employees any facilities that are segregated or based on race, color, creed, or national origin.

Bidders must show a certification of prior work under Executive Order 11246 (Equal Employment Opportunity) as amended.

All contractors and subcontractors must comply with 41 CFR 60-4, in regard to affirmative action. This is to insure equal opportunity to females and minorities, and apply the time tables and goals set forth in 41 CFR 60-4.

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The Barkley Lake Water District may consider informal any bid not prepared and submitted in accordance with the provisions of this advertisement and/or the Specifications and may waive any informalities or reject any and all bids.

BARKLEY LAKE WATER DISTRICT

By\_\_\_\_\_

Bell Engineering  
107 Forbes Drive  
Hopkinsville, Kentucky 42240  
Phone: 270/226-5466

**END OF SECTION**

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00010-3



# INSTRUCTIONS TO BIDDERS FOR CONSTRUCTION CONTRACTS

Prepared by



Issued and Published Jointly by



Compliant with RUS Kentucky Bulletin 1780-1, issued February 6, 2019.

## 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.

## ARTICLE 2 – COPIES OF BIDDING DOCUMENTS

2.01 Complete sets of the Bidding Documents may be obtained from the Issuing Office in the number and format stated in the advertisement or invitation to bid.

2.02 Complete sets of Bidding Documents shall be used in preparing Bids; neither Owner nor Engineer assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

2.03 Owner and Engineer, in making copies of Bidding Documents available on the above terms, do so only for the purpose of obtaining Bids for the Work and do not authorize or confer a license for any other use.

## ARTICLE 3 – QUALIFICATIONS OF BIDDERS

~~3.01 To demonstrate Bidder's qualifications to perform the Work, after submitting its Bid and within [ ] days of Owner's request, Bidder shall submit (a) written evidence establishing its qualifications such as financial data, previous experience, and present commitments, and (b) the following additional information:~~

~~A. [Evidence of Bidder's authority to do business in the state where the Project is located.]~~

~~B. [Bidder's state or other contractor license number, if applicable.]~~

~~C. [Subcontractor and Supplier qualification information; coordinate with provisions of Article 12 of these Instructions, "Subcontractors, Suppliers, and Others."]~~

~~D. [Other required information regarding qualifications]~~

~~{or}~~

~~3.01 Prospective Bidders shall submit required information regarding their qualifications by [ ] [insert deadline for prequalification submittals]. Owner will review the submitted information to determine which contractors are qualified to bid on the Work. Owner will issue an Addendum listing those contractors that Owner has determined to be qualified to construct the project. Bids will only be accepted from listed contractors. The information that each prospective Bidder must submit to seek prequalification includes (a) written evidence establishing its qualifications such as financial data, previous experience, and present commitments, and (b) the following additional information:~~

~~A. [Evidence of prospective Bidder's authority to do business in the state where the Project is located.]~~

~~B. [Prospective Bidder's state or other contractor license number, if applicable.]~~

~~C. [Subcontractor and Supplier qualification information; coordinate with provisions of Article 12 of these Instructions, "Subcontractors, Suppliers, and Others."]~~

~~D. [Other required information regarding qualifications]~~

~~{or}~~

- 3.01 To demonstrate Bidder's qualifications to perform the Work, Bidder shall submit with its Bid (a) written evidence establishing its qualifications such as financial data, previous experience, and present commitments, and (b) the following additional information:
- A. [Evidence of Bidder's authority to do business in the state where the Project is located.]
  - B. [Bidder's state or other contractor license number, if applicable.]
  - C. [Subcontractor and Supplier qualification information; coordinate with provisions of Article 12 of these Instructions, "Subcontractors, Suppliers, and Others."]
  - D. [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.
- 3.04 Bidder is advised to carefully review those portions of the Bid Form requiring Bidder's representations and certifications.

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

4.01 *Site and Other Areas*

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

4.02 *Existing Site Conditions*

- A. Subsurface and Physical Conditions; Hazardous Environmental Conditions
  - 1. The Supplementary Conditions identify:
    - a. those reports known to Owner of explorations and tests of subsurface conditions at or adjacent to the Site.
    - b. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities).
    - 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.
4. Geotechnical Baseline Report: The Bidding Documents contain a Geotechnical Baseline Report (GBR). The GBR describes certain select subsurface conditions that are anticipated to be encountered by Contractor during construction in specified locations (“Baseline Conditions”). The GBR is a Contract Document.

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

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

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

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

- A. Bidder shall conduct the required Site visit during normal working hours, and shall not disturb any ongoing operations at the Site.
- B. Bidder is not required to conduct any subsurface testing, or exhaustive investigations of Site conditions.
- C. On request, and to the extent Owner has control over the Site, and schedule permitting, the Owner will provide Bidder access to the Site to conduct such additional examinations, investigations, explorations, tests, and studies as Bidder deems necessary for preparing and submitting a successful Bid. Owner will not have any obligation to grant such access if doing so is not practical because of existing operations, security or safety concerns, or restraints on Owner’s authority regarding the Site.
- D. Bidder shall comply with all applicable Laws and Regulations regarding excavation and location of utilities, obtain all permits, and comply with all terms and conditions established by Owner or by property owners or other entities controlling the Site with respect to

schedule, access, existing operations, security, liability insurance, and applicable safety programs.

- E. Bidder shall fill all holes and clean up and restore the Site to its former condition upon completion of such explorations, investigations, tests, and studies.

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

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

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

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

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

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

- A. examine and carefully study the Bidding Documents, and any data and reference items identified in the Bidding Documents;
- B. visit the Site, conduct a thorough, alert visual examination of the Site and adjacent areas, and become familiar with and satisfy itself as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work;
- C. become familiar with and satisfy itself as to all Laws and Regulations that may affect cost, progress, and performance of the Work;
- D. carefully study all: (1) reports of explorations and tests of subsurface conditions at or adjacent to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings, and (2) reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings;
- E. consider the information known to Bidder itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder; and (3) Bidder's safety precautions and programs;
- F. agree, based on the information and observations referred to in the preceding paragraph, that at the time of submitting its Bid no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of its Bid for performance of the

Work at the price bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents;

- G. become aware of the general nature of the work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents;
- H. promptly give Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder discovers in the Bidding Documents and confirm that the written resolution thereof by Engineer is acceptable to Bidder;
- I. determine that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance and furnishing of the Work; and
- J. agree that the submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article, that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

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

- 6.01 A pre-Bid conference will be held at the time and location stated in the invitation or advertisement to bid. Representatives of Owner and Engineer will be present to discuss the Project. Bidders are encouraged to attend and participate in the conference. Engineer will transmit to all prospective Bidders of record such Addenda as Engineer considers necessary in response to questions arising at the conference. Oral statements may not be relied upon and will not be binding or legally effective.

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

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

#### **ARTICLE 8 – BID SECURITY**

- 8.01 A Bid must be accompanied by Bid security made payable to Owner in an amount of 5 percent of Bidder's maximum Bid price (determined by adding the base bid and all alternates) and in the form of a certified check, bank money order, or a Bid bond (on the form included in the Bidding Documents) issued by a surety meeting the requirements of Paragraphs 6.01 and 6.02 of the General Conditions.
- 8.02 The Bid security of the apparent Successful Bidder will be retained until Owner awards the contract to such Bidder, and such Bidder has executed the Contract Documents, furnished the required contract security, and met the other conditions of the Notice of Award, whereupon the Bid security will be released. If the Successful Bidder fails to execute and deliver the Contract Documents and furnish the required contract security within 15 days after the Notice of Award, Owner may consider Bidder to be in default, annul the Notice of Award, and the Bid security of

that Bidder will be forfeited. Such forfeiture shall be Owner's exclusive remedy if Bidder defaults.

- 8.03 The Bid security of other Bidders that Owner believes to have a reasonable chance of receiving the award may be retained by Owner until the earlier of seven days after the Effective Date of the Contract or 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 seven days after the Bid opening.

#### **ARTICLE 9 – CONTRACT TIMES**

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

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

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

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

- 11.01 **The Contract for the Work, if awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents, and those "or equal" or substitute materials and equipment subsequently approved by Engineer prior to the submittal of Bids and identified b 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 the Bidder and has been received by Engineer at least 15 days prior to the date for receipt of Bids in the case of a proposed substitute and 5 days prior in the case of a proposed "or equal." Each such request shall comply with the requirements of Paragraphs 7.04 and 7.05 of the General Conditions. The burden of proof of merit of the proposed item is upon the Bidder. Engineer's decision of approval or disapproval of proposed item will be final. If Engineer approves any such proposed item, such approval will be set forth in an Addendum issued to all prospective Bidders. Bidders shall not rely upon approvals made in any other matter. Substitutes and "or-equal" materials and equipment may be proposed by Contractor in accordance with Paragraphs 7.04 and 7.05 of the General Conditions after the Effective Date of the Contract.**
- 11.02 **All prices that Bidder sets forth in its Bid shall be based on the presumption that the Contractor will furnish the materials and equipment specified or described in the Bidding Documents, as supplemented by Addenda. Any assumptions regarding the possibility of a post-Bid approval of "or equal" or substitution requests are made at Bidder's sole risk.**
- 11.03 **If award is made, Contractor shall be allowed to submit proposed substitutes and "or equals" in accordance with the General Conditions.**
- ~~11.01 The Contract for the Work, as awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents without consideration during the bidding and Contract award process of possible substitute or "or-equal" items. In cases in which the Contract allows the Contractor to request that Engineer authorize the use of a substitute or "or-equal"~~

~~item of material or equipment, application for such acceptance may not be made to and will not be considered by Engineer until after the Effective Date of the Contract.~~

~~11.02 All prices that Bidder sets forth in its Bid shall be based on the presumption that the Contractor will furnish the materials and equipment specified or described in the Bidding Documents, as supplemented by Addenda. Any assumptions regarding the possibility of post-Bid approvals of "or equal" or substitution requests are made at Bidder's sole risk.~~

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

12.01 A Bidder shall be prepared to retain specific Subcontractors, Suppliers, or other individuals or entities for the performance of the Work if required by the Bidding Documents (most commonly in the Specifications) to do so, **in accordance with SC7.06B, ITB Article 23, and Article 2.02 of the Bid Form**. If a prospective Bidder objects to retaining any such Subcontractor, Supplier, or other individual or entity, and the concern is not relieved by an Addendum, then the prospective Bidder should refrain from submitting a Bid.

~~12.02 Subsequent to the submittal of the Bid, Owner may not require the Successful Bidder or Contractor to retain any Subcontractor, Supplier, or other individual or entity against which Contractor has reasonable objection.~~

12.02 **If required by the bid documents**, the apparent Successful Bidder, and any other Bidder so requested, shall within five days after Bid opening, submit to Owner a list of the Subcontractors or Suppliers proposed for the ~~following portions of the Work~~.

If requested by Owner, such list shall be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor, Supplier, or other individual or entity. If Owner or Engineer, after due investigation, has reasonable objection to any proposed Subcontractor, Supplier, individual, or entity, Owner may, before the Notice of Award is given, request apparent Successful Bidder to submit an acceptable substitute, in which case apparent Successful Bidder shall 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.

12.03 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, Suppliers, or other individuals or entities. Declining to make requested substitutions will constitute grounds for forfeiture of the Bid security of any Bidder. Any Subcontractor, Supplier, individual, or entity so listed and against which Owner or Engineer makes no written objection prior to the giving of the Notice of Award will be deemed acceptable to Owner and Engineer subject to subsequent revocation of such acceptance as provided in Paragraph 7.06 of the General Conditions.

12.04 **Contractor shall not be required to employ a Subcontractor, Supplier, individual, or entity against whom the Contractor has reasonable objection.**

12.05 **The Contractor shall not award work to a Subcontractor(s) in excess of the limits sated in SC7.06.**

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

13.01 The Bid Form is included with the Bidding Documents.

A. All blanks on the Bid Form shall be completed in ink and the Bid Form signed in ink. Erasures or alterations shall be initialed in ink by the person signing the Bid Form. A Bid



price shall be indicated for each section, Bid item, alternate, adjustment unit price item, and unit price item listed therein.

- B. If the Bid Form expressly indicates that submitting pricing on a specific alternate item is optional, and Bidder elects to not furnish pricing for such optional alternate item, then Bidder may enter the words "No Bid" or "Not Applicable."
- 13.02 A Bid by a corporation shall be executed in the corporate name by a corporate officer (whose title must appear under the signature), accompanied by evidence of authority to sign. The corporate address and state of incorporation shall be shown.
  - 13.03 A Bid by a partnership shall 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 partnership's address for receiving notices shall be shown.
  - 13.04 A Bid by a limited liability company shall be executed in the name of the firm by a member or other authorized person and accompanied by evidence of authority to sign. The state of formation of the firm and the firm's address for receiving notices shall be shown.
  - 13.05 A Bid by an individual shall show the Bidder's name and address for receiving notices.
  - 13.06 A Bid by a joint venture shall be executed by an authorized representative of each joint venturer in the manner indicated on the Bid Form. The joint venture's address for receiving notices shall be shown.
  - 13.07 All names shall be printed in ink below the signatures.
  - 13.08 The Bid shall contain an acknowledgment of receipt of all Addenda, the numbers of which shall be filled in on the Bid Form.
  - 13.09 Postal and e-mail addresses and telephone number for communications regarding the Bid shall be shown.
  - 13.10 The Bid shall contain evidence of Bidder's authority and qualification to do business in the state where the Project is located, or Bidder shall covenant in writing to obtain such authority and qualification prior to award of the Contract and attach such covenant to the Bid. Bidder's state contractor license number, if any, shall also be shown on the Bid Form.

#### **ARTICLE 14 – BASIS OF BID**

##### **14.01 *Lump Sum***

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

##### **14.02 *Unit Price***

- A. Bidders shall 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.

#### 14.03 Allowances

- A. For cash allowances the Bid price shall 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.

#### ~~14.04 Price-Plus-Time Bids~~

- ~~A. The Owner will consider the time of Substantial Completion commitment made by the Bidder in the comparison of Bids.~~
- ~~B. Bidder shall designate the number of days required to achieve Substantial Completion of the Work and enter that number in the Bid Form as the total number of calendar days to substantially complete the Work.~~
- ~~C. The total number of calendar days for Substantial Completion designated by Bidder shall be less than or equal to a maximum of [\_\_\_\_], but not less than the minimum of [\_\_\_\_]. If Bidder purports to designate a time for Substantial Completion that is less than the allowed minimum, or greater than the allowed maximum, Owner will reject the Bid as nonresponsive.~~
- ~~D. The Agreement as executed will contain the Substantial Completion time designated in Successful Bidder's Bid, and the Contractor will be assessed liquidated damages at the rate stated in the Agreement for failure to attain Substantial Completion within that time.~~
- ~~E. [Bidder shall also designate the time in which it will achieve Milestones, and achieve readiness for final payment. Such time commitments shall be consistent with the "Time of Substantial Completion" to which Bidder commits. The Agreement as executed will contain, as binding Contract Times, Successful Bidder's time commitments regarding Milestones, as applicable, and readiness for final payment.]~~

### ARTICLE 15 – SUBMITTAL OF BID

- 15.01 With each copy of the Bidding Documents, a Bidder is furnished one separate unbound copy of the Bid Form, and, if required, the Bid Bond Form. The unbound copy of the Bid Form is to be completed and submitted with the Bid security and the other documents required to be submitted under the terms of Article 7 of the Bid Form.
- 15.02 A Bid shall be received no later than the date and time prescribed and at the place indicated in the advertisement or invitation to bid and shall be enclosed in a plainly marked package with the Project title (and, if applicable, the designated portion of the Project for which the Bid is submitted), the name and address of Bidder, and shall be accompanied by the Bid security and other required documents. If a Bid is sent by mail or other delivery system, the sealed envelope containing the Bid shall be enclosed in a separate package plainly marked on the outside with the notation "BID ENCLOSED." A mailed Bid shall be addressed to **Barkley Lake Water District, 1420 Canton Road, Cadiz, Kentucky 42211.**
- 15.03 Bids received after the date and time prescribed for the opening of bids, or not submitted at the correct location or in the designated manner, will not be accepted and will be returned to the Bidder unopened.

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

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

## **ARTICLE 17 – OPENING OF BIDS**

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

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

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

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

- 19.01 Owner reserves the right to reject any or all Bids, including without limitation, nonconforming, nonresponsive, unbalanced, or conditional Bids. Owner will reject the Bid of any Bidder that Owner finds, after reasonable inquiry and evaluation, to not be responsible. If Bidder purports to add terms or conditions to its Bid, takes exception to any provision of the Bidding Documents, or attempts to alter the contents of the Contract Documents for purposes of the Bid, then the Owner will reject the Bid as nonresponsive; provided that Owner also reserves the right to waive all minor informalities not involving price, time, or changes in the Work.
- 19.02 If Owner awards the contract for the Work, such award shall be to the responsible Bidder submitting the lowest responsive Bid.
- 19.03 Evaluation of Bids
- A. In evaluating Bids, Owner will consider whether or not the Bids comply with the prescribed requirements, and such alternates, unit prices, and other data, as may be requested in the Bid Form or prior to the Notice of Award.
  - B. **In comparison of the bids, if there is no acceptable bid within available project funds, alternate deducts will be applied in the same order of priority as listed in the bid form. To determine the bid prices for purpose of comparison, Owner shall announce a “Base bid minus any necessary deducts” budget after receiving all bids, but prior to the opening of them. For comparison purposes, deductions will be made, following the order of priority established in the Bid Form, until an acceptable bid is within the project funds available.**

**All bids will be recalculated with each deduction, and each bidder should be aware, the apparent low bidder may change following each deduction. After determination of Successful Bidder based on this comparative process and on the responsiveness, responsibilities, and other factors set forth in these instructions, the award may be made to said Successful Bidder on its base bid, minus any deductions to the base bid price.**

- B. 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.
- ~~C. Bid prices will be compared after adjusting for differences in time of Substantial Completion (total number of calendar days to substantially complete the Work) designated by Bidders. The adjusting amount will be determined at the rate set forth in the Agreement for liquidated damages for failing to achieve Substantial Completion, or such other amount that Owner has designated in the Bid Form.~~
- ~~1. The method for calculating the lowest bid for comparison will be the summation of the Bid price shown in the Bid Form plus the product of the Bidder specified time of Substantial Completion (in calendar days) times the rate for liquidated damages ~~[or other Owner designated daily rate]~~ (in dollars per day).~~
  - ~~2. This procedure is only used to determine the lowest bid for comparison and contractor selection purposes. The Contract Price for compensation and payment purposes remains the Bid price shown in the Bid Form.~~
- 19.04 In evaluating whether a Bidder is responsible, Owner will consider the qualifications of the Bidder and may consider the qualifications and experience of Subcontractors and Suppliers proposed for those portions of the Work for which the identity of Subcontractors and Suppliers must be submitted as provided in the Bidding Documents.
- 19.05 Owner may conduct such investigations as Owner deems necessary to establish the responsibility, qualifications, and financial ability of Bidders and any proposed Subcontractors or Suppliers.

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

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

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

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

**ARTICLE 22 – SALES AND USE TAXES**

~~22.01 Owner is exempt from [ ] state sales and use taxes on materials and equipment to be incorporated in the Work. (Exemption No. [ ]). Said taxes shall not be included in the Bid. Refer to Paragraph SC-7.09 of the Supplementary Conditions for additional information.~~

~~*this Article if necessary.*~~

**ARTICLE 23 – CONTRACTS TO BE ASSIGNED**

**Not applicable.**

**ARTICLE 24 – FEDERAL WAGE RATE REQUIREMENTS**

**24.01 Federal requirements in Article 19 of the Supplementary Conditions apply to this Project.**

**24.02 If the contract price is in excess of \$100,000.00, provisions of the Contract Work Hours and Safety Standards Act at 29 CFR 5.5(b) apply.**

**BID FORM**

**BARKLEY LAKE WATER DISTRICT  
1420 CANTON ROAD  
CADIZ, KENTUCKY 42211**

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**ARTICLE 1 – BID RECIPIENT**

1.01 This Bid is submitted to:

***Barkley Lake Water District  
1420 Canton Road  
Cadiz, Kentucky 42211***

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

**ARTICLE 2 – BIDDER’S ACKNOWLEDGEMENTS**

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

**ARTICLE 3 – BIDDER’S REPRESENTATIONS**

3.01 In submitting this Bid, Bidder represents that:

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

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

B. Bidder has visited the Site, conducted a thorough, alert visual examination of the Site and adjacent areas, and become familiar with and satisfied itself as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

C. Bidder is familiar with and has satisfied itself as to all Laws and Regulations that may affect cost, progress, and performance of the Work.

D. Bidder has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or adjacent to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings, and (2) reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings.

E. Bidder has considered the information known to Bidder itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and any Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of

such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder; and (3) Bidder's safety precautions and programs.

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

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

4.01 Bidder certifies that:

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



## **ARTICLE 5 – BASIS OF BID**

5.01 Bidder will complete the Work in accordance with the Contract Documents for the price(s) as shown on the Form of Proposal following Article 9.01 of this Section C-410 of these Specifications.

## **ARTICLE 6 – TIME OF COMPLETION**

6.01 Bidder agrees that the Work will be substantially complete within 180 calendar days after the date when the Contract Times commence to run as provided in Paragraph 4.01 of the General Conditions, and will be completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions within 180 calendar days after the date when the Contract Times commence to run.

6.02 Bidder accepts the provisions of the Agreement as to liquidated damages.

## **ARTICLE 7 – ATTACHMENTS TO THIS BID**

7.01 The following documents are submitted with and made a condition of this Bid:

- A. Required Bid security;
- B. List of Proposed Subcontractors;
- C. List of Proposed Suppliers;
- D. List of Project References;
- E. Evidence of authority to do business in the state of the Project; or a written covenant to obtain such license within the time for acceptance of Bids;
- F. Contractor's License No.: [REDACTED] [or] Evidence of Bidder's ability to obtain a State Contractor's License and a covenant by Bidder to obtain said license within the time for acceptance of Bids;
- G. Required Bidder Qualification Statement with supporting data; and

## **ARTICLE 8 – DEFINED TERMS**

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

**ARTICLE 9 – BID SUBMITTAL**

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

By:

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

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

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

Attest:

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

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

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

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

Address for giving notices:

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

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

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

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

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

*(where applicable)*

**FORM OF PROPOSAL**  
**CONTRACT 586-19-01**  
**HIGHWAY 139 NORTH WATER LINE UPGRADES AND**  
**MCUPTON BOOSTER PUMP STATION REPLACEMENT**  
**BARKLEY LAKE WATER DISTRICT**  
**TRIGG COUNTY, KENTUCKY**

Note: The following Form of Proposal shall be followed exactly in submitting a proposal for this work. This copy, properly filled in, shall be used in submitting a proposal.

This proposal is submitted by \_\_\_\_\_

\_\_\_\_\_  
(Name and Address of Bidding Contractor) Zip Code

Date: \_\_\_\_\_ Phone No.: \_\_\_\_\_  
Area Code

To: Barkley Lake Water District  
1420 Canton Road  
Cadiz, Kentucky 42211

Having carefully examined the complete contract documents, including all general and technical specifications and drawings, special requirements, as well as the project site, the undersigned, hereinafter known as the CONTRACTOR, proposes to furnish all labor, materials, tools, machinery, appliances, supplies, equipment, and services as called for by the applicable contract documents, as well as by all Addenda heretofore issued. We agree to enter into a contract and to complete all work required by and under the terms and conditions of the contract documents for the amounts shown in this proposal form.

We acknowledge receipt of the following Addenda:

No. _____, dated _____.	No. _____, dated _____.
No. _____, dated _____.	No. _____, dated _____.
No. _____, dated _____.	No. _____, dated _____.
No. _____, dated _____.	No. _____, dated _____.

If none received, write "none" here: \_\_\_\_\_.

HIGHWAY 139 NORTH WATERLINE UPGRADES  
 AND McUPTON BOOSTER PUMP STATION REPLACEMENT  
 BARKLEY LAKE WATER DISTRICT  
 TRIGG COUNTY, KENTUCKY

Item No.	Item	Quantity	Unit	Unit Price	Total
----------	------	----------	------	------------	-------

If the Contract is to be awarded, it will be awarded to the lowest responsive, responsible Base Bidder whose evaluation by the OWNER indicates to the OWNER that the award will be in the best interest of the Project.

**DIVISION "A"-WATER LINES**

1.	6-Inch Class 250 (SDR 17) PVC Pipe, Furnishing, Trenching, Bedding, Laying and Backfilling, Including Compact Ductile Iron, Mechanical Joint Fittings, Detectable Wire, Unclassified Excavation, Complete	7,329	L.F.	\$_____	\$_____
2.	6-Inch Ductile Iron Restrained Joint Pipe for Bridge Crossing. Includes Pipe, Supports, Insulation, Coring of Bridge End Bents, Connections to PVC Pipes, Expansion Joint, and Installation on Bridge, Complete	348	L.F.	\$_____	\$_____
3.	6-Inch Ductile Iron, Mechanical Joint Gate Valve, Valve Box, and Collar, Complete	4	Each	\$_____	\$_____
4.	Fire Hydrant Assembly, Furnish and Install, Per Detail on Plans, Complete	1	Each	\$_____	\$_____
5.	Flush Hydrant Assembly, Furnish and Install, Per Detail on Plans, Complete	1	Each	\$_____	\$_____
6.	Locate and Reconnect Existing Water Service, Per Detail on Plans, Includes up to 12 lf of 3/4" Poly Service Tubing, and all Fittings Necessary for Reconnection	13	Each	\$_____	\$_____
7.	3/4" Corp Stop and Saddle for 6" PVC Pipe, Complete	13	Each	\$_____	\$_____
8.	3/4" Polyethylene Service Tubing, Where Reconnection Distance Required Exceeds 12' in Length	100	L.F.		\$_____
9.	Reconnect Existing 2" Water Main, Including DIMJ Tee, Bronze Full-Port Ball Valve, Standard Valve Box and Collar, Complete	1	Each		\$_____
10.	Reconnect Existing 1" Water Main, Including Bronze Saddle, Corp Stop, Bronze Full-Port Ball Valve, Copper Tubing, Standard Valve Box, and Collar, Complete	1	Each		\$_____

CONTRACT 586-19-01

HIGHWAY 139 NORTH WATERLINE UPGRADES  
AND McUPTON BOOSTER PUMP STATION REPLACEMENT  
BARKLEY LAKE WATER DISTRICT  
TRIGG COUNTY, KENTUCKY

Item No.	Item	Quantity	Unit	Unit Price	Total
11.	Cut/Tie-in To Existing 6-Inch Line, Including All Necessary Fittings, Complete	2	Each	\$_____	\$_____
12.	Supply and Install 6" SDR 17 PVC Carrier Pipe under Driveways or Obstacles by Drilling/Boring Method, No Casing Pipe Required (Freebore), Complete	105	L.F.	\$_____	\$_____
13.	Remove Existing Hydrant, Reset on New Line, Including New Gate Valve, Box And Collar, DIMJ Tee, Complete	1	Each		\$_____
14.	Supply and Install Cap on End of Abandoned Water Mains, Complete	2	Each	\$_____	\$_____
15.	Crushed Rock on Trench Surface (_____ L.F. x 225/2000 lbs = _____ Tons)	165	Ton	\$_____	\$_____
16.	Fiberglass Line Marker, Furnish, and Install, Complete	6	Each	\$_____	\$_____
17.	Trench Width, on Streets, Drives, and Roads,	60	L.F.	\$_____	\$_____
18.	Remove Existing Flush Hydrant, Return To Owner.	1	Each	\$_____	\$_____
19.	Search And Extra Depth Trench Excavation, Only on Order of the Engineer.	10	C.Y.	\$_____	\$_____
20.	Extra for Riprap Stone, Only on Order of the Engineer	10	Ton	\$_____	\$_____
21.	on Order of the Engineer	10	Ton	\$_____	\$_____
	SUBTOTAL DIVISION "A"				\$_____

CONTRACT 586-19-01

HIGHWAY 139 NORTH WATERLINE UPGRADES  
AND McUPTON BOOSTER PUMP STATION REPLACEMENT  
BARKLEY LAKE WATER DISTRICT  
TRIGG COUNTY, KENTUCKY

Item No.	Item	Quantity	Unit	Unit Price	Total
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**DIVISION "B" - BOOSTER PUMPING STATION**

For the complete construction as shown on plan sheets and specifications of a water booster pumping station, complete, as specified and/or shown on the Drawings, including excavation, regrade, valves, piping, conduits, pumps, site work, flushing hydrants, line markers, concrete work, crushed stone, security fence, gate, access road, electrical and control work, Telemetry Relocation & Coordination, and all other items of work necessary for a complete and functional facility;

THE LUMP SUM OF \_\_\_\_\_  
\_\_\_\_\_ DOLLARS AND \_\_\_\_\_ CENTS (\$\_\_\_\_\_)

SUBTOTAL DIVISION "B" \$\_\_\_\_\_

**SUMMARY**

DIVISION "A" \$\_\_\_\_\_  
DIVISION "B" \$\_\_\_\_\_

**TOTAL BID CONTRACT 586-19-01** \$\_\_\_\_\_

## BID BOND

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

---

BIDDER (*Name and Address*):

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

OWNER (*Name and Address*):

Barkley Lake Water District  
1420 Canton Road  
Cadiz, Kentucky 42211

BID

Bid Due Date:

Description (*Project Name— Include Location*):

BOND

Bond Number:

Date:

Penal sum

\$

(Words)

(Figures)

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

**BIDDER**

**SURETY**

(Seal)

(Seal)

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

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

By:

\_\_\_\_\_  
Signature

By:

\_\_\_\_\_  
Signature (Attach Power of Attorney)

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

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

\_\_\_\_\_  
Title

\_\_\_\_\_  
Title

Attest:

\_\_\_\_\_  
Signature

Attest:

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Title

\_\_\_\_\_  
Title

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

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

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



# QUALIFICATIONS STATEMENT

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

**1. SUBMITTED BY:**

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

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

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

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

Owner: \_\_\_\_\_

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

**TYPE OF WORK:** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**4. CONTRACTOR'S CONTACT INFORMATION**

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

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

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

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

**5. AFFILIATED COMPANIES:**

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

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

\_\_\_\_\_

\_\_\_\_\_

**6. TYPE OF ORGANIZATION:**

SOLE PROPRIETORSHIP

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

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

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

PARTNERSHIP

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

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

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

\_\_\_\_\_

\_\_\_\_\_

CORPORATION

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

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

Executive Officers:

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

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

\_\_\_\_\_

\_\_\_\_\_

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

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

LIMITED LIABILITY COMPANY

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

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

Members: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

JOINT VENTURE

Sate of Organization: \_\_\_\_\_

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

Form of Organization: \_\_\_\_\_

Joint Venture Managing Partner

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

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

\_\_\_\_\_

\_\_\_\_\_

Joint Venture Managing Partner

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

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

\_\_\_\_\_

Joint Venture Managing Partner

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

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

\_\_\_\_\_

**7. LICENSING**

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

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

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

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

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

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

**8. CERTIFICATIONS**

**CERTIFIED BY:**

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

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

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

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

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

**9. BONDING INFORMATION**

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

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

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

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

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

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

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

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

**10. FINANCIAL INFORMATION**

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

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

\_\_\_\_\_

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

Phone:

INCLUDE AS AN ATTACHMENT AN AUDITED BALANCE SHEET FOR EACH OF THE  
LAST 3 YEARS ONLY IF REQUIRED BY OWNER SUBSEQUENT TO RECEIPT OF BIDS.

**11. CONSTRUCTION EXPERIENCE:**

Current Experience:

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

Previous Experience:

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

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

YES  NO

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

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

YES  NO

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

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

YES  NO

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

**12. SAFETY PROGRAM:**

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

Include the following as attachments:

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

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

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

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

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

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

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

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

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

YEAR	_____	TOTAL NUMBER OF MAN-HOURS	_____
YEAR	_____	TOTAL NUMBER OF MAN-HOURS	_____
YEAR	_____	TOTAL NUMBER OF MAN-HOURS	_____
YEAR	_____	TOTAL NUMBER OF MAN-HOURS	_____
YEAR	_____	TOTAL NUMBER OF MAN-HOURS	_____

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

YEAR	_____	DART	_____
YEAR	_____	DART	_____
YEAR	_____	DART	_____
YEAR	_____	DART	_____
YEAR	_____	DART	_____

**13. EQUIPMENT:**

MAJOR EQUIPMENT:

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

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

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

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

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

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

NOTARY ATTEST:

SUBSCRIBED AND SWORN TO BEFORE ME

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

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

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

REQUIRED ATTACHMENTS

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



## SCHEDULE A

### CURRENT EXPERIENCE

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

## SCHEDULE B

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

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

## SCHEDULE B

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

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

SCHEDULE C - LIST OF MAJOR EQUIPMENT AVAILABLE

ITEM	PURCHASE DATE	CONDITION	ACQUIRED VALUE

**NOTICE OF AWARD**

TO: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

PROJECT Description: \_\_\_\_\_  
\_\_\_\_\_

The OWNER has considered the BID submitted by you for the above described WORK in response to its Advertisement for Bids dated \_\_, 20\_\_, and Information for Bidders.

You are hereby notified that your BID has been accepted for items in the amount of \$\_\_\_\_\_.

You are required by the Information for Bidders to execute the enclosed Agreement and furnish the required CONTRACTOR'S Performance BOND, Payment BOND and certificates of insurance within fifteen (15) calendar days from the date of this Notice to you.

If you fail to execute said Agreement and to furnish said BONDS within fifteen (15) days from the date of this Notice, said OWNER will be entitled to consider all your rights arising out of the OWNER's acceptance of your BID as abandoned and as a forfeiture of your BID BOND. The OWNER will be entitled to such other rights as may be granted by law.

Within ten (10) days of your compliance of the above conditions, Owner will return to you one fully executed counterpart of the Agreement, together with any additional copies of the Contract Documents as indicated in Paragraph 2.02 of the General Conditions.

You are required to return an acknowledged copy of this NOTICE OF AWARD to the OWNER.

Dated this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_.

Owner: \_\_\_\_\_

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

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

**ACCEPTANCE OF NOTICE**

Receipt of the above NOTICE OF AWARD is hereby acknowledged

By \_\_\_\_\_, this the \_\_\_\_\_ day

of \_\_\_\_\_, 20\_\_\_\_\_.

Title \_\_\_\_\_

---

**NOTICE OF AWARD**

---

Date of Issuance:

Owner:

Owner's Contract No.:

Engineer:

Engineer's Project No.:

Project:

Contract Name:

Bidder:

Bidder's Address:

**TO BIDDER:**

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

\_\_\_\_\_  
*[describe Work, alternates, or sections of Work awarded]*

The Contract Price of the awarded Contract is: \$ \_\_\_\_\_ *[note if subject to unit prices, or cost-plus]*

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

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

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

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

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

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

---

Owner:

Authorized Signature

By:

Title:

Copy: — Engineer

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

THIS AGREEMENT is by and between Barkley Lake Water District (“Owner”) and  
\_\_\_\_\_ (“Contractor”).

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:

**ARTICLE 2 – THE PROJECT**

2.01 The Project, of which the Work under the Contract Documents is a part, is generally described as follows: Contract 586-19-01, Highway 139 North Water Line Upgrades and McUpton Booster Pump Station Replacement, Barkley Lake Water District, Trigg County, Kentucky.

**ARTICLE 3 – ENGINEER**

3.01 The part of the Project that pertains to the Work has been designed by Bell Engineering, 107 Forbes Drive, Hopkinsville, Kentucky 42240.

3.02 The Owner has retained Bell Engineering (“Engineer”) to act as Owner’s representative, assume all duties and responsibilities, and have the rights and authority assigned to Engineer in the Contract Documents in connection with the completion of the Work in accordance with the Contract Documents.

**ARTICLE 4 – CONTRACT TIMES**

4.01 *Time 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 completed within 180 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 180 days after the date when the Contract Times commence to run.

4.03 *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 times specified in Paragraph 4.02 above, plus any extensions thereof allowed in accordance with the Contract. The parties also recognize the delays, expense, and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of

requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty):

1. Substantial Completion: Contractor shall pay Owner \$750.00 for each day that expires after the time (as duly adjusted pursuant to the Contract) specified in Paragraph 4.02.A above for Substantial Completion until the Work is substantially 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 \$750.00 for each day that expires after such time until the Work is completed and ready for final payment.
3. Liquidated damages for failing to timely attain Substantial Completion and final completion are not additive and will not be imposed concurrently.

#### 4.04 *Special Damages*

- A. In addition to the amount provided for liquidated damages, Contractor shall reimburse Owner for any fines or penalties imposed on Owner as a direct result of the Contractor's failure to attain Substantial Completion according to the Contract Times.

### **ARTICLE 5 – CONTRACT PRICE**

- 5.01 Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents the sum of the amounts included on the Form of Proposal, subject to adjustment under the Contract.

### **ARTICLE 6 – PAYMENT PROCEDURES**

#### 6.01 *Submittal and Processing of Payments*

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

#### 6.02 *Progress Payments; Retainage*

- A. Owner shall make progress payments on account of the Contract Price on the basis of Contractor's Applications for Payment on or about the tenth 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. 90 percent of Work completed (with the balance being retainage). If the Work has been 50 percent completed as determined by Engineer, and if the character and progress of the Work have been satisfactory to Owner and Engineer, then as long



as the character and progress of the Work remain satisfactory to Owner and Engineer, there will be no additional retainage; and

- b. 90 percent of cost of materials and equipment not incorporated in the Work (with the balance being retainage).
- B. Upon Substantial Completion, Owner shall pay an amount sufficient to increase total payments to Contractor to 100 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 in accordance with Paragraph 15.06 of the General Conditions, Owner shall pay the remainder of the Contract Price as recommended by Engineer as provided in said Paragraph 15.06.

### **ARTICLE 7 – INTEREST**

- 7.01 An amount not paid when due shall bear interest at the maximum legal rate.

### **ARTICLE 8 – CONTRACTOR'S REPRESENTATIONS**

- 8.01 In order to induce Owner to enter into this Contract, Contractor makes the following representations:
  - A. Contractor has examined and carefully studied the Contract Documents, and any data and reference items identified in the Contract Documents.
  - B. Contractor has visited the Site, conducted a thorough, alert visual examination of the Site and adjacent areas, and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
  - C. Contractor is familiar with and is satisfied as to all Laws and Regulations that may affect cost, progress, and performance of the Work.
  - D. Contractor has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or adjacent to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings, and (2) reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings.
  - E. Contractor has considered the information known to Contractor itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Contract Documents; and the Site-related reports and drawings identified in the Contract Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor; and (3) Contractor's safety precautions and programs.

- F. 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.
- G. 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.
- H. Contractor has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.
- I. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.
- J. Contractor's entry into this Contract constitutes an incontrovertible representation by Contractor that without exception all prices in the Agreement are premised upon performing and furnishing the Work required by the Contract Documents.

## ARTICLE 9 – CONTRACT DOCUMENTS

### 9.01 *Contents*

- A. The Contract Documents consist of the following:
  - 1. This Agreement (pages 1 to 6, inclusive).
  - 2. Performance bond (pages \_\_\_ to \_\_\_, inclusive).
  - 3. Payment bond (pages \_\_\_ to \_\_\_, inclusive).
  - 4. Other bonds.
    - a. \_\_\_ (pages \_\_\_ to \_\_\_, inclusive).
  - 5. General Conditions (pages \_\_\_ to \_\_\_, inclusive).
  - 6. Supplementary Conditions (pages \_\_\_ to \_\_\_, inclusive).
  - 7. Specifications as listed in the table of contents of the Project Manual.
  - 8. Drawings (not attached but incorporated by reference) consisting of \_\_\_ sheets with each sheet bearing the following general title: \_\_\_ **[or]** the Drawings listed on the attached sheet index.
  - 9. Addenda (numbers \_\_\_ to \_\_\_, inclusive).
  - 10. Exhibits to this Agreement (enumerated as follows):
    - a. Contractor's Bid (pages \_\_\_ to \_\_\_, inclusive).
  - 11. The following which may be delivered or issued on or after the Effective Date of the Contract and are not attached hereto:
    - a. Notice to Proceed.
    - b. Work Change Directives.
    - c. Change Orders.
    - d. Field Orders.
- B. The documents listed in Paragraph 9.01.A are attached to this Agreement (except as expressly noted otherwise above).

- C. There are no Contract Documents other than those listed above in this Article 9.
- D. The Contract Documents may only be amended, modified, or supplemented as provided in the General Conditions.

## **ARTICLE 10 – MISCELLANEOUS**

### **10.01 Terms**

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

### **10.02 Assignment of Contract**

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

### **10.03 Successors and Assigns**

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

### **10.04 Severability**

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

### **10.05 Contractor's Certifications**

- A. Contractor certifies that it has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Contract. For the purposes of this Paragraph 10.05:
  1. "corrupt practice" means the offering, giving, receiving, or soliciting of 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.

10.06 *Other Provisions*

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

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

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

OWNER: BARKLEY LAKE WATER DISTRICT

CONTRACTOR:

\_\_\_\_\_

\_\_\_\_\_

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

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

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

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

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

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

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

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

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

Address for giving notices:

Address for giving notices:

1420 Canton Road

\_\_\_\_\_

Cadiz, Kentucky 42211

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

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

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

## PERFORMANCE BOND

CONTRACTOR *(name and address):*

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

OWNER *(name and address):*

Barkley Lake Water District  
1420 Canton Road  
Cadiz, Kentucky 42211

### CONSTRUCTION CONTRACT

Effective Date of the Agreement:

Amount:

Description *(name and location):*

### BOND

Bond Number:

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

Amount:

Modifications to this Bond Form:  None  See Paragraph 16

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

### CONTRACTOR AS PRINCIPAL

### SURETY

\_\_\_\_\_  
Contractor's Name and Corporate Seal *(seal)*

\_\_\_\_\_  
Surety's Name and Corporate Seal *(seal)*

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

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

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

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

\_\_\_\_\_  
Title

\_\_\_\_\_  
Title

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

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

\_\_\_\_\_  
Title

\_\_\_\_\_  
Title

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

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

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

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

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

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

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

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

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

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

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

5.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owners concurrence,

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

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

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

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

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

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

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

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

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

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

9. The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors, and assigns.

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

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

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

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

#### 14. Definitions

14.1 Balance of the Contract Price: The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made including allowance for the Contractor for any amounts received or to be received by the Owner in settlement of insurance or other claims

for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

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

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

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

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

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

16. Modifications to this Bond are as follows:



## PAYMENT BOND

CONTRACTOR *(name and address)*:

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

OWNER *(name and address)*:

Barkley Lake Water District  
1420 Canton Road  
Cadiz, Kentucky 42211

### CONSTRUCTION CONTRACT

Effective Date of the Agreement:

Amount:

Description *(name and location)*:

### BOND

Bond Number:

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

Amount:

Modifications to this Bond Form:  None  See Paragraph 18

---

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

### CONTRACTOR AS PRINCIPAL

### SURETY

\_\_\_\_\_  
Contractor's Name and Corporate Seal *(seal)*

\_\_\_\_\_  
Surety's Name and Corporate Seal *(seal)*

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

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

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

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

\_\_\_\_\_  
Title

\_\_\_\_\_  
Title

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

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

\_\_\_\_\_  
Title

\_\_\_\_\_  
Title

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

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

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



ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

**Contractor's Application for Payment No.**

Application Period:	Application Date:
To (Owner):	From (Contractor):
Project:	Via (Engineer):
Contract:	
Owner's Contract No.:	Contractor's Project No.:
	Engineer's Project No.:

**Application For Payment  
Change Order Summary**

Approved Change Orders			1. ORIGINAL CONTRACT PRICE.....	\$ _____
Number	Additions	Deductions	2. Net change by Change Orders.....	\$ _____
			3. Current Contract Price (Line 1 ± 2).....	\$ _____
			4. TOTAL COMPLETED AND STORED TO DATE	
			(Column F total on Progress Estimates).....	\$ _____
			5. RETAINAGE:	
			a. X _____ Work Completed.....	\$ _____
			b. X _____ Stored Material.....	\$ _____
			c. Total Retainage (Line 5.a + Line 5.b).....	\$ _____
			6. AMOUNT ELIGIBLE TO DATE (Line 4 - Line 5.c).....	\$ _____
			7. LESS PREVIOUS PAYMENTS (Line 6 from prior Application).....	\$ _____
			8. AMOUNT DUE THIS APPLICATION.....	\$ _____
			9. BALANCE TO FINISH, PLUS RETAINAGE	
			(Column G total on Progress Estimates + Line 5.c above).....	\$ _____
TOTALS				
NET CHANGE BY CHANGE ORDERS				

**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**

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

Payment of: \$ \_\_\_\_\_  
(Line 8 or other - attach explanation of the other amount)

is recommended by: \_\_\_\_\_ (Engineer) \_\_\_\_\_ (Date)

Payment of: \$ \_\_\_\_\_  
(Line 8 or other - attach explanation of the other amount)

is approved by: \_\_\_\_\_ (Owner) \_\_\_\_\_ (Date)

Approved by: \_\_\_\_\_ (Date)  
Funding or Financing Entity (if applicable)

**Contractor's Application for Payment No.**

	Application Period:	Application Date:
To (Owner):	From (Contractor):	Via (Engineer):
Project:	Contract:	
Owner's Contract No.:	Contractor's Project No.:	Engineer's Project No.:

**Application For Payment  
Change Order Summary**

Approved Change Orders	Number	Additions	Deductions		
				<b>1. ORIGINAL CONTRACT PRICE.....</b>	<b>\$</b> _____
				<b>2. Net change by Change Orders.....</b>	<b>\$</b> _____
				<b>3. Current Contract Price (Line 1 ± 2).....</b>	<b>\$</b> _____
				<b>4. TOTAL COMPLETED AND STORED TO DATE</b> <b>(Column F total on Progress Estimates).....</b>	<b>\$</b> _____
				<b>5. RETAINAGE:</b>	
				a. X _____ Work Completed.....	<b>\$</b> _____
				b. X _____ Stored Material.....	<b>\$</b> _____
				c. Total Retainage (Line 5.a + Line 5.b).....	<b>\$</b> _____
				<b>6. AMOUNT ELIGIBLE TO DATE (Line 4 - Line 5.c).....</b>	<b>\$</b> _____
				<b>7. LESS PREVIOUS PAYMENTS (Line 6 from prior Application).....</b>	<b>\$</b> _____
				<b>8. AMOUNT DUE THIS APPLICATION.....</b>	<b>\$</b> _____
				<b>9. BALANCE TO FINISH, PLUS RETAINAGE</b> <b>(Column G total on Progress Estimates + Line 5.c above).....</b>	<b>\$</b> _____
TOTALS					
NET CHANGE BY CHANGE ORDERS					

<b>Contractor's Certification</b>	
<p>The undersigned Contractor certifies, to the best of its knowledge, the following:</p> <p>(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;</p> <p>(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</p> <p>(3) All the Work covered by this Application for Payment is in accordance with the Contract Documents and is not defective.</p>	
<b>Contractor Signature</b>	
By: _____	Date: _____

Payment of: \$ \_\_\_\_\_  
(Line 8 or other - attach explanation of the other amount)

Approved by: \_\_\_\_\_ (Date) \_\_\_\_\_  
Resident Project Representative

is recommended by: \_\_\_\_\_ (Date) \_\_\_\_\_  
(Engineer)

Payment of: \$ \_\_\_\_\_  
(Line 8 or other - attach explanation of the other amount)

is approved by: \_\_\_\_\_ (Date) \_\_\_\_\_  
(Owner)

Approved by: \_\_\_\_\_ (Date) \_\_\_\_\_  
Funding or Financing Entity (if applicable)

**Progress Estimate - Lump Sum Work**

**Contractor's Application**

For (Contract):					Application Number:				
Application Period:					Application Date:				
A		B	Work Completed		E	F		G	
			C	D		Materials Presently Stored (not in C or D)	Total Completed and Stored to Date (C + D + E)		% (F / B)
Specification Section No.	Description	Scheduled Value (\$)	From Previous Application (C+D)	This Period					
<b>Totals</b>									



# Stored Material Summary

# Contractor's Application

For (Contract):								Application Number:			
Application Period:								Application Date:			
A	B	C			D		E	Subtotal Amount Completed and Stored to Date (D + E)	F		G
Bid Item No.	Supplier Invoice No.	Submittal No. (with Specification Section No.)	Storage Location	Description of Materials or Equipment Stored	Stored Previously		Amount Stored this Month (\$)		Incorporated in Work		Materials Remaining in Storage (\$) (D + E - F)
					Date Placed into Storage (Month/Year)	Amount (\$)		Date (Month/Year)	Amount (\$)		
<b>Totals</b>											



**CERTIFICATE OF SUBSTANTIAL COMPLETION**

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

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

All Work  The following specified portions of the Work:

**Date of Substantial Completion**

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

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

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

Amendments to Owner's responsibilities:  None  
 As follows

Amendments to Contractor's responsibilities:  None  
 As follows:

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

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

EXECUTED BY ENGINEER:		RECEIVED:		RECEIVED:	
By: _____	By: _____	By: _____	By: _____	By: _____	By: _____
(Authorized signature)		Owner (Authorized Signature)		Contractor (Authorized Signature)	
Title: _____	Title: _____	Title: _____	Title: _____	Title: _____	Title: _____
Date: _____	Date: _____	Date: _____	Date: _____	Date: _____	Date: _____

**STANDARD GENERAL CONDITIONS OF THE  
CONSTRUCTION CONTRACT**

**CONTRACT 586-19-01  
HIGHWAY 139 NORTH WATER LINE UPGRADES AND  
MCUPTON BOOSTER PUMP STATION REPLACEMENT  
BARKLEY LAKE WATER DISTRICT  
TRIGG COUNTY, KENTUCKY**

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## ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

### 1.01 *Defined Terms*

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

has declined to address. A demand for money or services by a third party is not a Claim.

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



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

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

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

## 1.02 Terminology

- A. The words and terms discussed in the following paragraphs are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.
- B. *Intent of Certain Terms or Adjectives:*
1. The Contract Documents include the terms “as allowed,” “as approved,” “as ordered,” “as directed” or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” “satisfactory,” or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Article 10 or any other provision of the Contract Documents.
- C. *Day:*
1. The word “day” means a calendar day of 24 hours measured from midnight to the next midnight.
- D. *Defective:*
1. The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:
    - a. does not conform to the Contract Documents; or
    - b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or
    - c. has been damaged prior to Engineer’s recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 15.03 or 15.04).
- E. *Furnish, Install, Perform, Provide:*
1. The word “furnish,” when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.
  2. The word “install,” when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.

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

## **ARTICLE 2 – PRELIMINARY MATTERS**

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

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

### **2.02 *Copies of Documents***

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

### **2.03 *Before Starting Construction***

- A. *Preliminary Schedules*: Within 10 days after the Effective Date of the Contract (or as otherwise specifically required by the Contract Documents), Contractor shall submit to Engineer for timely review:
  1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract;
  2. a preliminary Schedule of Submittals; and

3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

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

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

#### 2.05 *Initial Acceptance of Schedules*

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

#### 2.06 *Electronic Transmittals*

- A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may transmit, and shall accept, Project-related correspondence, text, data, documents, drawings, information, and graphics, including but not limited to Shop Drawings and other submittals, in electronic media or digital format, either directly, or through access to a secure Project website.
- B. If the Contract does not establish protocols for electronic or digital transmittals, then Owner, Engineer, and Contractor shall jointly develop such protocols.
- C. When transmitting items in electronic media or digital format, the transmitting party makes no representations as to long term compatibility, usability, or readability of the items resulting from the recipient's use of software application packages, operating systems, or

computer hardware differing from those used in the drafting or transmittal of the items, or from those established in applicable transmittal protocols.

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

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

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

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

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

#### **3.03 *Reporting and Resolving Discrepancies***

- A. *Reporting Discrepancies:*
  - 1. *Contractor's Verification of Figures and Field Measurements:* Before undertaking each part of the Work, Contractor shall carefully study the Contract Documents, and check and verify pertinent figures and dimensions therein, particularly with respect to applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy that Contractor discovers, or has actual knowledge of, and shall not proceed with any Work affected thereby until the conflict,

error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract Documents issued pursuant to Paragraph 11.01.

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

B. *Resolving Discrepancies:*

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

3.04 *Requirements of the Contract Documents*

- A. During the performance of the Work and until final payment, Contractor and Owner shall submit to the Engineer all matters in question concerning the requirements of the Contract Documents (sometimes referred to as requests for information or interpretation—RFIs), or relating to the acceptability of the Work under the Contract Documents, as soon as possible after such matters arise. Engineer will be the initial interpreter of the requirements of the Contract Documents, and judge of the acceptability of the Work thereunder.
- B. Engineer will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract Documents. Engineer's written clarification, interpretation, or decision will be final and binding on Contractor, unless it appeals by submitting a Change Proposal, and on Owner, unless it appeals by filing a Claim.
- C. If a submitted matter in question concerns terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work under the Contract Documents, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, then Engineer will promptly give written notice to Owner and Contractor that Engineer is unable to provide a decision or interpretation. If Owner and Contractor are unable to agree on resolution of such a matter in question, either party may pursue resolution as provided in Article 12.

### 3.05 *Reuse of Documents*

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

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

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

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

### 4.02 *Starting the Work*

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

### 4.03 *Reference Points*

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

### 4.04 *Progress Schedule*

- A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.05 as it may be adjusted from time to time as provided below.
  - 1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.05) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times.



2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 11.
- B. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, or during any appeal process, except as permitted by Paragraph 16.04, or as Owner and Contractor may otherwise agree in writing.

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

- A. If Owner, Engineer, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Times and Contract Price. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
- B. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delay, disruption, or interference caused by or within the control of Contractor. Delay, disruption, and interference attributable to and within the control of a Subcontractor or Supplier shall be deemed to be within the control of Contractor.
- C. If Contractor's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault of and beyond the control of Owner, Contractor, and those for which they are responsible, then Contractor shall be entitled to an equitable adjustment in Contract Times. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this paragraph. Causes of delay, disruption, or interference that may give rise to an adjustment in Contract Times under this paragraph include but are not limited to the following:
1. severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;
  2. abnormal weather conditions;
  3. acts or failures to act of utility owners (other than those performing other work at or adjacent to the Site by arrangement with the Owner, as contemplated in Article 8); and
  4. acts of war or terrorism.
- D. Delays, disruption, and interference to the performance or progress of the Work resulting from the existence of a differing subsurface or physical condition, an Underground Facility that was not shown or indicated by the Contract Documents, or not shown or indicated with reasonable accuracy, and those resulting from Hazardous Environmental Conditions, are governed by Article 5.
- E. Paragraph 8.03 governs delays, disruption, and interference to the performance or progress of the Work resulting from the performance of certain other work at or adjacent to the Site.
- F. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of Contractor.

- G. Contractor must submit any Change Proposal seeking an adjustment in Contract Price or Contract Times under this paragraph within 30 days of the commencement of the delaying, disrupting, or interfering event.

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

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

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

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

#### **A. *Limitation on Use of Site and Other Areas:***

1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for (a) damage to the Site; (b) damage to any such other adjacent areas used for Contractor's operations; (c) damage to any other adjacent land or areas; and (d) for injuries and losses sustained by the owners or occupants of any such land or areas; provided that such damage or injuries result from the performance of the Work or from other actions or conduct of the Contractor or those for which Contractor is responsible.
2. If a damage or injury claim is made by the owner or occupant of any such land or area because of the performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 7.12, or otherwise; (b) promptly attempt to settle the claim as to all parties through negotiations with such owner or occupant, or otherwise resolve the claim by arbitration or other dispute resolution proceeding, or at law; and (c) to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claim, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused directly or indirectly, in whole or in part

by, or based upon, Contractor's performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible.

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

### 5.03 *Subsurface and Physical Conditions*

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

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

- A. *Notice by Contractor:* If Contractor believes that any subsurface or physical condition that is uncovered or revealed at the Site either:
1. is of such a nature as to establish that any Technical Data on which Contractor is entitled to rely as provided in Paragraph 5.03 is materially inaccurate; or
  2. is of such a nature as to require a change in the Drawings or Specifications; or
  3. differs materially from that shown or indicated in the Contract Documents; or
  4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

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

- B. *Engineer's Review:* After receipt of written notice as required by the preceding paragraph, Engineer will promptly review the subsurface or physical condition in question; determine the necessity of Owner's obtaining additional exploration or tests with respect to the condition; conclude whether the condition falls within any one or more of the differing site condition categories in Paragraph 5.04.A above; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the subsurface or physical condition in question and the need for any change in the Drawings or Specifications; and advise Owner in writing of Engineer's findings, conclusions, and recommendations.
- C. *Owner's Statement to Contractor Regarding Site Condition:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the subsurface or physical condition in question, addressing the resumption of Work in connection with such condition, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations, in whole or in part.
- D. *Possible Price and Times Adjustments:*
1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, or both, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:
    - a. such condition must fall within any one or more of the categories described in Paragraph 5.04.A;
    - b. with respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03; and,

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

#### 5.05 *Underground Facilities*

- A. *Contractor's Responsibilities:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or adjacent to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:
  1. Owner and Engineer do not warrant or guarantee the accuracy or completeness of any such information or data provided by others; and
  2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:
    - a. reviewing and checking all information and data regarding existing Underground Facilities at the Site;
    - b. locating all Underground Facilities shown or indicated in the Contract Documents as being at the Site;
    - c. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and
    - d. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.
- B. *Notice by Contractor:* If Contractor believes that an Underground Facility that is uncovered or revealed at the Site was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, then Contractor shall, promptly after

becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer.

- C. *Engineer's Review:* Engineer will promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the Underground Facility in question; determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Underground Facility; and advise Owner in writing of Engineer's findings, conclusions, and recommendations. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.
- D. *Owner's Statement to Contractor Regarding Underground Facility:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the Underground Facility in question, addressing the resumption of Work in connection with such Underground Facility, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations in whole or in part.
- E. *Possible Price and Times Adjustments:*
  - 1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, or both, to the extent that any existing Underground Facility at the Site that was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:
    - a. Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated the existence or actual location of the Underground Facility in question;
    - b. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03;
    - c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times; and
    - d. Contractor gave the notice required in Paragraph 5.05.B.
  - 2. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment shall be set forth in a Change Order.
  - 3. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.

5.06 *Hazardous Environmental Conditions at Site*

- A. *Reports and Drawings*: The Supplementary Conditions identify:
1. those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; and
  2. Technical Data contained in such reports and drawings.
- B. *Reliance by Contractor on Technical Data Authorized*: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely on the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:
1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or
  2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or
  3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions or information.
- C. Contractor shall not be responsible for removing or remediating any Hazardous Environmental Condition encountered, uncovered, or revealed at the Site unless such removal or remediation is expressly identified in the Contract Documents to be within the scope of the Work.
- D. Contractor shall be responsible for controlling, containing, and duly removing all Constituents of Concern brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible, and for any associated costs; and for the costs of removing and remediating any Hazardous Environmental Condition created by the presence of any such Constituents of Concern.
- E. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 7.15); and (3) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 5.06.F. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous Environmental Condition, and impose a set-off against payments to account for the associated costs.

- F. Contractor shall not resume Work in connection with such Hazardous Environmental Condition or in any affected area until after Owner has obtained any required permits related thereto, and delivered written notice to Contractor either (1) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (2) specifying any special conditions under which such Work may be resumed safely.
- G. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, then within 30 days of Owner's written notice regarding the resumption of Work, Contractor may submit a Change Proposal, or Owner may impose a set-off.
- H. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work, following the contractual change procedures in Article 11. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 8.
- I. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition (1) was not shown or indicated in the Drawings, Specifications, or other Contract Documents, identified as Technical Data entitled to limited reliance pursuant to Paragraph 5.06.B, or identified in the Contract Documents to be included within the scope of the Work, and (2) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.I shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- J. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the failure to control, contain, or remove a Constituent of Concern brought to the Site by Contractor or by anyone for whom Contractor is responsible, or to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.J shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- K. The provisions of Paragraphs 5.03, 5.04, and 5.05 do not apply to the presence of Constituents of Concern or to a Hazardous Environmental Condition uncovered or revealed at the Site.



## ARTICLE 6 – BONDS AND INSURANCE

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

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

### 6.02 *Insurance—General Provisions*

- A. Owner and Contractor shall obtain and maintain insurance as required in this Article and in the Supplementary Conditions.
- B. All insurance required by the Contract to be purchased and maintained by Owner or Contractor shall be obtained from insurance companies that are duly licensed or authorized, in the state or jurisdiction in which the Project is located, to issue insurance policies for the required limits and coverages. Unless a different standard is indicated in the Supplementary Conditions, all companies that provide insurance policies required under this Contract shall have an A.M. Best rating of A-VII or better.
- C. Contractor shall deliver to Owner, with copies to each named insured and additional insured (as identified in this Article, in the Supplementary Conditions, or elsewhere in the Contract), certificates of insurance establishing that Contractor has obtained and is

maintaining the policies, coverages, and endorsements required by the Contract. Upon request by Owner or any other insured, Contractor shall also furnish other evidence of such required insurance, including but not limited to copies of policies and endorsements, and documentation of applicable self-insured retentions and deductibles. Contractor may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.

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

### 6.03 *Contractor's Insurance*

- A. *Workers' Compensation:* Contractor shall purchase and maintain workers' compensation and employer's liability insurance for:
  - 1. claims under workers' compensation, disability benefits, and other similar employee benefit acts.
  - 2. United States Longshoreman and Harbor Workers' Compensation Act and Jones Act coverage (if applicable).
  - 3. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees (by stop-gap endorsement in monopolist worker's compensation states).

4. Foreign voluntary worker compensation (if applicable).
- B. *Commercial General Liability—Claims Covered:* Contractor shall purchase and maintain commercial general liability insurance, covering all operations by or on behalf of Contractor, on an occurrence basis, against:
1. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees.
  2. claims for damages insured by reasonably available personal injury liability coverage.
  3. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom.
- C. *Commercial General Liability—Form and Content:* Contractor's commercial liability policy shall be written on a 1996 (or later) ISO commercial general liability form (occurrence form) and include the following coverages and endorsements:
1. Products and completed operations coverage:
    - a. Such insurance shall be maintained for three years after final payment.
    - b. Contractor shall furnish Owner and each other additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract) evidence of continuation of such insurance at final payment and three years thereafter.
  2. Blanket contractual liability coverage, to the extent permitted by law, including but not limited to coverage of Contractor's contractual indemnity obligations in Paragraph 7.18.
  3. Broad form property damage coverage.
  4. Severability of interest.
  5. Underground, explosion, and collapse coverage.
  6. Personal injury coverage.
  7. Additional insured endorsements that include both ongoing operations and products and completed operations coverage through ISO Endorsements CG 20 10 10 01 and CG 20 37 10 01 (together); or CG 20 10 07 04 and CG 20 37 07 04 (together); or their equivalent.
  8. For design professional additional insureds, ISO Endorsement CG 20 32 07 04, "Additional Insured—Engineers, Architects or Surveyors Not Engaged by the Named Insured" or its equivalent.
- D. *Automobile liability:* Contractor shall purchase and maintain automobile liability insurance against claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance, or use of any motor vehicle. The automobile liability policy shall be written on an occurrence basis.
- E. *Umbrella or excess liability:* Contractor shall purchase and maintain umbrella or excess liability insurance written over the underlying employer's liability, commercial general liability, and automobile liability insurance described in the paragraphs above. Subject to industry-standard exclusions, the coverage afforded shall follow form as to each and every one of the underlying policies.
- F. *Contractor's pollution liability insurance:* Contractor shall purchase and maintain a policy covering third-party injury and property damage claims, including clean-up costs, as a result

of pollution conditions arising from Contractor's operations and completed operations. This insurance shall be maintained for no less than three years after final completion.

- G. *Additional insureds*: The Contractor's commercial general liability, automobile liability, umbrella or excess, and pollution liability policies shall include and list as additional insureds Owner and Engineer, and any individuals or entities identified in the Supplementary Conditions; include coverage for the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of all such additional insureds; and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby (including as applicable those arising from both ongoing and completed operations) on a non-contributory basis. Contractor shall obtain all necessary endorsements to support these requirements.
- H. *Contractor's professional liability insurance*: If Contractor will provide or furnish professional services under this Contract, through a delegation of professional design services or otherwise, then Contractor shall be responsible for purchasing and maintaining applicable professional liability insurance. This insurance shall provide protection against claims arising out of performance of professional design or related services, and caused by a negligent error, omission, or act for which the insured party is legally liable. It shall be maintained throughout the duration of the Contract and for a minimum of two years after Substantial Completion. If such professional design services are performed by a Subcontractor, and not by Contractor itself, then the requirements of this paragraph may be satisfied through the purchasing and maintenance of such insurance by such Subcontractor.
- I. *General provisions*: The policies of insurance required by this Paragraph 6.03 shall:
  - 1. include at least the specific coverages provided in this Article.
  - 2. be written for not less than the limits of liability provided in this Article and in the Supplementary Conditions, or required by Laws or Regulations, whichever is greater.
  - 3. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed, or renewal refused until at least 10 days prior written notice has been given to Contractor. Within three days of receipt of any such written notice, Contractor shall provide a copy of the notice to Owner, Engineer, and each other insured under the policy.
  - 4. remain in effect at least until final payment (and longer if expressly required in this Article) and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work as a warranty or correction obligation, or otherwise, or returning to the Site to conduct other tasks arising from the Contract Documents.
  - 5. be appropriate for the Work being performed and provide protection from claims that may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable.
- J. The coverage requirements for specific policies of insurance must be met by such policies, and not by reference to excess or umbrella insurance provided in other policies.

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

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

#### 6.05 *Property Insurance*

- A. *Builder's Risk*: Unless otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain builder's risk insurance upon the Work on a completed value basis, in the amount of the full insurable replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:
  - 1. include the Owner and Contractor as named insureds, and all Subcontractors, and any individuals or entities required by the Supplementary Conditions to be insured under such builder's risk policy, as insureds or named insureds. For purposes of the remainder of this Paragraph 6.05, Paragraphs 6.06 and 6.07, and any corresponding Supplementary Conditions, the parties required to be insured shall collectively be referred to as "insureds."
  - 2. be written on a builder's risk "all risk" policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire; lightning; windstorm; riot; civil commotion; terrorism; vehicle impact; aircraft; smoke; theft; vandalism and malicious mischief; mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; flood; collapse; explosion; debris removal; demolition occasioned by enforcement of Laws and Regulations; water damage (other than that caused by flood); and such other perils or causes of loss as may be specifically required by the Supplementary Conditions. If insurance against mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; or flood, are not commercially available under builder's risk policies, by endorsement or otherwise, such insurance may be provided through other insurance policies acceptable to Owner and Contractor.
  - 3. cover, as insured property, at least the following: (a) the Work and all materials, supplies, machinery, apparatus, equipment, fixtures, and other property of a similar nature that are to be incorporated into or used in the preparation, fabrication, construction, erection, or completion of the Work, including Owner-furnished or assigned property; (b) spare parts inventory required within the scope of the Contract; and (c) temporary works which are not intended to form part of the permanent constructed Work but which are intended to provide working access to the Site, or to the Work under construction, or which are intended to provide temporary support for the Work under construction, including scaffolding, form work, fences, shoring, falsework, and temporary structures.
  - 4. cover expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects).

5. extend to cover damage or loss to insured property while in temporary storage at the Site or in a storage location outside the Site (but not including property stored at the premises of a manufacturer or Supplier).
  6. extend to cover damage or loss to insured property while in transit.
  7. allow for partial occupation or use of the Work by Owner, such that those portions of the Work that are not yet occupied or used by Owner shall remain covered by the builder's risk insurance.
  8. allow for the waiver of the insurer's subrogation rights, as set forth below.
  9. provide primary coverage for all losses and damages caused by the perils or causes of loss covered.
  10. not include a co-insurance clause.
  11. include an exception for ensuing losses from physical damage or loss with respect to any defective workmanship, design, or materials exclusions.
  12. include performance/hot testing and start-up.
  13. be maintained in effect, subject to the provisions herein regarding Substantial Completion and partial occupancy or use of the Work by Owner, until the Work is complete.
- B. *Notice of Cancellation or Change:* All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this Paragraph 6.05 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 10 days prior written notice has been given to the purchasing policyholder. Within three days of receipt of any such written notice, the purchasing policyholder shall provide a copy of the notice to each other insured.
- C. *Deductibles:* The purchaser of any required builder's risk or property insurance shall pay for costs not covered because of the application of a policy deductible.
- D. *Partial Occupancy or Use by Owner:* If Owner will occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 15.04, then Owner (directly, if it is the purchaser of the builder's risk policy, or through Contractor) will provide notice of such occupancy or use to the builder's risk insurer. The builder's risk insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy; rather, those portions of the Work that are occupied or used by Owner may come off the builder's risk policy, while those portions of the Work not yet occupied or used by Owner shall remain covered by the builder's risk insurance.
- E. *Additional Insurance:* If Contractor elects to obtain other special insurance to be included in or supplement the builder's risk or property insurance policies provided under this Paragraph 6.05, it may do so at Contractor's expense.
- F. *Insurance of Other Property:* If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, such as tools, construction equipment, or other personal property owned by Contractor, a Subcontractor, or an employee of Contractor or a Subcontractor, then the entity or individual owning such property item will be responsible for deciding whether to insure it, and if so in what amount.

## 6.06 *Waiver of Rights*

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

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

- A. Any insured loss under the builder's risk and other policies of insurance required by Paragraph 6.05 will be adjusted and settled with the named insured that purchased the

policy. Such named insured shall act as fiduciary for the other insureds, and give notice to such other insureds that adjustment and settlement of a claim is in progress. Any other insured may state its position regarding a claim for insured loss in writing within 15 days after notice of such claim.

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

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

### **7.01 *Supervision and Superintendence***

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

### **7.02 *Labor; Working Hours***

- A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.
- B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours, Monday through Friday. Contractor will not perform Work on a Saturday, Sunday, or any legal holiday. Contractor may perform Work outside regular working hours or on Saturdays, Sundays, or legal holidays only with Owner's written consent, which will not be unreasonably withheld.

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

- A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start up, and completion of the Work, whether or not such items are specifically called for in the Contract Documents.
- B. All materials and equipment incorporated into the Work shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and



guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.

- C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

#### 7.04 "Or Equals"

- A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the Contract Price has been based upon Contractor furnishing such item as specified. The specification or description of such an item is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or equal" item is permitted, Contractor may request that Engineer authorize the use of other items of material or equipment, or items from other proposed suppliers under the circumstances described below.
  - 1. If Engineer in its sole discretion determines that an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, Engineer shall deem it an "or equal" item. For the purposes of this paragraph, a proposed item of material or equipment will be considered functionally equal to an item so named if:
    - a. in the exercise of reasonable judgment Engineer determines that:
      - 1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;
      - 2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;
      - 3) it has a proven record of performance and availability of responsive service; and
      - 4) it is not objectionable to Owner.
    - b. Contractor certifies that, if approved and incorporated into the Work:
      - 1) there will be no increase in cost to the Owner or increase in Contract Times; and
      - 2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.
- B. *Contractor's Expense:* Contractor shall provide all data in support of any proposed "or equal" item at Contractor's expense.
- C. *Engineer's Evaluation and Determination:* Engineer will be allowed a reasonable time to evaluate each "or-equal" request. Engineer may require Contractor to furnish additional data about the proposed "or-equal" item. Engineer will be the sole judge of acceptability. No "or-equal" item will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an "or-equal", which will be evidenced by an approved Shop Drawing or other written communication. Engineer will advise Contractor in writing of any negative determination.

- D. *Effect of Engineer's Determination:* Neither approval nor denial of an "or-equal" request shall result in any change in Contract Price. The Engineer's denial of an "or-equal" request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents.
- E. *Treatment as a Substitution Request:* If Engineer determines that an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item, Contractor may request that Engineer considered the proposed item as a substitute pursuant to Paragraph 7.05.

#### 7.05 *Substitutes*

- A. Unless the specification or description of an item of material or equipment required to be furnished under the Contract Documents contains or is followed by words reading that no substitution is permitted, Contractor may request that Engineer authorize the use of other items of material or equipment under the circumstances described below. To the extent possible such requests shall be made before commencement of related construction at the Site.
  - 1. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is functionally equivalent to that named and an acceptable substitute therefor. Engineer will not accept requests for review of proposed substitute items of material or equipment from anyone other than Contractor.
  - 2. The requirements for review by Engineer will be as set forth in Paragraph 7.05.B, as supplemented by the Specifications, and as Engineer may decide is appropriate under the circumstances.
  - 3. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:
    - a. shall certify that the proposed substitute item will:
      - 1) perform adequately the functions and achieve the results called for by the general design,
      - 2) be similar in substance to that specified, and
      - 3) be suited to the same use as that specified.
    - b. will state:
      - 1) the extent, if any, to which the use of the proposed substitute item will necessitate a change in Contract Times,
      - 2) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item, and
      - 3) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty.
    - c. will identify:
      - 1) all variations of the proposed substitute item from that specified, and

- 2) available engineering, sales, maintenance, repair, and replacement services.
  - d. shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including but not limited to changes in Contract Price, shared savings, costs of redesign, and claims of other contractors affected by any resulting change.
- B. *Engineer's Evaluation and Determination:* Engineer will be allowed a reasonable time to evaluate each substitute request, and to obtain comments and direction from Owner. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No substitute will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an acceptable substitute. Engineer's determination will be evidenced by a Field Order or a proposed Change Order accounting for the substitution itself and all related impacts, including changes in Contract Price or Contract Times. Engineer will advise Contractor in writing of any negative determination.
  - C. *Special Guarantee:* Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.
  - D. *Reimbursement of Engineer's Cost:* Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.
  - E. *Contractor's Expense:* Contractor shall provide all data in support of any proposed substitute at Contractor's expense.
  - F. *Effect of Engineer's Determination:* If Engineer approves the substitution request, Contractor shall execute the proposed Change Order and proceed with the substitution. The Engineer's denial of a substitution request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.05.D, by timely submittal of a Change Proposal.

#### 7.06 *Concerning Subcontractors, Suppliers, and Others*

- A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner.
- B. Contractor shall retain specific Subcontractors, Suppliers, or other individuals or entities for the performance of designated parts of the Work if required by the Contract to do so.
- C. Subsequent to the submittal of Contractor's Bid or final negotiation of the terms of the Contract, Owner may not require Contractor to retain any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against which Contractor has reasonable objection.
- D. Prior to entry into any binding subcontract or purchase order, Contractor shall submit to Owner the identity of the proposed Subcontractor or Supplier (unless Owner has already deemed such proposed Subcontractor or Supplier acceptable, during the bidding process or otherwise). Such proposed Subcontractor or Supplier shall be deemed acceptable to Owner unless Owner raises a substantive, reasonable objection within five days.

- E. Owner may require the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work. Owner also may require Contractor to retain specific replacements; provided, however, that Owner may not require a replacement to which Contractor has a reasonable objection. If Contractor has submitted the identity of certain Subcontractors, Suppliers, or other individuals or entities for acceptance by Owner, and Owner has accepted it (either in writing or by failing to make written objection thereto), then Owner may subsequently revoke the acceptance of any such Subcontractor, Supplier, or other individual or entity so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity.
- F. If Owner requires the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, or both, with respect to the replacement; and Contractor shall initiate a Change Proposal for such adjustment within 30 days of Owner's requirement of replacement.
- G. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of the right of Owner to the completion of the Work in accordance with the Contract Documents.
- H. On a monthly basis Contractor shall submit to Engineer a complete list of all Subcontractors and Suppliers having a direct contract with Contractor, and of all other Subcontractors and Suppliers known to Contractor at the time of submittal.
- I. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions.
- J. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors, Suppliers, and all other individuals or entities performing or furnishing any of the Work.
- K. Contractor shall restrict all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed herein.
- L. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.
- M. All Work performed for Contractor by a Subcontractor or Supplier shall be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer.
- N. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor on account of Work performed for Contractor by the particular Subcontractor or Supplier.

O. Nothing in the Contract Documents:

1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier, or other individual or entity; nor
2. shall create any obligation on the part of Owner or Engineer to pay or to see to the payment of any money due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

7.07 *Patent Fees and Royalties*

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

7.08 *Permits*

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

#### 7.09 *Taxes*

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

#### 7.10 *Laws and Regulations*

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

#### 7.11 *Record Documents*

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

#### 7.12 *Safety and Protection*

- A. Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury, or loss to:
  - 1. all persons on the Site or who may be affected by the Work;

2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
  3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, other work in progress, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.
- B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify Owner; the owners of adjacent property, Underground Facilities, and other utilities; and other contractors and utility owners performing work at or adjacent to the Site, when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property or work in progress.
  - C. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. The Supplementary Conditions identify any Owner's safety programs that are applicable to the Work.
  - D. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.
  - E. All damage, injury, or loss to any property referred to in Paragraph 7.12.A.2 or 7.12.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor at its expense (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).
  - F. Contractor's duties and responsibilities for safety and protection shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 15.06.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).
  - G. Contractor's duties and responsibilities for safety and protection shall resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from the Contract Documents.

#### 7.13 *Safety Representative*

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

#### 7.14 *Hazard Communication Programs*

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

#### 7.15 *Emergencies*

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

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

##### A. *Shop Drawing and Sample Submittal Requirements:*

1. Before submitting a Shop Drawing or Sample, Contractor shall have:
  - a. reviewed and coordinated the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
  - b. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;
  - c. determined and verified the suitability of all materials and equipment offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
  - d. determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.
2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review of that submittal, and that Contractor approves the submittal.
3. With each submittal, Contractor shall give Engineer specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be set forth in a written communication separate from the Shop Drawings or Sample submittal; and, in addition, in the case of Shop Drawings by a specific notation made on each Shop Drawing submitted to Engineer for review and approval of each such variation.

- B. *Submittal Procedures for Shop Drawings and Samples:* Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals. Each submittal will be identified as Engineer may require.

##### 1. *Shop Drawings:*

- a. Contractor shall submit the number of copies required in the Specifications.



- b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide and to enable Engineer to review the information for the limited purposes required by Paragraph 7.16.D.
2. *Samples:*
  - a. Contractor shall submit the number of Samples required in the Specifications.
  - b. Contractor shall clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 7.16.D.
3. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.
- C. *Other Submittals:* Contractor shall submit other submittals to Engineer in accordance with the accepted Schedule of Submittals, and pursuant to the applicable terms of the Specifications.
- D. *Engineer's Review:*
1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.
  2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction or to safety precautions or programs incident thereto.
  3. Engineer's review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.
  4. Engineer's review and approval of a Shop Drawing or Sample shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 7.16.A.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer will document any such approved variation from the requirements of the Contract Documents in a Field Order.
  5. Engineer's review and approval of a Shop Drawing or Sample shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 7.16.A and B.
  6. Engineer's review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Contract Documents, shall not, under any circumstances, change the Contract Times or Contract Price, unless such changes are included in a Change Order.

7. Neither Engineer's receipt, review, acceptance or approval of a Shop Drawing, Sample, or other submittal shall result in such item becoming a Contract Document.
8. Contractor shall perform the Work in compliance with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 7.16.D.4.

E. *Resubmittal Procedures:*

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

7.17 *Contractor's General Warranty and Guarantee*

- A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on Contractor's warranty and guarantee.
- B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:
  1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
  2. normal wear and tear under normal usage.
- C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:
  1. observations by Engineer;
  2. recommendation by Engineer or payment by Owner of any progress or final payment;
  3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;
  4. use or occupancy of the Work or any part thereof by Owner;
  5. any review and approval of a Shop Drawing or Sample submittal;
  6. the issuance of a notice of acceptability by Engineer;
  7. any inspection, test, or approval by others; or

8. any correction of defective Work by Owner.
- D. If the Contract requires the Contractor to accept the assignment of a contract entered into by Owner, then the specific warranties, guarantees, and correction obligations contained in the assigned contract shall govern with respect to Contractor's performance obligations to Owner for the Work described in the assigned contract.

#### 7.18 *Indemnification*

- A. To the fullest extent permitted by Laws and Regulations, and in addition to any other obligations of Contractor under the Contract or otherwise, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable.
- B. In any and all claims against Owner or Engineer or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 7.18.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.
- C. The indemnification obligations of Contractor under Paragraph 7.18.A shall not extend to the liability of Engineer and Engineer's officers, directors, members, partners, employees, agents, consultants and subcontractors arising out of:
  1. the preparation or approval of, or the failure to prepare or approve maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or
  2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

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

- A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable Laws and Regulations.
- B. If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations,

specifications, certifications, and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.

- C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.
- D. Pursuant to this paragraph, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 7.16.D.1.
- E. Contractor shall not be responsible for the adequacy of the performance or design criteria specified by Owner or Engineer.

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

### **8.01 *Other Work***

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

## 8.02 *Coordination*

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

## 8.03 *Legal Relationships*

- A. If, in the course of performing other work at or adjacent to the Site for Owner, the Owner's employees, any other contractor working for Owner, or any utility owner for whom the Owner is responsible causes damage to the Work or to the property of Contractor or its Subcontractors, or delays, disrupts, interferes with, or increases the scope or cost of the performance of the Work, through actions or inaction, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor must submit any Change Proposal seeking an equitable adjustment in the Contract Price or the Contract Times under this paragraph within 30 days of the damaging, delaying, disrupting, or interfering event. The entitlement to, and extent of, any such equitable adjustment shall take into account information (if any) regarding such other work that was provided to Contractor in the Contract Documents prior to the submittal of the Bid or the final negotiation of the terms of the Contract. When applicable, any such equitable adjustment in Contract Price shall be conditioned on Contractor assigning to Owner all Contractor's rights against such other contractor or utility owner with respect to the damage, delay, disruption, or interference that is the subject of the adjustment. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
- B. Contractor shall take reasonable and customary measures to avoid damaging, delaying, disrupting, or interfering with the work of Owner, any other contractor, or any utility owner performing other work at or adjacent to the Site. If Contractor fails to take such measures and as a result damages, delays, disrupts, or interferes with the work of any such other contractor or utility owner, then Owner may impose a set-off against payments due to Contractor, and assign to such other contractor or utility owner the Owner's contractual rights against Contractor with respect to the breach of the obligations set forth in this paragraph.
- C. When Owner is performing other work at or adjacent to the Site with Owner's employees, Contractor shall be liable to Owner for damage to such other work, and for the reasonable direct delay, disruption, and interference costs incurred by Owner as a result of Contractor's failure to take reasonable and customary measures with respect to Owner's other work. In response to such damage, delay, disruption, or interference, Owner may impose a set-off against payments due to Contractor.

- D. If Contractor damages, delays, disrupts, or interferes with the work of any other contractor, or any utility owner performing other work at or adjacent to the Site, through Contractor's failure to take reasonable and customary measures to avoid such impacts, or if any claim arising out of Contractor's actions, inactions, or negligence in performance of the Work at or adjacent to the Site is made by any such other contractor or utility owner against Contractor, Owner, or Engineer, then Contractor shall (1) promptly attempt to settle the claim as to all parties through negotiations with such other contractor or utility owner, or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law, and (2) indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claims, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such damage, delay, disruption, or interference.

## **ARTICLE 9 – OWNER'S RESPONSIBILITIES**

### **9.01 *Communications to Contractor***

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

### **9.02 *Replacement of Engineer***

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

### **9.03 *Furnish Data***

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

### **9.04 *Pay When Due***

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

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

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

### **9.06 *Insurance***

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

### **9.07 *Change Orders***

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

9.08 *Inspections, Tests, and Approvals*

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

9.09 *Limitations on Owner's Responsibilities*

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

9.10 *Undisclosed Hazardous Environmental Condition*

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

9.11 *Evidence of Financial Arrangements*

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

9.12 *Safety Programs*

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

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

10.01 *Owner's Representative*

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

10.02 *Visits to Site*

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

or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

10.03 *Project Representative*

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

10.04 *Rejecting Defective Work*

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

10.05 *Shop Drawings, Change Orders and Payments*

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

10.06 *Determinations for Unit Price Work*

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

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

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

10.08 *Limitations on Engineer's Authority and Responsibilities*

- A. Neither Engineer's authority or responsibility under this Article 10 or under any other provision of the Contract, nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer, shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.



- B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.
- C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.
- D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 15.06.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals, that the results certified indicate compliance with the Contract Documents.
- E. The limitations upon authority and responsibility set forth in this Paragraph 10.08 shall also apply to the Resident Project Representative, if any.

10.09 *Compliance with Safety Program*

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

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

11.01 *Amending and Supplementing Contract Documents*

- A. The Contract Documents may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.
  - 1. *Change Orders:*
    - a. If an amendment or supplement to the Contract Documents includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order. A Change Order also may be used to establish amendments and supplements of the Contract Documents that do not affect the Contract Price or Contract Times.
    - b. Owner and Contractor may amend those terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, without the recommendation of the Engineer. Such an amendment shall be set forth in a Change Order.
  - 2. *Work Change Directives:* A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the modification ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order, following negotiations by the parties as to the Work Change Directive's effect, if any, on the Contract Price and Contract Times; or, if negotiations are unsuccessful, by a determination under the terms of the Contract Documents governing adjustments, expressly including Paragraph 11.04 regarding change of Contract Price. Contractor must submit any Change Proposal seeking an

adjustment of the Contract Price or the Contract Times, or both, no later than 30 days after the completion of the Work set out in the Work Change Directive. Owner must submit any Claim seeking an adjustment of the Contract Price or the Contract Times, or both, no later than 60 days after issuance of the Work Change Directive.

3. *Field Orders*: Engineer may authorize minor changes in the Work if the changes do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Such changes will be accomplished by a Field Order and will be binding on Owner and also on Contractor, which shall perform the Work involved promptly. If Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, then before proceeding with the Work at issue, Contractor shall submit a Change Proposal as provided herein.

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

- A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work. Such changes shall be supported by Engineer's recommendation, to the extent the change involves the design (as set forth in the Drawings, Specifications, or otherwise), or other engineering or technical matters. Such changes may be accomplished by a Change Order, if Owner and Contractor have agreed as to the effect, if any, of the changes on Contract Times or Contract Price; or by a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved; or, in the case of a deletion in the Work, promptly cease construction activities with respect to such deleted Work. Added or revised Work shall be performed under the applicable conditions of the Contract Documents. Nothing in this paragraph shall obligate Contractor to undertake work that Contractor reasonably concludes cannot be performed in a manner consistent with Contractor's safety obligations under the Contract Documents or Laws and Regulations.

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

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

#### 11.04 *Change of Contract Price*

- A. The Contract Price may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Price shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment of Contract Price shall comply with the provisions of Article 12.
- B. An adjustment in the Contract Price will be determined as follows:
  1. where the Work involved is covered by unit prices contained in the Contract Documents, then by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 13.03); or
  2. where the Work involved is not covered by unit prices contained in the Contract Documents, then by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.04.C.2); or
  3. where the Work involved is not covered by unit prices contained in the Contract Documents and the parties do not reach mutual agreement to a lump sum, then on

the basis of the Cost of the Work (determined as provided in Paragraph 13.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 11.04.C).

- C. *Contractor's Fee*: When applicable, the Contractor's fee for overhead and profit shall be determined as follows:
1. a mutually acceptable fixed fee; or
  2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
    - a. for costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2, the Contractor's fee shall be 15 percent;
    - b. for costs incurred under Paragraph 13.01.B.3, the Contractor's fee shall be five percent;
    - c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 11.04.C.2.a and 11.04.C.2.b is that the Contractor's fee shall be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.A.1 and 13.01.A.2 by the Subcontractor that actually performs the Work, at whatever tier, and (2) with respect to Contractor itself and to any Subcontractors of a tier higher than that of the Subcontractor that actually performs the Work, a fee of five percent of the amount (fee plus underlying costs incurred) attributable to the next lower tier Subcontractor; provided, however, that for any such subcontracted work the maximum total fee to be paid by Owner shall be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the work;
    - d. no fee shall be payable on the basis of costs itemized under Paragraphs 13.01.B.4, 13.01.B.5, and 13.01.C;
    - e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and
    - f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 11.04.C.2.a through 11.04.C.2.e, inclusive.

#### 11.05 *Change of Contract Times*

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

#### 11.06 *Change Proposals*

- A. Contractor shall submit a Change Proposal to Engineer to request an adjustment in the Contract Times or Contract Price; appeal an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; contest a set-off against payment due; or seek other relief under

the Contract. The Change Proposal shall specify any proposed change in Contract Times or Contract Price, or both, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents.

1. *Procedures:* Contractor shall submit each Change Proposal to Engineer promptly (but in no event later than 30 days) after the start of the event giving rise thereto, or after such initial decision. The Contractor shall submit supporting data, including the proposed change in Contract Price or Contract Time (if any), to the Engineer and Owner within 15 days after the submittal of the Change Proposal. The supporting data shall be accompanied by a written statement that the supporting data are accurate and complete, and that any requested time or price adjustment is the entire adjustment to which Contractor believes it is entitled as a result of said event. Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal.
  2. *Engineer's Action:* Engineer will review each Change Proposal and, within 30 days after receipt of the Contractor's supporting data, either deny the Change Proposal in whole, approve it in whole, or deny it in part and approve it in part. Such actions shall be in writing, with a copy provided to Owner and Contractor. If Engineer does not take action on the Change Proposal within 30 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of Engineer's inaction the Change Proposal is deemed denied, thereby commencing the time for appeal of the denial under Article 12.
  3. *Binding Decision:* Engineer's decision will be final and binding upon Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under Article 12.
- B. *Resolution of Certain Change Proposals:* If the Change Proposal does not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters, then Engineer will notify the parties that the Engineer is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice shall be deemed a denial, and Contractor may choose to seek resolution under the terms of Article 12.

#### 11.07 Execution of Change Orders

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

- B. If Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of this Paragraph 11.07, it shall be deemed to be of full force and effect, as if fully executed.

11.08 *Notification to Surety*

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

**ARTICLE 12 – CLAIMS**

12.01 *Claims*

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

submittal and decision process shall resume as of the date of the conclusion of the mediation, as determined by the mediator.

3. Owner and Contractor shall each pay one-half of the mediator's fees and costs.
- E. *Partial Approval*: If the party receiving a Claim approves the Claim in part and denies it in part, such action shall be final and binding unless within 30 days of such action the other party invokes the procedure set forth in Article 17 for final resolution of disputes.
- F. *Denial of Claim*: If efforts to resolve a Claim are not successful, the party receiving the Claim may deny it by giving written notice of denial to the other party. If the receiving party does not take action on the Claim within 90 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of the inaction, the Claim is deemed denied, thereby commencing the time for appeal of the denial. A denial of the Claim shall be final and binding unless within 30 days of the denial the other party invokes the procedure set forth in Article 17 for the final resolution of disputes.
- G. *Final and Binding Results*: If the parties reach a mutual agreement regarding a Claim, whether through approval of the Claim, direct negotiations, mediation, or otherwise; or if a Claim is approved in part and denied in part, or denied in full, and such actions become final and binding; then the results of the agreement or action on the Claim shall be incorporated in a Change Order to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

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

### 13.01 *Cost of the Work*

- A. *Purposes for Determination of Cost of the Work*: The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this Paragraph 13.01 are used for two distinct purposes:
  1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or
  2. To determine the value of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price. When the value of any such adjustment is determined on the basis of Cost of the Work, Contractor is entitled only to those additional or incremental costs required because of the change in the Work or because of the event giving rise to the adjustment.
- B. *Costs Included*: Except as otherwise may be agreed to in writing by Owner, costs included in the Cost of the Work shall be in amounts no higher than those prevailing in the locality of the Project, shall not include any of the costs itemized in Paragraph 13.01.C, and shall include only the following items:
  1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, and vacation and holiday pay applicable

thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.

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

other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.

- g. The cost of utilities, fuel, and sanitary facilities at the Site.
- h. Minor expenses such as communication service at the Site, express and courier services, and similar petty cash items in connection with the Work.
- i. The costs of premiums for all bonds and insurance that Contractor is required by the Contract Documents to purchase and maintain.

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

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

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

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

## 13.02 Allowances

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



- B. *Cash Allowances*: Contractor agrees that:
  - 1. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and
  - 2. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.
- C. *Contingency Allowance*: Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.
- D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

### 13.03 *Unit Price Work*

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

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

### 14.01 *Access to Work*

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

### 14.02 *Tests, Inspections, and Approvals*

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

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

- E. If the Contract Documents require the Work (or part thereof) to be approved by Owner, Engineer, or another designated individual or entity, then Contractor shall assume full responsibility for arranging and obtaining such approvals.
- F. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation. Such uncovering shall be at Contractor's expense unless Contractor had given Engineer timely notice of Contractor's intention to

cover the same and Engineer had not acted with reasonable promptness in response to such notice.

#### 14.03 *Defective Work*

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

#### 14.04 *Acceptance of Defective Work*

- A. If, instead of requiring correction or removal and replacement of defective Work, Owner prefers to accept it, Owner may do so (subject, if such acceptance occurs prior to final payment, to Engineer's confirmation that such acceptance is in general accord with the design intent and applicable engineering principles, and will not endanger public safety). Contractor shall pay all claims, costs, losses, and damages attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness), and for the diminished value of the Work to the extent not otherwise paid by Contractor. If any such acceptance occurs prior to final payment, the necessary revisions in the Contract Documents with respect to the Work shall be incorporated in a Change Order. If the parties are unable to agree as to the decrease in the Contract Price, reflecting the diminished value of Work so accepted, then Owner may impose a reasonable set-off against payments due under Article 15. If the acceptance of defective Work occurs after final payment, Contractor shall pay an appropriate amount to Owner.

#### 14.05 *Uncovering Work*

- A. Engineer has the authority to require additional inspection or testing of the Work, whether or not the Work is fabricated, installed, or completed.

- B. If any Work is covered contrary to the written request of Engineer, then Contractor shall, if requested by Engineer, uncover such Work for Engineer's observation, and then replace the covering, all at Contractor's expense.
- C. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, then Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, and provide all necessary labor, material, and equipment.
  - 1. If it is found that the uncovered Work is defective, Contractor shall be responsible for all claims, costs, losses, and damages arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and pending Contractor's full discharge of this responsibility the Owner shall be entitled to impose a reasonable set-off against payments due under Article 15.
  - 2. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, then Contractor may submit a Change Proposal within 30 days of the determination that the Work is not defective.

#### 14.06 *Owner May Stop the Work*

- A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, then Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work shall not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

#### 14.07 *Owner May Correct Defective Work*

- A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace rejected Work as required by Engineer, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, then Owner may, after seven days written notice to Contractor, correct or remedy any such deficiency.
- B. In exercising the rights and remedies under this Paragraph 14.07, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this paragraph.
- C. All claims, costs, losses, and damages incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 14.07 will be charged against Contractor as set-offs against payments due under Article 15. Such claims, costs, losses and damages will

include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.

- D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 14.07.

## **ARTICLE 15 – PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD**

### **15.01 Progress Payments**

- A. *Basis for Progress Payments:* The Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed during the pay period, as determined under the provisions of Paragraph 13.03. Progress payments for cost-based Work will be based on Cost of the Work completed by Contractor during the pay period.
- B. *Applications for Payments:*
1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens, and evidence that the materials and equipment are covered by appropriate property insurance, a warehouse bond, or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.
  2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.
  3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.
- C. *Review of Applications:*
1. Engineer will, within 10 days after receipt of each Application for Payment, including each resubmittal, either indicate in writing a recommendation of payment and present the Application to Owner, or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.
  2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:

- a. the Work has progressed to the point indicated;
  - b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 13.03, and any other qualifications stated in the recommendation); and
  - c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.
3. By recommending any such payment Engineer will not thereby be deemed to have represented that:
- a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract; or
  - b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.
4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
- a. to supervise, direct, or control the Work, or
  - b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or
  - c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or
  - d. to make any examination to ascertain how or for what purposes Contractor has used the money paid on account of the Contract Price, or
  - e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.
5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 15.01.C.2.
6. Engineer will recommend reductions in payment (set-offs) necessary in Engineer's opinion to protect Owner from loss because:
- a. the Work is defective, requiring correction or replacement;
  - b. the Contract Price has been reduced by Change Orders;
  - c. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
  - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible; or

- e. Engineer has actual knowledge of the occurrence of any of the events that would constitute a default by Contractor and therefore justify termination for cause under the Contract Documents.

D. *Payment Becomes Due:*

- 1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended (subject to any Owner set-offs) will become due, and when due will be paid by Owner to Contractor.

E. *Reductions in Payment by Owner:*

- 1. In addition to any reductions in payment (set-offs) recommended by Engineer, Owner is entitled to impose a set-off against payment based on any of the following:
  - a. claims have been made against Owner on account of Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages on account of Contractor's conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;
  - b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;
  - c. Contractor has failed to provide and maintain required bonds or insurance;
  - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;
  - e. Owner has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;
  - f. the Work is defective, requiring correction or replacement;
  - g. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
  - h. the Contract Price has been reduced by Change Orders;
  - i. an event that would constitute a default by Contractor and therefore justify a termination for cause has occurred;
  - j. liquidated damages have accrued as a result of Contractor's failure to achieve Milestones, Substantial Completion, or final completion of the Work;
  - k. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;
  - l. there are other items entitling Owner to a set off against the amount recommended.
- 2. If Owner imposes any set-off against payment, whether based on its own knowledge or on the written recommendations of Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and the specific amount of the reduction, and promptly pay Contractor any amount

remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, if Contractor remedies the reasons for such action. The reduction imposed shall be binding on Contractor unless it duly submits a Change Proposal contesting the reduction.

3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 15.01.C.1 and subject to interest as provided in the Agreement.

#### 15.02 *Contractor's Warranty of Title*

- A. Contractor warrants and guarantees that title to all Work, materials, and equipment furnished under the Contract will pass to Owner free and clear of (1) all Liens and other title defects, and (2) all patent, licensing, copyright, or royalty obligations, no later than seven days after the time of payment by Owner.

#### 15.03 *Substantial Completion*

- A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before final payment.
- B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.
- C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a preliminary certificate of Substantial Completion which shall fix the date of Substantial Completion. Engineer shall attach to the certificate a punch list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the preliminary certificate during which to make written objection to Engineer as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the preliminary certificate to Owner, notify Contractor in writing that the Work is not substantially complete, stating the reasons therefor. If Owner does not object to the provisions of the certificate, or if despite consideration of Owner's objections Engineer concludes that the Work is substantially complete, then Engineer will, within said 14 days, execute and deliver to Owner and Contractor a final certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as Engineer believes justified after consideration of any objections from Owner.
- D. At the time of receipt of the preliminary certificate of Substantial Completion, Owner and Contractor will confer regarding Owner's use or occupancy of the Work following Substantial Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Owner and Contractor agree otherwise in writing, Owner shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.



- E. After Substantial Completion the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.
- F. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the punch list.

#### 15.04 *Partial Use or Occupancy*

- A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:
  - 1. At any time Owner may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 15.03.A through E for that part of the Work.
  - 2. At any time Contractor may notify Owner and Engineer in writing that Contractor considers any such part of the Work substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.
  - 3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 15.03 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.
  - 4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 6.05 regarding builder's risk or other property insurance.

#### 15.05 *Final Inspection*

- A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work, or agreed portion thereof, is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

#### 15.06 *Final Payment*

- A. *Application for Payment:*
  - 1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of

inspection, annotated record documents (as provided in Paragraph 7.11), and other documents, Contractor may make application for final payment.

2. The final Application for Payment shall be accompanied (except as previously delivered) by:
  - a. all documentation called for in the Contract Documents;
  - b. consent of the surety, if any, to final payment;
  - c. satisfactory evidence that all title issues have been resolved such that title to all Work, materials, and equipment has passed to Owner free and clear of any Liens or other title defects, or will so pass upon final payment.
  - d. a list of all disputes that Contractor believes are unsettled; and
  - e. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of the Work, and of Liens filed in connection with the Work.
3. In lieu of the releases or waivers of Liens specified in Paragraph 15.06.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (a) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (b) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien, or Owner at its option may issue joint checks payable to Contractor and specified Subcontractors and Suppliers.

**B. *Engineer's Review of Application and Acceptance:***

1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the Application for Payment to Owner for payment. Such recommendation shall account for any set-offs against payment that are necessary in Engineer's opinion to protect Owner from loss for the reasons stated above with respect to progress payments. At the same time Engineer will also give written notice to Owner and Contractor that the Work is acceptable, subject to the provisions of Paragraph 15.07. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

**C. *Completion of Work:*** The Work is complete (subject to surviving obligations) when it is ready for final payment as established by the Engineer's written recommendation of final payment.

**D. *Payment Becomes Due:*** Thirty days after the presentation to Owner of the final Application for Payment and accompanying documentation, the amount recommended by Engineer (less any further sum Owner is entitled to set off against Engineer's recommendation,

including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions above with respect to progress payments) will become due and shall be paid by Owner to Contractor.

#### 15.07 *Waiver of Claims*

- A. The making of final payment will not constitute a waiver by Owner of claims or rights against Contractor. Owner expressly reserves claims and rights arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 15.05, from Contractor's failure to comply with the Contract Documents or the terms of any special guarantees specified therein, from outstanding Claims by Owner, or from Contractor's continuing obligations under the Contract Documents.
- B. The acceptance of final payment by Contractor will constitute a waiver by Contractor of all claims and rights against Owner other than those pending matters that have been duly submitted or appealed under the provisions of Article 17.

#### 15.08 *Correction Period*

- A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents, or by any specific provision of the Contract Documents), any Work is found to be defective, or if the repair of any damages to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas used by Contractor as permitted by Laws and Regulations, is found to be defective, then Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:
  - 1. correct the defective repairs to the Site or such other adjacent areas;
  - 2. correct such defective Work;
  - 3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and
  - 4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others, or to other land or areas resulting therefrom.
- B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others).
- C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.
- D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

- E. Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph shall not be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

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

### **16.01 *Owner May Suspend Work***

- A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by written notice to Contractor and Engineer. Such notice will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be entitled to an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension. Any Change Proposal seeking such adjustments shall be submitted no later than 30 days after the date fixed for resumption of Work.

### **16.02 *Owner May Terminate for Cause***

- A. The occurrence of any one or more of the following events will constitute a default by Contractor and justify termination for cause:
  - 1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule);
  - 2. Failure of Contractor to perform or otherwise to comply with a material term of the Contract Documents;
  - 3. Contractor's disregard of Laws or Regulations of any public body having jurisdiction; or
  - 4. Contractor's repeated disregard of the authority of Owner or Engineer.
- B. If one or more of the events identified in Paragraph 16.02.A occurs, then after giving Contractor (and any surety) ten days written notice that Owner is considering a declaration that Contractor is in default and termination of the contract, Owner may proceed to:
  - 1. declare Contractor to be in default, and give Contractor (and any surety) notice that the Contract is terminated; and
  - 2. enforce the rights available to Owner under any applicable performance bond.
- C. Subject to the terms and operation of any applicable performance bond, if Owner has terminated the Contract for cause, Owner may exclude Contractor from the Site, take possession of the Work, incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and complete the Work as Owner may deem expedient.
- D. Owner may not proceed with termination of the Contract under Paragraph 16.02.B if Contractor within seven days of receipt of notice of intent to terminate begins to correct its failure to perform and proceeds diligently to cure such failure.
- E. If Owner proceeds as provided in Paragraph 16.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds the cost to complete the Work, including all related claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals) sustained by Owner, such excess will be paid to Contractor. If the cost to complete the Work including such related claims, costs, losses,

and damages exceeds such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this paragraph, Owner shall not be required to obtain the lowest price for the Work performed.

- F. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue, or any rights or remedies of Owner against Contractor or any surety under any payment bond or performance bond. Any retention or payment of money due Contractor by Owner will not release Contractor from liability.
- G. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 6.01.A, the provisions of that bond shall govern over any inconsistent provisions of Paragraphs 16.02.B and 16.02.D.

#### 16.03 *Owner May Terminate For Convenience*

- A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):
  - 1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;
  - 2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses; and
  - 3. other reasonable expenses directly attributable to termination, including costs incurred to prepare a termination for convenience cost proposal.
- B. Contractor shall not be paid on account of loss of anticipated overhead, profits, or revenue, or other economic loss arising out of or resulting from such termination.

#### 16.04 *Contractor May Stop Work or Terminate*

- A. If, through no act or fault of Contractor, (1) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (2) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (3) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the contract and recover from Owner payment on the same terms as provided in Paragraph 16.03.
- B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this paragraph are not intended to preclude Contractor from submitting a Change Proposal for an adjustment in Contract Price or Contract Times or otherwise for

expenses or damage directly attributable to Contractor's stopping the Work as permitted by this paragraph.

## **ARTICLE 17 – FINAL RESOLUTION OF DISPUTES**

### **17.01 *Methods and Procedures***

- A. *Disputes Subject to Final Resolution:* The following disputed matters are subject to final resolution under the provisions of this Article:
  - 1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full; and
  - 2. Disputes between Owner and Contractor concerning the Work or obligations under the Contract Documents, and arising after final payment has been made.
- B. *Final Resolution of Disputes:* For any dispute subject to resolution under this Article, Owner or Contractor may:
  - 1. elect in writing to invoke the dispute resolution process provided for in the Supplementary Conditions; or
  - 2. agree with the other party to submit the dispute to another dispute resolution process; or
  - 3. if no dispute resolution process is provided for in the Supplementary Conditions or mutually agreed to, give written notice to the other party of the intent to submit the dispute to a court of competent jurisdiction.

## **ARTICLE 18 – MISCELLANEOUS**

### **18.01 *Giving Notice***

- A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:
  - 1. delivered in person, by a commercial courier service or otherwise, to the individual or to a member of the firm or to an officer of the corporation for which it is intended; or
  - 2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the sender of the notice.

### **18.02 *Computation of Times***

- A. When any period of time is referred to in the Contract by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

### **18.03 *Cumulative Remedies***

- A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract. The provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

18.04 *Limitation of Damages*

- A. With respect to any and all Change Proposals, Claims, disputes subject to final resolution, and other matters at issue, neither Owner nor Engineer, nor any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, shall be liable to Contractor for any claims, costs, losses, or damages sustained by Contractor on or in connection with any other project or anticipated project.

18.05 *No Waiver*

- A. A party's non-enforcement of any provision shall not constitute a waiver of that provision, nor shall it affect the enforceability of that provision or of the remainder of this Contract.

18.06 *Survival of Obligations*

- A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract, as well as all continuing obligations indicated in the Contract, will survive final payment, completion, and acceptance of the Work or termination or completion of the Contract or termination of the services of Contractor.

18.07 *Controlling Law*

- A. This Contract is to be governed by the law of the state in which the Project is located.

18.08 *Headings*

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

# SUPPLEMENTARY CONDITIONS

Prepared by



Issued and Published Jointly by





## ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

### SC-1.01 *Defined Terms*

- A. Section C-700, following Article 1.01.A.48, add the following paragraph:  
49. Bonds--Bid, performance and payment bonds, and/or other instruments of security.
- B. Section C-700--Article 1.01.A.27, change the first sentence to read: "A written notice by Owner to Contractor (with copy to Engineer) . . ."
- C. Section C-700, following Article 1.01.A.49, add the following paragraph:  
50. Partial Utilization--Placing a portion of the Work in service for the purpose for which it is intended (or a related purpose) before reaching completion for all the Work.
- D. Section C-700, following Article 1.01.A.50, add the following paragraph:  
51. Special Conditions--Additional instructions to the Bidder/Contractor denoting special construction or other requirements applicable to this Contract.
- E. Section C-700--Article 1.01.31, delete this paragraph in its entirety.
- F. Section C-700--Article 1.01.A.37, revise the paragraph to read "Lands or areas indicated in the Contract Documents as being furnished by the Owner upon which the work is to be performed, including fee simple property, rights-of-way, permanent and temporary construction easements, encroachment permits from governmental and private entities, and such other lands furnished by the Owner which are designated for the use of the Contractor in the completion of the Work."
- G. Section C-700, following Article 1.01.A.51, add the following paragraph:  
52. Written Notice--Any notice to any party of this Agreement in writing and considered delivered and the service thereof completed, when posted by certified or registered mail to the said party at his last given address, or delivered in person to said party or his authorized representative on the Work.

## ARTICLE 2 – PRELIMINARY MATTERS

### SC-2.05 *Initial Acceptance of Schedules*

- A. SC-2.05, delete paragraph A and replace with the following paragraph A:

- A. Initial Acceptance of Schedules

The Contractor shall, within 5 days after the Work commences on the Contract or another period of time determined by the Owner/Engineer, prepare and submit to the Owner/Engineer:

- 1. Three copies of a practicable schedule showing the order in which the Contractor proposes to perform the Work, and the dates on which the Contractor contemplates starting and completing to several salient features of the Work (including acquiring materials, plant, and equipment). The Schedule shall be in the form of a progress chart of suitable scale to indicate appropriately the percentage of Work schedules for completion by any given date during the period. If the Contractor fails to submit a schedule within the time prescribed, the Owner/Engineer may withhold approval of progress payments until the Contractor submits the required schedule.

2. The Contractor shall enter the actual progress on the chart at the end of each month during the construction period and upon doing so shall immediately deliver 3 copies of the annotated schedule to the Owner/Engineer.
3. If the Contractor falls behind the progress schedule, the Contractor shall take such steps as may be necessary to improve the progress. Such steps may include increasing the number of shifts, overtime operations, days of work, amount of construction plant, or all of them, and to submit for review any supplementary schedule or schedules in chart form necessary to demonstrate the manner in which the agreed rate of progress will be regained, all without additional cost to the Owner.
4. Failure of the Contractor to prosecute the Work with sufficient diligence to ensure completion within the time specified in the Contract, or failure of the Contractor to take necessary steps to improve the Contractor's progress should it fall behind the Contractor's schedule shall be grounds for the Owner to terminate the Contractor's right to proceed with the Work, or any separate part of it, in accordance with the terms of the Contract.
5. A schedule of Shop Drawing submissions acceptable to the Engineer as providing a workable arrangement for processing the submissions.
6. A schedule of values for all of the work which will include quantities and prices of items aggregating the Contract Price and will subdivide the Work into component parts in sufficient detail to serve as the basis for progress payments during construction. the schedule of values must be acceptable to the Engineer as to form and substance.
7. The Contractor shall also submit a schedule of payments that the Contractor anticipates the Contractor will earn during the course of the Work.

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

#### *SC-3.01 Intent*

- A. Insert the following new paragraphs under Article 3.01:
  - B. The Contract Documents comprise the entire Agreement between the Owner and the Contractor concerning the Work.
  - C. When words which have a well-known technical or trade meaning are used to describe the Work, materials or equipment, such words shall be interpreted in accordance with that meaning.
  - D. In case of conflict between the Drawings and Specifications, the Specifications shall govern unless specifically noted to the contrary in the Drawings. Figure dimensions on Drawings shall govern over scale dimensions, and detailed drawings shall govern over General Drawings.

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

Not applicable.

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

#### *SC-5.01 Availability of Lands*

- A. Add the following new paragraph under Article 5.01:

- D. All land required for this Project is presently owned by the Owner or is under condemnation. The limits of ownership are shown on the Drawings. Easements for pipelines have been obtained by the Owner or are under condemnation. Easement widths are shown on the Drawings.

*SC-5.03 Subsurface and Physical Conditions*

- A. Delete paragraphs 5.03.A and 5.03.B in their entirety and insert the following:
  - A. No reports of explorations or tests of subsurface conditions at or adjacent to the Site, or drawings of physical conditions relating to existing surface or subsurface structures at the Site, are known to Owner.

*SC-5.04 Differing Subsurfaces or Conditions*

- A. Add the following paragraphs:
  - E. Damages
    - 1. Repair to existing utilities and facilities damaged by the Contractor's construction forces shall be considered as a part of the Contract covered only by the prices bid for the new construction. The only exceptions to this provision, wherein extra compensation will be authorized, are:
      - a. Relocation of an existing facility due to direct conflict with the new pipeline.
      - b. Relocation (outside of limits of maximum allowable trench widths) of an existing facility presently located within the bounds of maximum allowable trench width, where necessitated for assurance against future damage due to settlement or to permit reasonable access to the new work.
    - 2. Repair to damaged underground utilities, whether reimbursable or otherwise, must meet the requirements of the agency in charge of that particular utility.
    - 3. The intent of this article is to assure compensation to the Contractor for changes in existing utilities reasonably necessary, and at the same time, to protect the Owner against excessive damages due to carelessness of the Contractor's construction forces.
    - 4. Compensation for extra work covered herein shall be in accordance with other provisions of the general conditions.

*SC-5.05 Underground Facilities*

- A. Add the following paragraphs:
  - F. The layout of the work shall be the responsibility of the Contractor and shall be subject to checking by the Engineer. The Engineer shall establish base lines and a system of bench levels for the Contractor's use as required. All instruments, stakes, barricades, traffic signs, flags, and other materials necessary, and personnel needed for establishing and marking lines, grades, and structure location during construction, shall be the responsibility of the Contractor.

The Contractor's personnel engaged in the layout work described herein and the aides furnished to the Engineer shall be fully capable of performing the duties set out herein and shall be fully qualified for the work required.

## 1. Sewer Lines

The Engineer will provide geometric base data for the Contractor's use in locating sewers and facilities in the design location. The locations for vertical control (bench marks) are shown on the Drawings with elevation and description duly noted. Each manhole, pumping station, wetwell or other notable sewage system component shall have the coordinates shown at the individual locations or listed with the General Notes of the Drawings. It shall be the Contractor's responsibility to locate the new facilities in their intended position using survey grade GPS survey equipment. It shall also be the Contractor's responsibility to provide offset hubs at each manhole or such reference points as may be required to maintain the location of each new installation.

Where the Contractor elects to use grade (batter) boards for sewer construction, offset line, and grade stakes shall be set and cut sheets prepared before trenching work is started. All stakeout work and cut sheet preparation shall be accomplished by the Contractor, the Engineer being responsible review and checking the finished cut sheets. The Contractor shall provide all material, equipment, and labor for all stakeout work. Cut sheets, where required, shall be prepared on forms supplied by the Engineer (HKB Form 404-4).

The cut sheets shall contain the following minimum information:

- a. Manhole stations
- b. Grade between manholes
- c. Centerline and offset stations
- d. Amount and direction of offset
- e. Centerline elevation
- f. Centerline cut
- g. Offset elevation
- h. Offset cut
- i. Utilities information and depths and/or any other pertinent information

Where the Contractor elects to use grade (batter) boards for sewer construction, offset line shall be set perpendicular to each 25 foot centerline station. Where laser beam equipment is to be used, the offset line shall be as required for the specific type of laser equipment used. In either case, the Contractor shall be required to maintain at least the offsets at manholes until the sewer main has been constructed.

Where paving or curbs and gutters are existing or where line and grade stakes have been established for same, the Contract shall determine the elevation of and construct the manholes to the height of the adjacent facilities either existing or proposed. Where paving curbs and gutters or stakes are not existing, the Contractor shall construct the manholes to the height determined by the Engineer.

The Contractor shall furnish all materials required for layout by the Contractor's forces. The Contractor shall furnish all labor and equipment for clearing underbrush, weeds, etc., prior to staking of the sewers.

## 2. Water, Gas, and Sewage Force Mains

Trench line stations will be set by the Contractor ahead of trenching. These will be set at least every 100 feet of pipeline and at the locations of all pipeline accessories.

SC-5.06 Delete Paragraphs 5.06.A and 5.06.B in their entirety and insert the following:

- A. No reports or drawings related to Hazardous Environmental Conditions at the Site are known to Owner.
- B. Not Used.

**ARTICLE 6 – BONDS AND INSURANCE**

SC-6.03 Contractor’s Insurance

- A. Add the following new paragraph immediately after Paragraph 6.03.J:
  - K. The limits of liability for the insurance required by Paragraph 6.03 of the General Conditions shall provide coverage for not less than the following amounts or greater where required by Laws and Regulations:

- 1. Workers’ Compensation, and related coverages under Paragraphs 6.03.A.1 and A.2 of the General Conditions:

State:	<u>Statutory</u>
Federal, if applicable (e.g., Longshoreman’s):	<u>Statutory</u>
Jones Act coverage, if applicable:	
Bodily injury by accident, each accident	\$500,000
Bodily injury by disease, aggregate	\$500,000
Employer’s Liability:	
Bodily injury, each accident	\$500,000
Bodily injury by disease, each employee	\$500,000
Bodily injury/disease aggregate	\$500,000
Foreign voluntary worker compensation	<u>Statutory</u>

- 2. Contractor’s Commercial General Liability under Paragraphs 6.03.B and 6.03.C of the General Conditions:

General Aggregate	\$2,000,000
Products - Completed Operations Aggregate	\$2,000,000
Personal and Advertising Injury	\$1,000,000
Each Occurrence (Bodily Injury and Property Damage)	\$1,000,000

3. Automobile Liability under Paragraph 6.03.D. of the General Conditions:

Bodily Injury:

Each person	\$1,000,000
Each accident	\$1,000,000

Property Damage:

Each accident	\$1,000,000
---------------	-------------

**[or]**

Combined Single Limit of	\$1,000,000
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4. Excess or Umbrella Liability:

Per Occurrence	\$2,000,000
General Aggregate	\$5,000,000

5. Contractor's Pollution Liability

Each Occurrence	\$ _____
General Aggregate	\$ _____

If box is checked, Contractor is not required to provide Contractor's Pollution Liability insurance under this Contract

6. Additional Insureds: In addition to Owner and Engineer, include as additional insureds the following:

Barkley Lake Water District (Client—List)

Bell Engineering

\_\_\_\_\_

\_\_\_\_\_

7. Contractor's Professional Liability

Each Claim	\$2,000,000
Annual Aggregate	\$2,000,000

*SC-6.05 Property Insurance*

A. Add the following to the list of requirements in Paragraph 6.05.A, as a numbered item:

14. be subject to a deductible amount of no more than \$2,500.00 for direct physical loss in any one occurrence.

B. Add the following new subparagraphs after subparagraph 6.05.A.1:

- a. include the interests of Engineer and any other individuals or entities identified herein, and the officers, directors, partners, employees, agents, and other consultants and subcontractors of any of them, each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured;
- b. in addition to the individuals and entities specified, include as additional insureds, the following:
  - 1) Engineer
    - Bell Engineering
    - 107 Forbes Drive
    - Hopkinsville, Kentucky 42240
- C. Add the following new subparagraph after subparagraph 6.05.A.1:
  - a. In addition to Owner, Contractor, and all Subcontractors, include as insureds the following: None.
- D. Add the following to the list of items in Paragraph 6.05.A, as numbered items:
  - 15. include for the benefit of Owner loss of profits and soft cost coverage including, without limitation, fixed expenses and debt service for a minimum of 12 months with a maximum deductible of 30 days, plus attorneys fees and engineering or other consultants' fees, if not otherwise covered;
  - 16. include, in addition to the Contract Price amount, the value of the following equipment and materials to be installed by the Contractor but furnished by the Owner or third parties: None.
  - 17. include by express endorsement coverage of damage to Contractor's equipment.
- E. Delete the first sentence of Paragraph 6.05.A and insert the following sentence in its place:
 

Owner shall purchase and maintain builder's risk insurance upon the Work on a completed value basis, in the amount of the full insurable replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations).
- F. Add the following subparagraphs to Article SC-6.05:
  - G. Where work involves railroad rights-of-way, the Contractor shall purchase and maintain at the Contractor's expense for the full contract Period or as required, Railroad Protective Insurance in an amount acceptable to the railroad company.
  - H. On federally funded projects, the Contractor shall purchase and maintain at the Contractor's expense for the full Contract Period or as required, flood insurance where the Project is in a designated flood hazard area in which federal flood insurance is available.

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

### *SC-7.01 Supervision and Superintendence*

- A. Following paragraph 7.01.B, add a new paragraph C as follows:
  - C. The Contractor shall at all times be responsible for the conduct and discipline of his employees and/or any Subcontractor or persons employed by the Subcontractor. All workmen must have sufficient knowledge and skill and experience to perform properly the work assigned to them. Any superintendent, foreman, or workman employed by the Contractor or Subcontractor who

does not perform his work in a skillful manner or acts in an incompetent, disorderly, or intemperate manner shall, at the written request of the Owner, be discharged immediately.

#### *SC-7.02 Labor; Working Hours*

- A. Amend the first and second sentences of Paragraph 7.02.B to state "...all Work at the Site shall be performed during regular working hours, Monday through Friday. Contractor will not perform Work on any legal holiday."
- B. Following Paragraph 7.02.B, add a new Paragraph C as follows:
  - C. Contractor shall be responsible for the cost of any overtime pay or other expense incurred by the Owner for Engineer's services (including those of the Resident Project Representative, if any), Owner's representative, and construction observation services, occasioned by the performance of Work on Saturday, Sunday, any legal holiday, or as overtime on any regular work day. If Contractor is responsible but does not pay, or if the parties are unable to agree as to the amount owed, then Owner may impose a reasonable set-off against payments due under Article 15.

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

- A. Add the following new paragraphs after paragraph 7.03.C:
  - D. Any equipment damaged or which has been subjected to possible damage by reason of inundation, improper storage and/or protection during the construction period of a project, shall be handled only as follows:
    - 1. Be replaced with new equipment.
    - 2. With approval of the Engineer, be returned to the manufacturer of the equipment, or his authorized repair agency, for inspection and repair provided; however, that such repair after inspection will place the equipment in new condition, and restore the manufacturer's guarantee the same as for new equipment.
    - 3. This is particularly applicable to, but not limited to, electric motors, motor controls, meter and gauges, and equipment with bearings.
  - E. Materials, supplies, and equipment shall be in accordance with samples submitted by the Contractor and accepted by the Engineer.
  - F. Materials, supplies, or equipment to be incorporated into the Work shall not be purchased by the Contractor or the Subcontractor subject to a chattel mortgage or under a conditional sale contract or other agreement by which an interest is retained by the seller.
  - G. The use of second hand and/or salvaged materials will not be permitted unless specifically provided for in the detailed Specifications. Materials and equipment shall be new when turned over to the Owner.
  - H. All materials and/or equipment to be removed from existing structures and not specifically specified to be reused shall remain the property of the Owner. Such materials and/or equipment shall be stored by the Contractor on sites as directed by the Owner.

#### *SC-7.12 Safety and Protection*

- A. The Contractor is required to inquire with the Owner and obtain a copy of any and all safety programs the Owner has.



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

A. Add the following to the existing paragraph 7.16.B.3:

No portion of the work requiring a shop drawing, working drawing, sample, or catalog data shall be started nor shall any materials be fabricated or installed prior to the review or qualified review of such item. The Owner will not be liable for any expense or delay due to corrections or remedies required to accomplish conformity.

B. Add the following to the existing paragraph 7.16.A.2:

The certification statement shall include the following information: contract name, contract number, submittal number, contractor's name, contractor's signature (original, not initialed), date, and reference to meeting the obligations required under Article 7.16.A.

C. Add the following new paragraphs under Article 7.16.A:

4. Shop drawing submittals shall contain:

- a. The date of submission and the dates of any previous submissions.
- b. The project title, contract number, and submittal number.
- c. Contractor identification.
- d. The names of:
  - (1) Contractor
  - (2) Supplier
  - (3) Manufacturer
- e. Identification of the product, with the Specification section number.
- f. Field dimensions, clearly identified as such.
- g. Relation to adjacent or critical features of the work or material.
- h. Applicable standards, such as ASTM, or federal Specification numbers.
- i. Identification of deviations from Contract Documents.
- j. Identification of revisions on resubmittals.
- k. An 8-inch x 3-inch blank space for Contractor's and Engineer's stamps.
- l. Critical path notation as required.

5. Coordination of Submittal Times

- a. The Contractor shall prepare and transmit each submittal sufficiently in advance of performing the related Work or other applicable activities, or within the time specified in the individual Work section of the Specifications, so that the installation will not be delayed by processing times, including disapproval and resubmittal (if required), coordination with other submittals, testing, purchasing, fabrication, delivery, and similar sequenced activities.

- D. Add the following new subparagraph under paragraph 7.16.E:
2. The Contractor shall bear the cost for review and processing of shop drawings after the second resubmittal.

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

SC-8.02 Not used.

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

SC-9.13 Not used.

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

*SC-10.01 Owner’s Representative*

- A. Add a new paragraph B under existing paragraph 10.01.A:
- B. Limit of Liability of Public Officials and Owner’s Agents
1. In carrying out any of the provisions of the Contract or in exercising any power or authority to him thereby, there shall be no personal liability upon the Engineer or the Owner’s other authorized assistants or employees, it being understood that in such matters they act as the agents and representatives of the Owner.

*SC-10.03 Project Representative*

- A. Add the following new paragraphs immediately after Paragraph 10.03.A:
- B. The Resident Project Representative (RPR) will be Engineer's representative at the Site, will act as directed by and under the supervision of Engineer, and will confer with Engineer regarding RPR's actions.
1. General: RPR's dealings in matters pertaining to the Work in general shall be with Engineer and Contractor. RPR's dealings with Subcontractors shall only be through or with the full knowledge and approval of Contractor. RPR shall generally communicate with Owner only with the knowledge of and under the direction of Engineer.
  2. Schedules: Review the progress schedule, schedule of Shop Drawing and Sample submittals, and Schedule of Values prepared by Contractor and consult with Engineer concerning acceptability.
  3. Conferences and Meetings: Attend meetings with Contractor, such as preconstruction conferences, progress meetings, job conferences, and other Project-related meetings, and prepare and circulate copies of minutes thereof.
  4. 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 proper execution of the Work.
5. Interpretation of Contract Documents: Report to Engineer when clarifications and interpretations of the Contract Documents are needed and transmit to Contractor clarifications and interpretations as issued by Engineer.
6. Shop Drawings and Samples
  - a. Record date of receipt of Samples and Contractor-approved Shop Drawings.
  - b. Receive Samples which are furnished at the Site by Contractor, and notify Engineer of availability of Samples for examination.
  - c. Advise Engineer and Contractor of the commencement of any portion of the Work requiring a Shop Drawing or Sample submittal for which RPR believes that the submittal has not been approved by Engineer.
7. Modifications: Consider and evaluate Contractor's suggestions for modifications in Drawings or Specifications and report such suggestions, together with RPR's recommendations, if any, to Engineer. Transmit to Contractor in writing decisions as issued by Engineer.
8. Review of Work and Rejection of Defective Work
  - a. Conduct on-Site observations of Contractor's work in progress to assist Engineer in determining if the Work is in general proceeding in accordance with the Contract Documents.
  - b. Report to Engineer whenever RPR believes that any part of Contractor's work in progress is defective, will not produce a completed Project that conforms generally to the Contract Documents, or will imperil the integrity of the design concept of the completed Project as a functioning whole as indicated in the Contract Documents, or has been damaged, or does not meet the requirements of any inspection, test or approval required to be made; and advise Engineer of that part of work in progress that RPR believes should be corrected or rejected or should be uncovered for observation, or requires special testing, inspection or approval.
9. Inspections, Tests, and System Startups
  - a. Verify that tests, equipment, and systems start-ups and operating and maintenance training are conducted in the presence of appropriate Owner's personnel, and that Contractor maintains adequate records thereof.
  - b. Observe, record, and report to Engineer appropriate details relative to the test procedures and systems startups.
10. Records
  - a. Prepare a daily report or keep a diary or log book, recording Contractor's hours on the Site, Subcontractors present at the Site, weather conditions, data relative to questions of Change Orders, Field Orders, Work Change Directives, or changed conditions, Site visitors, deliveries of equipment or materials, daily activities, decisions, observations in general, and specific observations in more detail as in the case of observing test procedures; and send copies to Engineer.

- b. Record names, addresses, fax numbers, e-mail addresses, web site locations, and telephone numbers of all Contractors, Subcontractors, and major Suppliers of materials and equipment.
- c. Maintain records for use in preparing Project documentation.

#### 11. Reports

- a. Furnish to Engineer periodic reports as required of progress of the Work and of Contractor's compliance with the Progress Schedule and schedule of Shop Drawing and Sample submittals.
- b. Draft and recommend to Engineer proposed Change Orders, Work Change Directives, and Field Orders. Obtain backup material from Contractor.
- c. Immediately notify Engineer of the occurrence of any Site accidents, emergencies, acts of God endangering the Work, force majeure or delay events, damage to property by fire or other causes, or the discovery of any Constituent of Concern or Hazardous Environmental Condition.

12. Payment Requests: Review applications for payment with Contractor for compliance with the established procedure for their submission and forward with recommendations to Engineer, noting particularly the relationship of the payment requested to the Schedule of Values, Work completed, and materials and equipment delivered at the Site but not incorporated in the Work.

13. Certificates, Operation and Maintenance Manuals: During the course of the Work, verify that materials and equipment certificates, operation and maintenance manuals and other data required by the Contract Documents to be assembled and furnished by Contractor are applicable to the items actually installed and in accordance with the Contract Documents, and have these documents delivered to Engineer for review and forwarding to Owner prior to payment for that part of the Work.

#### 14. Completion

- a. Participate in Engineer's visits to the Site to determine Substantial Completion, assist in the determination of Substantial Completion and the preparation of a punch list of items to be completed or corrected.
- b. Participate in Engineer's final visit to the Site to determine completion of the Work, in the company of Owner and Contractor, and prepare a final punch list of items to be completed and deficiencies to be remedied.
- c. Observe whether all items on the final list have been completed or corrected and make recommendations to Engineer concerning acceptance and issuance of the notice of acceptability of the work.

#### C. The RPR shall 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 Contractor's work.

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. Accept Shop Drawing or Sample submittals from anyone other than Contractor.
8. Authorize Owner to occupy the Project in whole or in part.

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

### *SC-13.01 Cost of the Work*

A. Delete Paragraph 13.01.B.5.c in its entirety and insert the following in its place:

c. Construction Equipment and Machinery

- 1) Rentals of all construction equipment and machinery, and the parts thereof, in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.
- 2) Costs for equipment and machinery owned by Contractor will be paid at a rate shown for such equipment in the *Green Book* compiled and distributed by Associates Equipment Distributors, 615 West 22nd Street, Oak Brook, Illinois 60523. An hourly rate will be computed by dividing the monthly rates by 176. These computed rates will include all operating costs. Costs will include 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, shall cease to accrue when the use thereof is no longer necessary for the changed Work. Equipment or machinery with a value of less than \$1,000 will be considered small tools.

### *SC-13.03 Unit Price Work*

A. Delete Paragraph 13.03.E in its entirety and insert the following in its place:

- E. The unit price of an item of Unit Price Work shall be subject to reevaluation and adjustment under the following conditions:
1. if the extended price of a particular item of Unit Price Work amounts to 5 percent or more of the Contract Price (based on estimated quantities at the time of Contract formation) and the variation in the quantity of that particular item of Unit Price Work actually furnished or performed by Contractor differs by more than 25 percent from the estimated quantity of such item indicated in the Agreement; and
  2. if there is no corresponding adjustment with respect to any other item of Work; and
  3. if Contractor believes that Contractor has incurred additional expense as a result thereof, Contractor may submit a Change Proposal, or if Owner believes that the quantity variation entitles Owner to an adjustment in the unit price, Owner may make a Claim, seeking an adjustment in the Contract Price.

## ARTICLE 15 – PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD

### SC-15.01 *Progress Payments*

- A. In Paragraph 15.01.D, change “Ten days” to “Ten business days (or longer if required by the funding agency).”

### SC-15.03 *Substantial Completion*

- A. 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, shall 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 Article 15.

## ARTICLE 19 FEDERAL REQUIREMENTS

### SC-19.01 *Add the following language as Paragraph 19.01 with the title “Agency not a Party”.*

- A. This Contract is expected to be funded in part with funds provided by Agency. Neither Agency, nor any of its departments, entities, or employees is a party to this Contract.

### SC-19.02 *Add the following sections after Article 19.01 with the title “Contract Approval”:*

- A. Owner and Contactor will furnish Owner’s attorney such evidence as required so that the Owner’s attorney can complete and execute the following “Certificate of Owner’s Attorney” (Exhibit F) before Owner submits the executed Contract Documents to Agency for approval.

### SC-19.03 *Add the following language after Article 19.02.B with the title “Conflict of Interest & Gratuities”:*

Contractor may not knowingly contract with a supplier or manufacturer if the individual or entity who prepared the plans and specifications has a corporate or financial affiliation with the supplier or manufacturer. Owner’s officers, employees, or agents shall not engage in the award or administration of this Contract if a conflict of interest, real or apparent, would be involved. Such a conflict would arise when: (i) the employee, officer or agent; (ii) any member of their immediate family; (iii) their partner; or (iv) an organization that employs, or is about to employ, any of the above, has a financial interest in Contractor. Owner’s officers, employees, or agents shall neither solicit nor accept gratuities, favors, or anything of monetary value from Contractor or Subcontractor.

### SC-19.04 *Add the following language after Article 19.03.A. with “Gratuities”*

- A. If Owner finds after a notice and hearing that Contractor, or any of the 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 maybe reviewed in proceedings under the dispute resolution provisions of this Contract.

- B. In the event this Contract is terminated as provided in Article 19.04.A, Owner may pursue the same remedies against Contractor as it could pursue in the event of a breach of 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 3 nor more than 10 times the costs Contractor incurs in providing any such gratuities to any such officer or employee.

*SC-19.05 Add the following language after Article 19.04 as Article 19.05 with the title "Small, Minority, and Women's Businesses":*

A. Contracting with small and minority businesses, women's business enterprises, and labor surplus area firms. If Contractor intends to let any subcontracts for a portion of the Work, Contractor must 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 must include:

- (1) Placing qualified small minority and women's businesses on solicitation lists;
- (2) Assuring that small, minority, and women's businesses are solicited whenever they are potential sources;
- (3) Dividing total requirements, when economically feasible, into small tasks or quantities to permit maximum participation of small, minority, and women's businesses;
- (4) Establishing delivery schedules, where the requirement permits, which encourage participation by small and minority businesses, women's business enterprises;
- (5) Using the services and assistance of the Small Business Administration and the Minority Business Development Agency of the U.S. Department of Commerce.

*SC-19.06 Add the following language after Article 19.05 as Article 19.06 with the title "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.

*SC-19.07 Add the following language after Article 19.06 as Article 19.07 with the title "Clean Air Act (42 USC 7401-7671q) and the Federal Pollution Control Act (33 USC1251-1387), as amended":*

- A. Contractor agrees to comply with all applicable standards, orders, or regulations issued pursuant to the Clean Air Act and the Federal Water Pollution Control Act. Violations must be reported to the federal awarding agency and the Regional Office of the Environmental Protection Agency (EPA).

*SC-19.08 Add the following language after Article 19.07 as Article 19.08 with the title “Equal Opportunity Requirements”:*

- 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. 339), 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.”

*SC-19.09 Add the following language after Article 19.08 as Article 19.09 with the title “Byrd Anti-Lobbying Amendment (31 USC 1352)”:*

- A. Contractors that apply for a bid for award exceeding \$100,000 must file the required certification (RD Instruction 1950Q, 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 an agency, a member of Congress, an officer or employee of Congress, or an employee of a member of Congress in connection with obtaining the Contract if it is covered by 31 USC 1352. The Contract and every subcontractor must also disclose any lobbying with non-federal funds that takes place in connection with obtaining federal award. Such disclosures are forwarded from tier to tier up to the Owner. Necessary certification and disclosure forms shall be provided by Owner.

*SC-19.10 Add the following language after Article 19.09 as Article 19.10 with the title “Environmental Requirements”:*

When constructing a Project involving trenching and/or other related each excavation, Contractor shall comply with the following environmental conditions:

- A. Wetlands—When disposing of excess, spoil, or other construction materials on public or private property, Contractor shall not fill in or otherwise convert wetlands.
- B. Floodplains—When disposing of excess, spoil, or other construction materials on public or private property, Contractor shall not fill in or otherwise concert 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 Soul Survey Maps.
- C. Historic Preservation—Any excavation by Contractor that uncovers an historical or archaeological artifact or human remains shall immediately report to the Owner and a representative of Agency. Construction shall be temporarily halted pending the notification process and further directions issued by Agency after consultation with the State Historic Preservation Officer (SHPO).
- D. Endangered Species—Contractor shall comply with the Endangered Species Act, which provides for the protection of endangered and/or threatened species and critical habitat. Should any evidence of the presence of endangered and/or other threatened species or their critical habitat be brought to the attention of Contractor, Contractor will immediately report this evidence to Owner and representative of Agency. Construction shall be temporarily



halted pending the notification process and further directions issued by Agency after consultation with the U.S. Fish and Wildlife Service.

E. Mitigation Measures—The following environmental mitigation measures are required on this Project: *(Insert mitigation measures here.)*

*SC-19.11 Add the following language after Article 19.10 as Article 19.11 with the title “Contract Work Hours and Safety Standards Act (40 USC 1701-3708)”:*

A. Where applicable, for contracts awarded by Owner in excess of \$100,000 that involve employment of mechanics or laborers, the Contractor must comply with 40 USC 3702 and 3704, as supplemented by Department of Labor regulations (29 CFR, Part 5). Under an USC 3702 of the Act, the Contractor must compute the wages of every mechanic and laborer on the basis of standard work week of 40 hours in the work week. The requirements of 40 USC 3704 are applicable in construction 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 transmittal of intelligence.

*SC-19.12 Add the following language after Article 19.11 as Article 19.12 with the title “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 government wide 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 Cop., 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 other than Executive Order 12549.

*SC-19.13 Add the following language after Article 19.12 as Article 19.13 with the title “Procurement of Recovered Materials”:*

A. The Contractor must comply with 2 CFR Part 200.322, “Procurement of Recovered Materials.”

**SECTION 00815**

**LABOR REGULATIONS ON PUBLIC WORKS  
KENTUCKY PROJECTS**

- A. All Public Works Projects submitted for bids and constructed by a Public Authority in the State of Kentucky are subject to the provisions of the Kentucky Revised Statutes, Chapter 337, entitled Wages and Hours as may be amended from time to time. Contractors submitting Bids for the specified project must consider the fact that in the event of an award it shall be his responsibility to comply with all aspects of the statutory requirements contained therein while engaged upon the project covered by these Specifications.
- B. If the Project to which these Specifications apply is funded in whole or in part by a federal grant or loan program whereby the U.S. Department of Labor is required to prescribe predetermined prevailing minimum wages, compliance with the currently applicable federal labor regulations is required.
- C. Prior to the scheduled date for receipt of construction Bids, where federal funds are involved, a determination of the prevailing rate of wages will be obtained from the U.S. Department of Labor and issued in the form of an addendum to these Specifications to each of the known prospective Bidders. The addendum shall become a part of the Contract Specifications. The rates so determined shall be the minimum hourly rate of wages to be paid to all laborers, workmen, mechanics, helpers and apprentices performing Work under this Project covered by these Specifications.
- D. On federally funded projects, weekly payroll data for all the CONTRACTOR and Subcontractor employees must be furnished monthly to the Federal agency designee or as may be prescribed by the agency at a preconstruction conference. While weekly wage data reports are not required to be filed with the Kentucky Department of Labor on Federally assisted projects, one copy of the report must be filed with the OWNER and be available at the Public Authority's (OWNER) office for inspection by the Kentucky Department of Labor. The prime CONTRACTOR is responsible for payroll reporting compliance by all his Subcontractors.
- E. Federal labor regulations applicable to the Project for which these Specifications are applicable shall be those established by the Federal agency involved (if any). The CONTRACTOR and Subcontractor performing the Work under this Project must fulfill all requirements of the presently effective labor legislation and Executive Orders as listed below and any other Federal labor regulations which may be or may become applicable.
  - 1. "Anti-Kickback" Act, Copeland Act
  - 2. Contract Work Hours Standard Act - Overtime Compensation
  - 3. Non Discrimination - Civil Rights Act

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4. Equal Employment Opportunity - Executive Orders 11246 and 11375
5. Elimination of segregated facilities
6. Certification of nonsegregated facilities

**END OF SECTION**

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00815-2

**SECTION 00820**

**SPECIAL CONDITIONS**

1. DESCRIPTION OF THE WORK; DESIGNATION OF OWNER AND ENGINEER

1.1 These Specifications and the accompanying Drawings describe the work to be done and the materials to be furnished for the construction of Contract 586-19-01, Highway 139 North Water Line Upgrades and McUpton Booster Pump Station Replacement, Barkley Lake Water District.

1.2 All references to the OWNER in these Specifications, Contract Documents and Drawings shall mean the Barkley Lake Water District.

1.3 All references to the ENGINEER in these Specifications, Contract Documents and Drawings shall mean Bell Engineering.

2. AVAILABLE FUNDS

2.1 The attention of all Bidders is directed to the fact that funds will be made available for the award this Contract from the following sources:

Rural Development (RD) and local funds.

3. TIME OF COMPLETION

3.1 The time allowed for completion of this Contract and/or portions thereof is as follows:

180 days	Substantial Completion
180 days	Final Completion

3.2 The time allowed for completion shall begin at midnight, local time, 10 calendar days from the date on which the OWNER, or his authorized representative, the ENGINEER, shall instruct the CONTRACTOR in writing to start work. In case of awarding more than one Contract to a CONTRACTOR, periods of construction are not additive, but will run concurrently. The same applies to divisions within a Contract.

4. LIQUIDATED DAMAGES

4.1 It is understood that time is of the essence of this Contract, and that the OWNER will sustain damages, monetary and otherwise, in the event of delay in completion of the work hereby contracted.

4.2 Therefore, if the said CONTRACTOR shall neglect, fail or refuse to complete the work within the time herein specified, or any proper extension thereof granted by the OWNER, then the CONTRACTOR does hereby agree, as a part consideration for the awarding of this Contract, to pay to the OWNER the amount specified in the Contract, not as a penalty but as liquidated damages for such breach of Contract

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as hereinafter set forth, for each and every calendar day that the CONTRACTOR shall be in default after the time stipulated in the Contract for completing the work.

4.3 The said amount is fixed and agreed upon by and between the CONTRACTOR and the OWNER because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages the OWNER would in such event sustain, and said amount is agreed to be the amount of damages which the OWNER would sustain and said amount shall be retained from time to time by the OWNER from current periodical estimates.

4.4 Liquidated damages are fixed at the following amounts per calendar day of overrun beyond the date set for completion or authorized extension thereof for each of the Contracts, divisions, sections, or combinations thereof:

Contract 586-19-01 - \$750.00 per calendar day

## 5. METHOD OF BIDDING

5.1 The work under this Contract shall be bid by unit price and/or lump sum as provided for in the Form of Proposal. This Contract shall be bid in full on the form provided.

5.2 The CONTRACTOR must bid all divisions and all listed unit price items and/or lump sums to complete a Contract. The OWNER will not award the work on divisions or sections within a Contract separately. Each Contract shall be bid separately and in full on the Form of Proposal provided.

5.3 The OWNER reserves the right, should financing considerations require or allow, to delete or add physical units to the unit price items bid. However, the monetary value of such deletions or additions shall not exceed 25 percent of the total amount bid for the Contract without specific approval of the CONTRACTOR.

5.4 If deletions or additions are made, comparison of bids will be made on the basis of portions of the Contract to be awarded and not on the total of the base bid made by the CONTRACTOR.

## 6. VIDEOTAPING

6.1 Continuous videotaping of preconstruction surface conditions is required for this Contract. All taping and reproduction must be completed before any construction activity will be allowed. Recording must be performed by persons experienced with this type equipment and must be acceptable to the ENGINEER. Recording equipment used shall utilize standard DVD format discs.

6.2 The video recording shall be supplemented with continuous audio description of the area traversed. Verbal description of problem areas and items of special interest shall be elaborated upon.

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6.3 All locations, streets, and/or easements on or in which construction activity will occur shall be recorded for the complete length or boundary of the construction area.

6.4 An index shall be furnished for each DVD coordinating the location of the recorded area with the location of the proposed facilities as shown on the Drawings.

6.5 The CONTRACTOR shall be responsible for providing access to all areas to be recorded. All DVDs shall be viewed by the ENGINEER before any construction is started. The CONTRACTOR shall provide DVD viewing equipment for the duration of the project.

6.6 The cost of preconstruction audio/video recording shall be at no additional cost to the OWNER, the cost being incorporated into the CONTRACTOR's unit price or lump sum bid for the items of work as listed on the Form of Proposal.

6.7 The CONTRACTOR is also urged to document on video any structure within a reasonable distance of his blasting or other work operations for reference and file.

6.8 Digital color print still photographs shall be used to supplement the continuous video recording of preconstruction conditions and/or pertinent construction items.

6.9 Any photographs or audio/video recordings required by governing agencies will be the responsibility of the OWNER.

6.10 The CONTRACTOR shall submit to the ENGINEER a number of copies of these documentation media in accordance with the Contract Documents.

6.10.1 Video recordings on DVD-R format discs shall be submitted in a quantity greater than or equal to 6 copies.

6.10.2 Digital still photographs on DVD-R or CD-R format discs shall be submitted in a quantity greater than or equal to 6 copies.

## 7. MINIMUM WAGE RATES

7.1 The prevailing minimum wage rates, if applicable, have not at this time been determined by the governing agencies. However, before bids are received, applicable rates will be determined and issued in the form of an addendum to these Specifications.

## 8. SALES AND USE TAX

8.1 See Specification Section 00700, Article 7.09, for instructions.

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9. EXCAVATION

9.1 It is to be specifically noted that no separate payment for solid rock excavation will be made under this Contract. All excavation shall be considered unclassified, and payment for same included in the appropriate trench and backfill, furnishing and laying, or other items containing excavation.

10. PERMISSION TO USE PROPERTY OTHER THAN THAT PROVIDED BY OWNER

10. Should the CONTRACTOR desire or elect to use, pass over, and/or encroach on private property other than that provided by the OWNER, either by fee simple title or right-of-way for a specific purpose, he shall obtain such rights and permission from the individual property owner at his own expense and risk.

11. TIE-IN TO EXISTING SEWER LINES

11.1 As far as possible, the locations and sizes of existing sewer lines are indicated on the Drawings; however, exact locations, pipe materials and sizes cannot be guaranteed. It shall be the responsibility of the CONTRACTOR to locate and uncover existing lines or manholes, to which new sewer lines are to be connected, and provide all connecting fittings of the correct size and type for each connection. Payment for the above shall be included in the unit price bid for each item used for the connection as indicated on the Drawings or as specified.

12. EXTRA FILL MATERIAL

12.1 Extra fill material required to complete the finished grading to the line and grade shown on the Drawings shall be obtained by the CONTRACTOR at no extra cost to the OWNER above that included in his lump sum bid.

13. SURFACE RESTORATION RETAINAGE

13.1 In the case of sewer line contracts, there will be retained from each monthly payment estimate from the unit prices for "Furnishing, Laying, Trenching, and Backfilling" an amount of \$5.00 per foot for each applicable depth classification. Upon completion of cleanup work satisfactory to the ENGINEER, this retainage will be paid on the subsequent periodic payment estimate. The retainage and release of same shall be between manhole sections only, and no shorter distances shall be considered.

13.2 In the case of sewage force mains, there will be retained from each monthly payment estimate from the unit prices for "Furnishing, Trenching, Laying and Backfilling" an amount of \$5.00 per foot of each applicable line size and length. Upon completion of clean-up work satisfactory to the ENGINEER, this retainage will be paid on the subsequent periodic payment estimate.

14. USE OF SPECIALS IN VERTICAL PLANE OPTIONAL

14.1 Where specials (fittings) are shown at change in grade of pipeline, the CONTRACTOR, at his option, may use fittings as shown with blocking, or he may, where possible without exceeding maximum allowable deflection in pipe joints, avoid

the use of specials at grade changes, by increasing the trench depth, provided the pipe installed to such extra depth is designed to withstand the extra depth cover and the maximum internal pressure specified. No additional compensation will be given for installing the pipe at an extra depth to avoid the use of fittings and thrust blocking.

15. ACCESS TO THE WORK

15.1 The representatives of the Barkley Lake Water District, Bell Engineering, the Kentucky Division of Water (KYDOW), Kentucky Transportation Cabinet (KYTC), and all funding agencies shall have access to the work wherever it is in preparation or progress, and the CONTRACTOR shall provide proper facilities for such access and inspection.

16. BLASTING AND PREBLAST SURVEYS

16.1 The CONTRACTOR will be held liable for all damages caused by blasting operations required for the construction of this project. All blasting operations shall be performed in accordance with local municipal ordinances and state laws governing such operations, including the storage of explosives.

16.2 Special precautions are required when blasting near natural gas pipelines. The CONTRACTOR shall notify the OWNER of the gas line at or near the area of blasting prior to beginning the blasting operation. The CONTRACTOR shall, with or without assistance from the gas company, develop emergency procedures, planned in advance of each blast.

16.3 Preblast surveys are required on this project for the protection of all parties concerned. These surveys shall be conducted by independent firms specializing in blasting damage control safety.

16.4 Preblast surveys shall be detailed studies of all commercial, industrial, residential or other structures within the areas subject to damage as a result of the blasting operations. The surveys shall include the exterior and/or interior of the building and other improvements on the property such as concrete, brick, or bituminous paved drives, parking areas, sidewalks, retaining walls or pillars subject to damage as a result of blasting operations. In rural areas, the surveys shall also include water sources such as wells, springs, and dams for farm ponds.

16.5 Individual reports shall be prepared for each parcel of property surveyed within the given radius of the blasting area. Each report shall indicate the type and location of existing structural damage, or the fact that none exists, shown in detail by sketch supplemented by color photo, audio cassette tape supplemented by color photo or video tape, as the CONTRACTOR may elect. Should the video tape method be provided, a video projector shall be furnished for the project duration.

16.6 Preblast survey reports shall also include recommended blasting methods and techniques to preclude damage.

16.7 One copy of each individual report shall be filed with the OWNER for his file and reference prior to the start of blasting operations.



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16.8 The cost for preblast surveys shall be considered incidental to the work and shall be included in the bid price for the work.

17. PROJECT SIGNS

17.1 The CONTRACTOR shall furnish and install a total of 2 project signs per details shown in Specifications or as shown in the set of Drawings. One of each sign at start of project and one of each sign at end of project. Locations to be field determined by OWNER and funding agencies.

18. TRAFFIC CONTROL

18.1 The CONTRACTOR shall be responsible for complying with appropriate temporary traffic control as described in the latest edition of the Manual on Uniform Traffic Control Devices (MUTCD).

18.2 It shall be the responsibility of the CONTRACTOR to advise the KYTC District Public Information Officer and local media of the location (including milepoints) and duration of any proposed lane closures, a minimum of 3 days prior to the closure.

18.3 Call the KYTC District Public Information Officer current assigned to that district's office.

19. FUNDING AGENCY CONDITIONS

19.1 Funding agency special or supplemental conditions are included as a separate section, Section 00830.

**END OF SECTION**

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**SECTION 00830**

**FUNDING AGENCY SPECIAL CONDITIONS**

The following section of these Specifications is an additional condition of the Contract and supplements the Contract Documents. The more stringent condition shall govern in the case of conflict with those applicable conditions in the “white” sections of this document.

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00830-1

UNITED STATES DEPARTMENT OF AGRICULTURE  
Rural Utilities Service  
Kentucky Bulletin 1780-1

SUBJECT: Guidance for Use of Engineers Joint Contract Documents Committee (EJCDC)  
Documents on Water and Waste Disposal Projects with RUS Financial Assistance

TO: Project Engineers

EFFECTIVE DATE: Date of approval. See "Use of Prior Versions of EJCDC Documents" on page three.

INSTRUCTIONS: This Bulletin replaces any and all previously dated Kentucky Bulletin 1780-1. April 26, 2018 is the most recent version that is to be included in all construction contracts.

PURPOSE: This Bulletin assists Rural Development staff in providing information and guidance to applicants and professional consultants in the development of engineering construction contracts that are legally sufficient, ensure appropriate services are provided at a reasonable fee, and expedite the achievement of the applicant's goals. This update amends language to support compliance with 2 CFR part 200 and ensure inclusion of AIS changes to contract documents.

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Signed

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2/6/19

Date

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Exhibits

- A. The Construction Contract and Bidding Documents
- B. Engineer's Development of Instructions to Bidders
- C. Engineer's Development of Bid Form
- D. Engineer's Development of Agreement Between Owner and Contractor
- E. Engineer's Development of Supplementary Conditions
- F. Certificate of Owner's Attorney and Agency Concurrence
- G. Engineer's Certification of Final Plans and Specifications
- H. Project Construction Sign Detail
- I. Notice of Award
- J. Notice to Proceed
- K. Compliance Statement (Form RD 400-6)
- L. Certification for Contracts, Grants, and Loans (RD Instruction 1940-Q, Exhibit A-1)
- M. Certification Regarding Debarment and Suspension (AD-1048)

1. General

- A. Approved Documents. Subject to the modification indicated in this Bulletin, the Engineers Joint Contract Document Committee (EJCDC) developed the following documents which were previously approved by the Rural Utilities Service (RUS) for procurement of professional and construction services by loan and grant recipients:
- (1) Agreement Between Owner and Contractor for Construction Contract (Stipulated Price) (EJCDC No. C-520, 2013 Edition)
  - (2) Standard General Conditions of the Construction Contract (EJCDC No. C-700, 2013 Edition)
- B. Associated Documents. In addition to items 1 and 2, there are also associated construction contract documents, some of which are available through EJCDC and its member organizations and some of which are to be developed by the engineer based on instructions in this bulletin.
- C. Alternative Documents. Recipients not wishing to use EJCDC documents may submit alternative documents for review and consideration. Such documents must be modified to meet all federal, state, and local requirements and must be approved for each project by the Agency and the USDA office of General Counsel (OGC). When modified as described in the Bulletin, the EJCDC documents listed above have been determined to meet such requirement and generally to not require OGC approval.

2. Availability

The EJCDC documents are available online from any of the sponsoring organizations: The National Society of Professional Engineers ([www.nspe.org](http://www.nspe.org)); American Council of Engineering Companies ([www.asce.org](http://www.asce.org)); and the American Society of Civil Engineers ([www.asce.org](http://www.asce.org)); or directly from EJCDC ([www.ejcdc.org](http://www.ejcdc.org)). EJCDC documents are proprietary and include a license agreement, RUS offices cannot distribute EJCDC documents for any purpose other than training or to illustrate the appropriate use of the integrated set of documents on RUS financially funded projects.

3. Prior Versions of EJCDC Documents

- A. Project-specific EJCDC documents approved prior to the effective date of this Bulletin are still considered approved. This Bulletin does not retroactively change the status of an individual document already approved.
- B. Phase out of Previous Editions. EJCDC documents from any and all previous versions of EJCDC documents will not be accepted by Rural Development (RD) for use on Water and Waste Disposal (WWD) projects.

4. Purpose

- A. Use by Staff. This Bulletin is to be used by Rural Development staff in providing information and guidance to applicants and professional consultants in the development of agreements and construction contracts that are legally sufficient, ensure appropriate services are provided for a reasonable fee, and expedite the achievement of the applicant's goals.
- B. Assembly of Documents. This Bulletin consists of exhibits with required modification that when combined with the standard EJCDC documents and appropriate drawings, specifications and other required documents, create a complete set of engineering and construction contracts for use with WWD projects. However, the documents in these exhibits are not to be used as a substitute for the careful evaluation of the requirements for a project. The owner, their engineer, and legal counsel, with RD consultation, must determine the best approach for a successful outcome.

5. Owner Responsibility

- A. Verify Bulletin is Current. Before an applicant or consultant proceeds with the development of a set of construction contract documents, they should contact the Rural Development State Office to verify they have the most current information specific to the type of project and state or other jurisdiction where the project is located.
- B. Contractual and Administrative Issues. The Owner is responsible for the settlement of all contractual and administrative issues arising out of procurement entered into in support of a loan or grant. These include, but are not limited to: source evaluation, protests, disputes, and claims. Matters concerning violations of laws are to be referred to the applicable local, state, or federal authority.
- C. Modifications. It is RUS policy that applications use the EJCDC documents with minimal modification. However, RUS recognized each project is unique and that modifications may be required to satisfy project requirements or state statutes. If changes must be made to the standard documents to address project-specific issues, they must be made via bold type additions and deletions with strike-outs or addenda showing all revisions. Because the EJCDC documents are fully integrated, when making modification in one document, applicants must ensure that appropriate modifications are made in all affected documents.

6. USE OF EXHIBITS

The following explains the purpose of each Exhibit in this Bulletin

- A. **THE CONSTRUCTION CONTRACT AND BIDDING DOCUMENTS MODIFICATIONS FOR RUS FUNDED PROJECTS.** This exhibit explains the use of the EJCDC construction contract and bidding documents. It includes a table of all the required documents and instructions for modification and review of these documents.
- B. **ENGINEER'S DEVELOPMENT OF INSTRUCTIONS TO BIDDERS.** This exhibit contains instructions for the engineer to develop Instructions to Bidders using C-200 (2013), "Suggested Instructions to Bidders" and a checklist of modifications included in the exhibit.

- C. ENGINEER'S DEVELOPMENT OF BID FORM. This exhibit contains a checklist of changes that must be made by the engineer to the C-410 (2013), "Bid Form for Construction Contracts".
- D. ENGINEER'S DEVELOPMENT OF AGREEMENT BETWEEN OWNER AND CONTRACTOR. This exhibit contains a checklist of changes that must be made by the engineer to C-520 (2013), "Agreement between Owner and Contractor for Construction Contracts (Stipulated Price)".
- E. ENGINEER'S DEVELOPMENT OF SUPPLEMENTARY CONDITIONS. This exhibit contains instructions for the engineer to develop Supplementary Conditions using C-800 (2013), "Guide to the Preparation of Supplementary Conditions" and a checklist of modifications included in the exhibit.
- F. CERTIFICATE OF OWNER'S ATTORNEY AND AGENCY CONCURRENCE. This exhibit consists of two certificates on a single page to be attached to the construction contract and signed upon execution. The first is a certificate signed by the owner's attorney and the second is the State Engineer's concurrence in the executed construction contract. This certificate is to be attached after the Owner-Contractor Agreement (C-520) is in the construction contract.
- G. ENGINEER'S CERTIFICATION OF FINAL PLANS AND SPECIFICATIONS. This exhibit is a certification by the engineer to the owner and RD that the plans and specifications have been completed in accordance with RUS requirements. This certificate is to be provided to the Agency with the final plans and specifications prior to advertisement for bids.
- H. PROJECT SIGN DETAIL. This is the construction sign that needs to be posted on every project funded by Rural Development.
- I. NOTICE OF AWARD. This is the alternate form to meet the requirement for giving low bidder the notice that they have been awarded the construction contract.
- J. NOTICE TO PROCEED. This is the alternate form to meet the requirement for giving the low bidder the notice of the date that the construction contract is to begin.
- K. COMPLIANCE STATEMENT. On bid amount that exceeds \$10,000, this form is required to be executed and included with bid submittal. This form ensures the equal employment opportunity compliance reports have been filed to meet requirements for federally funded contracts.
- L. CERTIFICATION FOR CONTRACTS, GRANTS, AND LOANS. On bid amount that exceeds \$100,000, this form is required to be executed and included with bid submittal. This form ensures anti-lobbying restrictions have been acknowledged to meet requirements for federally funded contracts.
- M. CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION. On bid amount that exceeds \$25,000, this form is required to be executed and included with bid submittal. This form ensures that the bidder is not debarred or ineligible to receive funds on federally funded projects. Up to date System Award Management (SAM.gov) up to date for all parties to the contract.

THE CONSTRUCTION CONTRACT AND BIDDING DOCUMENTS  
MODIFICATIONS FOR RUS FUNDED PROJECTS

1. PURPOSE

This exhibit explains the use of the EJCDC construction contract and bidding documents. It includes a table of all the required documents and instruction for modification and review of these documents.

2. GENERAL INFORMATION

The EJCDC has developed a 2013 edition of the Construction Series (Owner-Construction) documents that when assembled as described in this Bulletin, is acceptable for use on WWD projects funded by RUS. All contract documents must be approved by USDA Rural Development State Office Engineer prior to advertisement for bids. The Agency must concur in award and the executed contract documents must be approved by the USDA Rural Development State Engineer prior to Agency concurrence in any payment of RUS funding for construction services. A copy of the signature page, Exhibit G, must be used for this portion.

3. INSTRUCTIONS

- A. Assembly of Documents. Bid packages must be assembled in accordance with the following notes, requirements of exhibits A-J, and the table below.
- B. Indicating Revised Text. Although the following instructions direct the changes to be made to various EJCDC documents, actual changes to EJCDC standard must be made using either bold type additions or deletions with strike-outs or addenda showing all revisions.
- C. General Conditions. The EJCDC General Conditions (C-700) should not be modified. Changes to C-700 should only be made via the Supplementary Conditions, except in unusual cases approved by the USDA State Engineer.
- D. EJCDC Suggested Language. The Instructions to Bidders and Supplementary General Conditions must be developed by the Engineer based on EJCDC guidance documents and the instructions and Exhibits below. The USDA State Engineer must verify that the instruction and Exhibits below were followed prior to advertisement for bid.
- E. EJCDC Standard Language. The Bid Form and Agreement Between Owner and Contractor are standard documents from EJCDC, but must be modified before use on RUS funded projects as explained below. The USDA State Engineer must verify that the instructions and Exhibits below were followed prior to advertisement for bidding.
- F. Project Sign. It is customary that project signed identifying the Owner, Contractor, Engineer, and Funding Agencies be displayed during project construction. The sign requirements are not included in the Supplementary Conditions, but should be a part of the specifications and are provided in Exhibit H.

Note that at least five copies of the executed construction contract documents (2- agency; 1-Engineer; 1-Owner; and 1-Contractor) must be submitted to the RD State Office for review and acceptance before issuance of Notice to Proceed.



ASSEMBLING THE CONSTRUCTION CONTRACT AND BIDDING DOCUMENTS

Advertisement for Bids	Use EJCDC C-111 (2013)
Instructions to Bidders	Engineer will develop the Instruction to Bidders using the Standard Instruction to Bidders for Construction Contracts (EJCDC C-200, 2013) as modified by this Bulletin
Bid Form	Use EJCDC C-410 (2013) as modified by this Bulletin.
Bid Bond	
Notice of Award	Use EJCDC C-510 (2013) or Exhibit I of this Bulletin. Owner must obtain Concurrence of Agency prior to announcing award.
Agreement Between Owner and Contractor (Stipulated Price)	Use EJCDC C-520 (2013) as modified by this Bulletin.
Standard General Conditions of the Construction Contract	Use EJCDC C-700 (2013). Modifications to C-700 should be made in the Supplementary Conditions, not in C-700 itself.
Supplementary Conditions	Engineer will develop the Supplementary Conditions using the Guide to Preparation of Supplementary Conditions (EJCDC C-800) as modified by this Bulletin.
Performance Bond	Use EJCDC C-610 (2013) Note that the bond must be at least 100% of the bid amount.
Payment Bond	Use EJCDC C-615 (2013) Note that the bond must be at least 100% of the bid amount.
Application for Payment	Use EJCDC C-620 (2013) or Form RD 1924-18. These documents are pre-approved for use per 7 CFR 1780.76(e).
Change Order	Use EJCDC C-941 (2013) or Form RD 1924-7. These documents are pre-approved for use per 7 CFR 1780.76(h)(2).
Notice to Proceed	Use EJCDC C-550 (2013) or Exhibit J of this Bulletin.
Certificate of Substantial Completion	Use EJCDC C-625 (2013)
Compliance Statement	Use Form RD 400-6
Certification Regarding Debarment, Suspension, Ineligibility, and Voluntary Exclusion- Lower Tier Covered Transactions.	Use Form AD -1048
Certification for Contracts, Grants, and Loans	Use Exhibit A-1 of RD Instruction 1940-Q
Construction Project Sign	Use Exhibit H
Certificate of Owner's Attorney	Use template provided in Exhibit F of this Bulletin.
Engineer's Certification of Final Plans and Specifications.	Use template provided in Exhibit G of this Bulletin.
AIS Requirements, certifications, and materials list	Kentucky Bulletin 1780-2

## ENGINEER'S DEVELOPMENT OF INSTRUCTIONS TO BIDDERS

The Engineer will develop the Instructions to Bidders using the Suggested Instructions to Bidders (EJDCD C-200, 2013) and using the instructions provided in this Bulletin. In addition, the Engineer must ensure that any applicable state or federal requirements are added to the Instructions to Bidders (ITB) Article 24. The USDA, Rural Utilities Service, Water and Waste Disposal program does not require the use of Davis Bacon Wage rates in most cases, but other sources of federal funds only.

- ITB 3.01. The second suggested version of 3.01 is not acceptable for use on RUS funded projects. Owners must not preclude entities from submitting bids.
- ITB 8.01. Bid Security must be at least 5% of the Bidders maximum Bid price.
- ITB 9.01. The second suggested version of 9.01 (applicable to Price-plus-time bids) is not acceptable for use on RUS funded projects.
- ITB 11. The following text should be used for Article 11.

### Article 11- SUBSTITUTES AND "OR EQUAL" ITEMS

11.01 The Contract for the work, if awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents, and those "or equal" or substitute 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 the Bidder and has been received by Engineer at least 15 days prior to the date for receipt of Bids in the case of a proposed substitute and 5 days prior in the case of a proposed "or equal". Each such request shall comply with the requirements of Paragraphs 7.04 and 7.05 of the General Conditions. The burden of proof of merit of the proposed item is upon the Bidder. Engineer's decision of approval or disapproval of proposed item will be final. If Engineer approves any such proposed item, such approval will be set forth in an Addendum issued to all prospective Bidders. Bidders shall not rely upon approvals made in any other manner. Substitutes and "or-equal" materials and equipment may be proposed by Contractor in accordance with Paragraphs 7.04 and 7.05 of the General Conditions after the Effective Date of the Contract.

11.02 All prices that Bidder sets forth in its Bid shall be based on the presumption that the Contractor will furnish the materials and equipment specified or described in the Bidding Documents, as supplemented by Addenda. Any assumptions regarding the possibility of a post-Bid approval of "or equal" or substitution requests are made at Bidder's sole risk.

11.03 If award is made, Contractor shall be allowed to submit proposed substitutes and "or equals" in accordance with the General Conditions.

- ITB 12.01. **Note to user: If this paragraph is applicable to this construction contract, it should be amended to read:** Add the following text at the end of the first sentence " , in accordance with SC7.06B, ITB Article 23, and Article 2.02 of the Bid Form.
- ITB 12.02. Do not include this second paragraph of Article 12.
- ITB 12.03 Insert the following text at the beginning of the third paragraph of Article 12, "If required by the bid documents."

- ITB 12.05. Contractor shall not be required to employ any Subcontractor, Supplier, individual, or entity against whom the Contractor has reasonable objection.
- ITB 12.06. The Contractor shall not award work to a Subcontractor(s) in excess of the limits stated in SC 7.06.
- ITB 14.01. The fourth suggested versions of 14.01 (for cost-plus-fee bids) is not acceptable for use on RUS financed projects.
- ITB 14.04. Do not include Article 14.04 (applicable only to Price-plus-time bids).
- ITB 19.03 The fourth version of 19.03.B (for Cost-plus-fee bids) is not applicable for use on RUS financed projects and should be replaced with the following.

19.03.B. In comparison of the bids, if there is no acceptable bid within available project funds, alternate deducts will be applied in the same order of priority as listed in the bid form. To determine the bid prices for purpose of comparison, owner shall announce a “Base bid minus any necessary deducts” budget after receiving all bids, but prior to the opening of them. For comparison purposes, deductions will be made, following the order of priority established in the Bid Form, until an acceptable bid is within the project funds available. All bids will be recalculated with each deduction, and each bidder should be aware, the apparent low bidder may change following each deduction. After determination of Successful Bidder based on this comparative process and on the responsiveness, responsibilities, and other factors set forth in these instructions, the award may be made to said Successful Bidder on its base bid, minus any deductions to the base bid price.

- ITB 19.03.C. Will not be used (only applicable to Price-plus-time bids).
- ITB 22. This article should be deleted.
- ITB 23: ***Note to user: If this paragraph is applicable to this construction contract, specific language must be added to clearly relay to contractor expectations, liabilities assumed, warranty assumption, requirements..., with reference to SC7.06B, ITB 12.01, and Article 2.02 of the Bid Form.***
- ITB 24. The following text must be used for Article 24.

Article 24. Federal Wage Rate Requirements

- 24.01 Federal requirements in Article 19 of the Supplementary Conditions apply to this project.
- 24.02 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.

## ENGINEERS DEVELOPMENT OF BID FORM

Development of the Bid Form must be based on the Bid form for Construction Contracts (EJCDC C-401, 2013) as modified below.

- In article 2, Bidders Acknowledgements, bid hold time needs to be changed to 90 days.
  - Article 5, "Basis of Bid" do not use the suggested Formats for Price-plus-Time Bids or Cost-plus-Fee bids.
  - Use the first version of Article 6.01 regarding "Time of Completion".
  - Add the following additional required Attachments to Article 7.01, "Attachments to Bid";
- H. If bid amount exceeds \$10,000, signed Compliance Statement (RD 400-6). Refer to specific equal opportunity requirements set forth in the Supplemental General Conditions.
- I. If Bid amount exceeds \$25,000, signed Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion- Lower Tier Covered Transactions (AD-1048)
- J. If Bid amount exceeds \$100,000, signed RD Instruction 1940-Q, Certification for Contracts, Grants, and Loans.

ENGINEERS DEVELOPMENT OF AGREEMENT BETWEEN  
OWNER AND CONTRACTOR

Development of the Agreement between Owner and Contractor must be based on EJCDC C-520, 2013, as modified below.

- Delete paragraph 4.04 in its entirety and insert “Deleted” in its place.
- Amend Paragraph 6.02.A.1 by adding 95 to the blank.
- Amend Paragraph 6.02.A.1 by deleting the period at the end of the first sentence, replacing it with a semicolon, and by striking out the following text: “If Work has been 50 percent completed as determined by the Engineer, and if the character and progress of the Work have been satisfactory to Owner and Engineer, then as long as the character and progress of work remain satisfactory to the Owner and Engineer, there will be no additional retainage.”
- Amend paragraph 6.02.B by inserting “of the entire construction to be provided under the Contract Documents” after “Substantial Completion.”

## ENGINEER'S DEVELOPMENT OF SUPPLEMENTARY CONDITIONS

The Engineer will develop Supplementary Conditions using the guidelines from the Guide to Preparation of Supplementary Conditions (EJCDC C-800, 2013), instructions provided in the Bulletin, and by adding other project-specific supplementary conditions as required for the project.

The Supplementary Conditions document that is developed for a specific Project is the contractual means by which the Standard General Conditions (EJCDC C-700, 2013) are modified and supplemented for the Project. The references in the Supplementary Conditions items below (and in EJCDC C-800 as published) to adding, amending, or supplementing, are referring to the paragraph of C-700. Thus the first items below, SC 1.01.A.8, is a contractual provision that adds to the stated language ("The Change Order form used etc.") to Paragraph 1.01.A.8 of C-700.

As in C-800 itself, the actual Supplementary Conditions (contract terms) are shown in bold, as modified below. Also included below are few Guidance Notes to assist in development of the Project-specific Supplementary Conditions document. The Guidance Notes are not in bold.

The Supplementary Conditions items that follow are mandatory for each specific Project, unless noted otherwise. In most cases they are new supplemental (ASC) items; in a few cases, they replace or expand on a Supplementary Condition item that is in EJCDC C-800, as published.

In addition to including the items that follow in the Supplementary Conditions document for the specific Project, the Engineer (in cooperation with the Owner) should also follow the guidance of EJCDC C-800, as published, to develop other SC items for inclusion in the Project-specific Supplementary Conditions document; as the published guidance indicates, some of the published SC items are mandatory, or require additional Project-specific input, such as insurance coverage limits. Other SC items in C-800 as published are optional but in many cases will be useful for the specific Project.

Include the following RUS-mandated Supplementary Conditions (or follow the Guidance Notes provided) in the Supplementary Conditions document for the specific Project:

- SC 1.01.A.3 Add the following at the end of the last sentence of Paragraph 1.01.A.3

**The Application for Payment form to be used on this project is EJCDC C-620 (2013), or RD Form 1924-18.**

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

**The Change Order form to be used on this Project is EJCDC C-941 or RD Form 1924-7. Agency approval is required before Change Orders are effective or eligible for payment.**

- SC 1.01.A.48 Add the following language at the end of the last sentence of Paragraph 1.01.A.

**A work Change Directive cannot change Contract Price or Contract Times without a subsequent Change Order.**

- SC 1.01.A.49 Add the following new Paragraph

**Abnormal Weather Conditions- Conditions of extreme or unusual weather for a given region, elevation, or season as determined by Engineer. Extreme or unusual weather that is typical for a given region, elevation, or season should not be considered Abnormal Weather Conditions.**

- SC 1.01.A.50 Add the following new Paragraph after Paragraph 1.01.A.49

**Agency- The Project is financed in whole or in part by USDA Rural Utilities Services pursuant to the Consolidated Farm and Rural Development Act (7 USC Section 1921 et seq.). The Rural Utilities Service programs are administered through USDA Rural Development offices; therefore, the Agency for these documents is USDA Rural Development.**

- SC 2.02.A Amend the first sentence of Paragraph 2.02.A to read as follows:

**Owner shall furnish the Contractor five copies of the Contract Documents (including one fully executed counterpart of the Agreement), and one copy in electronic portable document format.**

- SC 2.06.B (non-mandatory). Guidance note. **If the parties do not intend to develop electronic or digital transmittal protocols, then Paragraph 2.06.B of the General Conditions may be deleted. Use the following Supplementary Condition in such case:**

SC 2.06.B Delete Paragraph 2.06.B and replace it with the term **[deleted]**

Guidance note continued: If the use of electronic data, electronic media, or electronic project monitoring in planned for this Project, then the parties may develop a protocol with the assistance of the Engineer or Consensus DOCS form 200.2 may be added to the Construction Contract as an Exhibit. If Consensus DOCS form 200.2 will be used, then include the following Supplementary Condition:

SC 2.06.B Add the following language to the end of 2.06.B:

**Special requirements for electronic data apply to this Project. See attached Exhibit entitled “Electronic Communications Protocol Addendum,” Consensus DOCS form 200.2.**

- SC 4.01.A Amend the last sentence of Paragraph 4.01.A by striking out the following words:

**In no event will the Contract Times commence run later than the ninetieth day after the day of Bid opening or the thirtieth day of the Effective Date of the Contract, whichever is earlier.**

- SC 5.03 Guidance Note: Amend Paragraph 5.03 using one of the suggested Paragraphs in SC 5.03 in EJCDC C-800, concerning reports and drawings of conditions at the Site, and any Technical Data in the reports and drawings on whose accuracy the Contractor may rely.
- SC 5.06 Guidance Note. Amend Paragraph 5.06 using one of the suggested Paragraphs SC 5.06 from ECJDC C-800, concerning reports and drawings regarding Hazardous Environmental Conditions at the Site, and any Technical Data in those reports and drawings on whose accuracy the Contractor may rely.
- SC 6.03 Guidance Note: Amend paragraph 6.03 identifying specific insurance coverage requirements using guidance from EJCDC C-800.
- SC 7.04 Amend the third sentence of Paragraph 7.04.A by striking out the following words:

**Unless the specifications or description contains or is followed by words reading that no like, equivalent, or “an-equal” item is permitted.**

- SC 7.04.A.1 Amend the last sentence of Paragraph a.3 by striking out “**and**”, and adding a period at the end of the paragraph.
- SC 7.04.A.1 Delete paragraph 7.04.A.1.a.4 and insert “**Deleted**” in its place
- SC 7.06.A Amend Paragraph 7.06A by adding the following text at the end of the Paragraph:  
“**The Contractor shall not award work valued at more than fifty percent of the Contract Price to Subcontractor(s).**”
- SC 7.06.B *Note to user: If GC 7.06B is applicable to this construction contract, SC 7.06B should be added to read:* Amend paragraph 7.06B by adding the following text at the end of the paragraph. “ , in accordance with ITB 12.01, ITB 23, and Article 2.2 of the Bid Form.”
- SC 7.06.E Amend the second sentence of Paragraph 7.06E by striking out “**Owner may also require Contractor to retain specific replacements provided, however, that**”
- SC 7.09 Delete paragraph 7.09 and insert “**Deleted**” in its place.
- SC 10.03 Guidance Note: **Amend Paragraph 10.03 using one of the two alternatives presented in C-800’s section 10.03. (Either the Engineer will provide the RPR services or the Project, with specific authority and responsibilities, or Engineer will not provide RPR services).**

- SC 11.07C Add the following new Paragraph after Paragraph 11.07B.

**All Contract Change Orders must be concurred by Agency before they are effective or can be eligible for reimbursement.**

- SC 13.02.C Delete Paragraph 13.02.C and insert “**Deleted**” in its place.
- SC 15.01.B Amend the second sentence of Paragraph 15.01B by striking out the following text: “**a bill of sale, invoice, or other.**”
- SC 15.01.B.3 Add the following language at the end of paragraph 15.01.B.3:

**No payments will be made that would deplete the retainage, place in escrow any funds that are required for retainage, or invest the retainage for the benefit of the Contractor.**

- SC 15.01.B.4 Add the following new Paragraph after Paragraph 15.01.B.3:

**The Application for Payment form to be used on the Project is EJCDC C-620 or Form RD 1924-18, unless another form is agreed upon by the Engineer, Owner, and Agency. The Agency must approve all Applications for Payment before payment is made.**

- SC 15.01.D.1 Delete Paragraph 15.01.D.1 in its entirety and insert the following in its place:

**The Application for Payment with Engineer’s recommendation 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 and payable twenty (20) days after the Application for Payment if presented to the Owner, and the Owner will make payment to the Contractor.**



- SC 15.02.A Amend paragraph 15.02.A by striking out the following text: “no later than seven days after the time of payment by Owner” and insert “no later than the time of payment by Owner.”
- SC 18.09 Add the following new paragraph after Paragraph 18.08:

**Tribal Sovereignty: No provision of this Agreement will be construed 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.**

- SC 19 Add Article 19 titled “**FEDERAL REQUIREMENTS**”
- SC 19.01 Add the following language as Paragraph 19.01 with the title “**Agency not a Party**”
  - A. **This Contract is expected to be funded in part with funds provided by Agency. Neither Agency, nor any of its departments, entities, or employees is a party to this Contract.**
- SC 19.02 Add the following sections after Article 19.01 with the title “**Contract Approval**”:
  - A. **Owner and Contractor will furnish Owner’s attorney such evidence as required so that the Owner’s attorney can complete and execute the following “Certificate of Owner’s Attorney” (Exhibit F) before Owner submits the executed Contract Documents to Agency for approval.**
  - B. **Guidance Note: Amend Paragraph 10.03 using one of the two alternatives presented in C-800’s section 10.03 (Either the Engineer will provide RPR services on the Project, with specific authority and responsibilities, or Engineer will not provide RPR services).**
- SC 19.03 Add the following language after Article 19.02B with the title “**Conflict of Interest & Gratuities**”:

**Contractor may not knowingly contract with a supplier or manufacturer if the individual or entity who prepared the plans and specifications has a corporate or financial affiliation with the supplier or manufacturer. Owner’s officers, employees, or agents shall not engage in the award or administration of this Contract if a conflict of interest, real or apparent, would be involved. Such a conflict would arise when: (i) the employee, officer or agent; (ii) any member of their immediate family; (iii) their partner or (iv) an organization that employs, or it about to employ, any of the above, has a financial interest in Contractor. Owner’s officers, employees, or agents shall neither solicit nor accept gratuities, favors or anything of monetary value from Contractor or Subcontractor.**
- SC 19.04 Add the following language after Article 19.03.A with “**Gratuities**”;
  - A. **If Owner finds after a notice and hearing that Contractor, or any of the 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 Contract by Contractor. As a penalty, in addition to any other damages to which it may be entitled by law, owner may pursue exemplary damages in an amount (as determined by Owner) which shall not be less than three nor more than ten times the costs Contractor incurs in providing any such gratuities to any such officer or employee.**
- SC 19.05 Add the following language after Article 19.04.B with the title “**Small, Minority, and Women's Businesses**”:
- A. Contracting with small and minority businesses, women's business enterprises, and labor surplus area firms. If Contractor intends to let any subcontracts for a portion of the work, Contractor must 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 must include**
- (1) Placing qualified small minority and women’s businesses on solicitation lists;**
  - (2) Assuring that small, minority and women’s businesses are solicited whenever they are potential sources;**
  - (3) Dividing total requirements, when economically feasible, into small tasks or quantities to permit maximum participation of small, minority, and women’s businesses;**
  - (4) Establishing delivery schedules, where the requirement permits, which encourage participation by small and minority businesses, women's business enterprises;**
  - (5) Using the services and assistance of the Small Business Administration and the Minority Business Development Agency of the US Department of Commerce.**
- SC 19.06 Add the following language after Article 19.05.A with “**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.**
- SC 19.07 Add the following language after Article 19.06.A with “**Clean Air Act (42 USC 7401-7671q) and the Federal Pollution Control Act (33 USC 1251-1387), as amended**”;
- A. Contractor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act and the Federal Water Pollution Control Act. Violations must be reported to the Federal awarding agency and the Regional Office of the Environmental Protection Agency (EPA).**

- SC 19.08 Add the following language after Article 19.07.A with “**Equal Opportunity Requirements**”;
  - 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. 339), 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."**
  
- SC 19.09 Add the following language after Article 19.08.A with “**Byrd Anti-Lobbying Amendment (31 USC 1352)**”;
  - A. **Contractors that apply for a bid for award exceeding \$100,000 must file the required certification (RD Instruction 1940Q, 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 an agency, a member of Congress, and officer or employee of Congress, or an employee of a member of Congress in connection with obtaining the Contract if it is covered by 31 USC 1352. The Contract and every subcontractor must also disclose any lobbying with non-Federal funds that takes place in connection with obtaining Federal award. Such disclosures are forwarded from tier to tier up to the Owner. Necessary certification and disclosure forms shall be provided by Owner.**
  
- SC 19.10 Add the following language after Article 19.09.A with the title “**Environmental Requirements**”:

**When constructing a Project involving trenching and/or other related earth excavation, Contractor shall comply with the following environmental conditions:**

  - A. **Wetlands- When disposing of excess, spoil, or other construction materials on public or private property, Contractor shall not fill in or otherwise convert wetlands.**
  
  - B. **Floodplains- When disposing of excess, spoil, or other construction materials on public or private property, Contractor shall not fill in or otherwise concert 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 Soul Survey Maps.**
  
  - C. **Historic Preservation- Any excavation by Contractor that uncovers an historical or archaeological artifact or human remains shall immediately report to the Owner and a representative of Agency. Construction shall be temporarily halted pending the notification process and further directions issued by Agency after consultation with the State Historic Preservation Officer (SHPO).**

- D. Endangered Species-** Contractor shall comply with the Endangered Species Act, which provides for the protection of endangered and/or threatened species and critical habitat. Should any evidence of the presence of endangered and/or other threatened species or their critical habitat be brought to the attention of Contractor, Contractor will immediately report this evidence to Owner and representative of Agency. Construction shall be temporarily halted pending the notification process and further directions issued by Agency after consultation with the US Fish and Wildlife Service.
- E Mitigation Measures-** The following environmental mitigation measures are required on this Project: *(Insert mitigation measures here)*.
- SC 19.11 Add the following language after Article 19.10.E with “**Contract Work Hours and Safety Standards Act (40 USC 3701-3708)**”;
- A. Where applicable, for contracts awarded by Owner in excess of \$100,000 that involve employment of mechanics or laborers, the Contractor must comply with 40 USC 3702 and 3704, as supplemented by Department of Labor regulations (29 CFR part 5). Under 40 USC 3702 of the Act, the Contractor must compute the wages of every mechanic and laborer on the basis of 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 pay for all hours worked in excess of 40 hours in the work week. The requirements of 40 USC 3704 are applicable in construction 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.**
- SC 19.12 Add the following language after Article 19.11.A with the title “**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 government wide 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 other than Executive Order 12549.**
- SC 19.13 Add the following language after Article 19.12.A with the title “**Procurement of recovered materials**”:
- A. The Contractor must comply with 2 CFR Part 200.322, "Procurement of recovered materials."**

CERTIFICATE OF OWNER'S ATTORNEY AND AGENCY CONCURRENCE

CERTIFICATE OF OWNER'S ATTORNEY

PROJECT NAME: \_\_\_\_\_

CONTRACTOR NAME: \_\_\_\_\_

I, the undersigned, \_\_\_\_\_, the duly authorized and acting legal representative of \_\_\_\_\_, do hereby certify as follows: I have examined the attached Contract(s) and performance and payment bond(s) and the manner of execution thereof, and I am of the opinion that each of the aforesaid agreements is adequate and has been duly executed by the proper parties thereto acting through their duly authorized representatives; and that said representatives have full power and authority to execute said agreements on behalf of the respective parties named thereon; and that the forgoing 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 the Contract, and without liability for any payments thereunder, the Agency hereby concurs in the form, content, and execution of this Agreement.

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Agency Representative Signature

Date

---

Printed Name and Title

ENGINEER'S CERTIFICATION ON FINAL PLANS AND SPECIFICATIONS

PROJECT NAME: \_\_\_\_\_

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

If the EJCDC documents have been used, all modifications required by Kentucky Bulletin 1780-1 have been made in accordance with 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).

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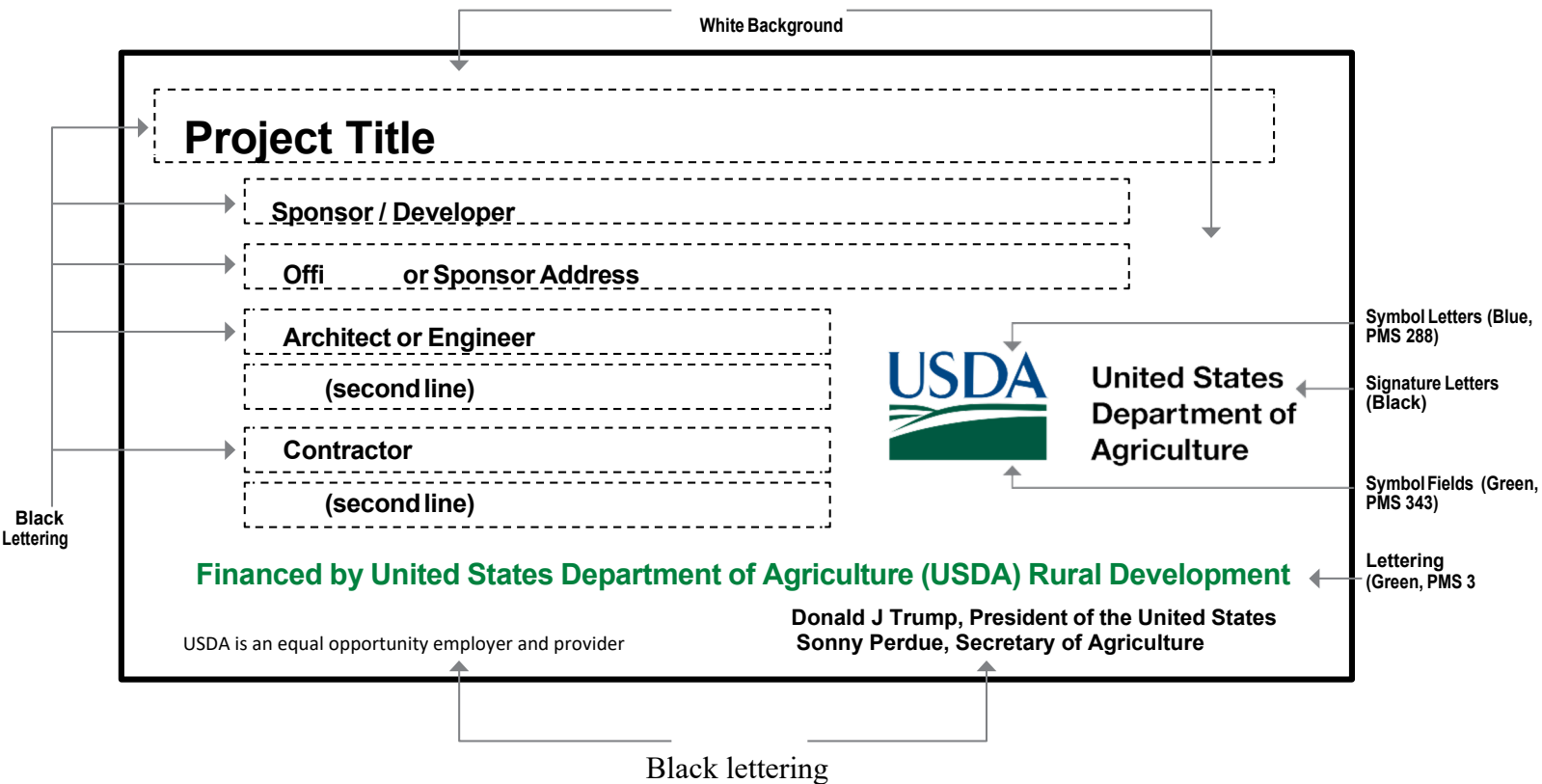
Engineer

Date

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Name and Title

## TEMPORARY CONSTRUCTION SIGN FOR RURAL DEVELOPMENT PROJECTS



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)

NOTICE OF AWARD

TO: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

PROJECT Description: \_\_\_\_\_  
\_\_\_\_\_

The OWNER has considered the BID submitted by you for the above described WORK in response to its Advertisement for Bids dated \_\_\_\_\_, 20\_\_\_\_, and Information for Bidders.

You are hereby notified that your BID has been accepted for items in the amount of \$\_\_\_\_\_.

You are required by the Information for Bidders to execute the enclosed Agreement and furnish the required CONTRACTOR'S Performance BOND, Payment BOND and certificates of insurance within fifteen (15) calendar days from the date of this Notice to you.

If you fail to execute said Agreement and to furnish said BONDS within fifteen (15) days from the date of this Notice, said OWNER will be entitled to consider all your rights arising out of the OWNER's acceptance of your BID as abandoned and as a forfeiture of your BID BOND. The OWNER will be entitled to such other rights as may be granted by law.

Within ten (10) days of your compliance of the above conditions, Owner will return to you one fully executed counterpart of the Agreement, together with any additional copies of the Contract Documents as indicated in Paragraph 2.02 of the General Conditions.

You are required to return an acknowledged copy of this NOTICE OF AWARD to the OWNER.

Dated this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_\_.

Owner: \_\_\_\_\_

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

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

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE OF AWARD is hereby acknowledged

By \_\_\_\_\_ . this the \_\_\_\_\_ day

of \_\_\_\_\_, 20\_\_\_\_\_.

Title \_\_\_\_\_



NOTICE TO PROCEED

TO: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

DATE: \_\_\_\_\_

PROJECT NAME: \_\_\_\_\_  
\_\_\_\_\_

You are hereby notified to commence WORK in accordance with the Agreement dated \_\_\_\_\_, 20\_\_\_\_, on or before \_\_\_\_\_, 20\_\_\_. In accordance with the Agreement, the date of substantial completion is \_\_\_\_\_, and the date of readiness for final payment is \_\_\_\_\_, 20 \_\_\_. **OR** , and the number of days needed to achieve readiness for final payment is \_\_\_\_\_.

Before starting work at the site, Contractor must comply with the following:  
{*Note any access limitations, security procedures, or other restrictions*}

Owner: \_\_\_\_\_

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

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

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE TO PRO-

CEED is hereby acknowledged on behalf of

\_\_\_\_\_  
(Company Name)

This, the \_\_\_\_\_ day of 20\_\_\_\_\_

By \_\_\_\_\_

Title \_\_\_\_\_

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

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

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

**EFFECTIVE DATE:** Date of approval.

**INSTRUCTIONS:** This Bulletin replaces the existing 2018 Kentucky Bulletin 1780-2.

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

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

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

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Julie Anderson  
State Engineer  
Water and Environmental Programs

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5/13/2019

Date

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1. BACKGROUND

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

2. APPLICABILITY

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

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

4. OWNER RESPONSIBILITIES:

- A. Sign loan resolutions, grant agreements and letters of intent to meet conditions which include AIS language, accepting AIS requirements in those documents and in the letter of conditions.
- B. Sign Agreement for Engineering Services, executed construction contracts and all other appropriate and necessary documents which include AIS language.
- C. Acknowledge responsibility for compliance with AIS requirements by signing change orders (i.e. C-941 of EJCDC or RD Form 1924-7) and partial payment estimates (i.e. C-602 of EJCDC or RD Form 1924-18).
- D. Obtain the certification letters from the Engineer once substantial completion has been achieved and maintain this documentation for the life of the loan.
- E. In special cases where the Owner provides its' own engineering and/or construction services, provide copies of Engineer's Certification Letter (Attachment 2) and Contractor's Certification Letter (Attachment 3) to the Agency. Manufacturer's Certification Letter (Attachment 4) must be obtained by the Owner for each AIS qualifying product. All certification letters must be kept in the Engineer's project file and on site during construction. For Owner Construction (Force Account), all AIS clauses from Section 11 must be included in the Agreement for Engineering Services.

5. ENGINEER RESPONSIBILITIES

- A. Costs of compliance with AIS should be included in the engineering fees (if appropriate) and in Engineer's opinions of probable project costs.
- B. Include AIS language (Section 11) in the Agreement for Engineering Services.
- C. Plans, specifications, bidding documents and bid addenda must include required AIS language (Section 12). For any AIS products specified by brand names, obtain a Manufacturer's Certification Letter (Attachment 4) from the manufacturer to verify the products comply with AIS.
- D. Certify that plans, specifications, and bidding documents comply with AIS and commit that bid addenda, executed contracts and change orders will comply with AIS and submit Engineer's Certification Letter (Attachment 2) to the Agency ***prior to authorization to advertise for bids.*** Include a preliminary list of those items subject to AIS for bidding purposes (Attachment 10).
- E. Provide a copy of the Manufacturer's Certification Letter (Attachment 4) on any specified brand name AIS products in the plans, specifications and bidding documents including any bid addenda to the Contractor.

- F. After award of the contract, consult with the low bidder to finalize the preliminary list of AIS items and develop a comprehensive list of all AIS components to be used in construction and electronically submit to RD State Engineer. AIS Materials List (Attachment 10) should be used to set up the master list and must be updated and submitted with each pay request.
- G. Review shop drawings and change orders to ensure compliance with AIS. For shop drawings under consideration for any brand name, equal and/or substitute, any iron and steel products subject to AIS, obtain the Manufacturer's Certification Letter (Attachment 4) from the Contractor to verify the products comply with AIS.
- H. Keep all certification letters from the Engineer, Contractor, and any AIS material manufacturer in the Engineer's project file. Provide a copy of the manufacturer's certification to the RD Engineer with each pay request that includes that AIS item. The RD Engineer will perform site AIS compliance inspections during construction. A copy of all manufacturer's letters to date that have been submitted and reviewed by RD Engineer will be used to compare the delivered and installed materials (if possible).
- I. Review AIS Materials List (Attachment 10) submitted with each pay request to verify accuracy and sign and date.
- J. For any change order under consideration for any AIS products, obtain a Manufacturer's Certification Letter (Attachment 4) from party submitting the change proposal to ensure compliance with AIS.
- K. Acknowledge responsibility for compliance with AIS requirements by signing change orders (i.e. C-941 of EJCDC or RD Form 1927-7) and partial pay estimates (i.e. C-620 of EJCDC or RD Form 1924-18).
- L. Upon substantial completion of project, obtain the Contractor's Certification Letter (Attachment 4) and a complete and final AIS Materials List (Attachment 10) to submit to the RD State Engineer. Obtain copies of any/all manufacturers' certification letters for all AIS products used in the project to be kept in the Owner's project file.
- M. Resident project representative (RPR) reports must include verification, either by picture or written statement, when an AIS item is delivered and when it is installed and was in compliance with requirements based on manufacturer's certification.

## 6. CONTRACTOR RESPONSIBILITIES

- A. Review the Engineer's AIS information, preliminary list of applicable AIS items, and all instructions prior to bid preparation.
- B. Bid submittal with a request for consideration from a proposed equal or substitute should also include a Manufacturer's Certification Letter (Attachment 4) to verify the products comply with AIS.
- C. Upon award of the contract, obtain copies of any and all manufacturers' certification letters from the Engineer for brand name products specified by the Engineer.

- D. Shop drawing submittals for proposed equals, substitutes, and any iron and steel product subject to AIS, provide a Manufacturer's Certification Letter (Attachment 4) to verify the product complies with AIS. Work with the Engineer to develop a final comprehensive list of all AIS applicable materials. AIS Materials List (Attachment 10) should be used to set up the master list and must be updated, signed, and submitted with each pay request throughout the project and accompanied by the applicable manufacturer's certification.
  - E. Prior to construction, ensure that copies of any and all manufacturers' certification letters, including those from others (e.g. Engineer, Owner, etc.), for any specified AIS products to be used in the project are in the project file on site prior to installation.
  - F. Pay request must have an updated AIS Materials List (Attachment 10) with manufacturers certification for items included on the pay request and submitted with each pay request. All columns must be filled out completely as applicable. Do not complete columns under "De Minimis Materials Only" for qualifying materials. Sign and date. An excel version that will compute all totals can be obtained from the RD State Office that can be used as a working copy.
  - G. Change orders for any AIS products must include a Manufacturer's Certification Letter (Attachment 4) to the Engineer to verify the products comply with AIS.
  - H. Acknowledge responsibility for compliance with AIS requirement by signing change orders (i.e. C-941 of EJCDC or RD Form 1924-7) and partial pay estimates (C-620 of EJCDC or RD Form 1924-18).
  - I. Keep all manufacturer certification letters (including those from the Engineer and any manufacturer providing AIS products) on site during construction in the construction project file. If a construction item is required that does not appear to meet the AIS requirements, notify the project engineer as soon as possible and do not install the item until it has been resolved.
  - J. Upon substantial completion of the project, provide Contractor's Certification Letter (Attachment 3) to the Engineer that all iron and steel products installed comply with AIS
7. MANUFACTURER, SUPPLIER, DISTRIBUTOR RESPONSIBILITIES
- A. If iron and steel products are produced in the United States as defined in this Bulletin, prepare (applicable to manufacturers and fabricators) or obtain (applicable to suppliers, distributors, vendors, etc.) Manufacturer's Certification Letters (Attachment 4) and make available upon request to Engineer, Contractor, etc.
8. RESPONSIBILITIES UNDER THE GUARANTEED LOAN PROGRAM  
AIS applies to projects funded by Section 306A- Guaranteed Loan Program
- A. Lenders are responsible to ensure that loan recipients comply with AIS requirements.
  - B. Loan recipients are ultimately responsible for compliance with AIS requirements.



9. ECWAG

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

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

- A. Article 5.01.A: Add the following "Opinions of probable cost and any revisions thereof should reflect compliance with American Iron and Steel (AIS) requirements mandated in the Consolidated Appropriations Act of 2017 and any subsequent mandating domestic preferences."
- B. Add paragraph 5.03.B: "Opinions of total project cost and any revisions thereof should reflect compliance with AIS and any subsequent statutes mandating domestic preference."
- C. Add paragraph A.1.03.A.12: "Services required to determine and certify that to the best of the Engineer's knowledge and belief that all iron and steel products referenced in engineering analysis, the plans, specifications, bidding documents, and associated bid addenda requiring design revisions are either produced in the US or are subject to approved waiver. Services required to determine to the best of the Engineer's knowledge and belief that approved substitutes, equals, and all iron and steel products proposed in the shop drawings, change orders and partial payment estimates are either produced in the US, or are subject of an approved waiver. The de minimis waiver {add project specific waivers if applicable} applies to this contract."
- D. Add paragraph A.1.04.A.10: "Provide copies of all manufacturers' certification letters to the Bidders on brand name iron and steel products along with plans, specifications and bidding documents. Manufacturers' certification letters must on the Manufacturer's Certification Letter (Attachment 4) provided and be kept in the Engineer's project file and on site during construction."
- E. Add paragraph A.1.04.A.11: "Provide copies of all manufacturers' certification letters to the Contractor on any brand name iron and steel products upon award, Including any bid addenda and change orders. Manufacturers' certification letters must be kept in the Engineer's project file for the duration of construction."
- F. Add paragraph A.1.04.A.12: "Provide a preliminary list of those items subject to AIS requirements for bidding purposes and finalize with the Contractor for tracking and submit to RD. Review the contractors AIS Materials List (Attachment 10) for accuracy each month and include in each pay request with manufacturer's certification. An excel version that will compute all totals can be obtained from the RD State Office that can be used as a working copy."

- G. Modify A.1.05.A.17: Add the following prior to the first sentence "Review and approve, or take other appropriate action, with respect to shop drawings, samples, and other required Contractor submittals to ensure compliance with AIS requirements and any subsequent statutes mandating domestic preference. Any iron and steel products included in any submittal by the Contractor, must include the Manufacturer's Certification Letter (Attachment 4) to verify the products were produced in the U.S. Copies of these letters must be kept in the Engineer's project file and on site during construction."
- H. Article A.1.05.A.18: Add the following at the end of the paragraph as amended by Kentucky Bulletin 1780-1 "Prior to approval of any substitute "or equal" obtain the Manufacturer's Certification Letter (Attachment 4) to verify the products were produced in the U.S. Manufacturers' certification letters must be kept in Engineer's project file and on site during construction to ensure compliance with AIS requirements and any subsequent statutes mandating domestic preference, if applicable."
- I. Add subparagraph A.1.05.A.19.d: "Receive and review all manufacturers' certification letters for materials required to comply with AIS and any subsequent statutes mandating domestic preference to verify the products were procured in the U.S. Manufacturers' certification letters must be kept in the Engineer's project file on site during construction."
- J. Add subparagraph (c) to the end of A.1.05.A.20: (c) Review change proposals to ensure compliance with AIS requirements and any subsequent statutes mandating domestic preference."
- K. Add item "a" as a deliverable under paragraph A.1.05.A.24.b: (s) Obtain the Contractor's Certification Letter (Attachment 3) and copies of manufacturers' certification letters for all AIS used in the project. Upon substantial completion, provide copies of Engineer's, Contractor's, and all manufacturers' certification letters to the Owner. Attach Contractor's Certification Letter(Attachment 3) and a final AIS Materials List (Attachment 10) with letter of substantial completion and submit it to the Agency."
- L. Add subparagraph B.2.02: "Owners are ultimately responsible for compliance with AIS and any subsequent statutes mandating domestic preference and will be responsible for the following:
  - 1. Signing loan resolutions, grant agreements and letter of intent to meet conditions which include AIS language, accepting AIS requirements in those documents and in the letter of conditions.
  - 2. Signing change orders (i.e. C-941 of EJDC or RD Form 1924-7) and partial pay estimates (C-620 of EJDC or RD Form 1924-18) and thereby acknowledging responsibility for compliance with AIS requirements.
  - 3. Obtaining all certification letters from the Engineer upon substantial completion of the project and maintaining this documentation for the life of the loan.

4. Where the Owner provides their own engineering and/or construction services, provide copies of Engineer's, and Contractor's certification letters to the Agency, and obtain all manufacturers' certification letters as required. All certification letters must be kept in the Engineer's project file and on-site during construction. For Owner Construction (Force Account), all clauses from Section 11 must be included in the Agreement or Engineering Services.
  5. Where the Owner directly procures AIS products, including AIS clauses in the procurement contracts and obtaining manufacturers' certification letters and providing copies to consulting engineers and contractors.
- M. Add subparagraph D.1.01.C.11.g: "(g) Maintain all manufacturers' certification letters in the project file and on site during construction to ensure compliance with AIS requirements and any subsequent statutes mandating domestic preference, as applicable."
- N. Add the following at the end of D.1.01.C.11b: Daily reports should document delivery and installation of an AIS material and verify by picture or statement on the report that the manufacturer was the same as that listed on the AIS materials list and complied with AIS requirements.
11. BIDDING AND CONSTRUCTION CONTRACT DOCUMENTS (EJCDC C-SERIES, 2013)
- A. Advertisement for Bids (C-111)

Add at the end of C-111 prior to the Owner's name: "Section 746 of Title VII of the Consolidated Appropriations Act of 2017 (Division A- Agriculture, Rural Development, Food and Drug Administration, and Related Agencies, Appropriations Act, 2017) and subsequent statutes mandating domestic preference applies to American Iron and Steel requirement to this project. All listed iron and steel products used in this project must be produced in the United States. The term "iron and steel products" means the following products made primarily of iron and steel: lines or unlined pipes and fittings, manhole covers and other municipal castings, hydrants, tanks, flanges, pipe clamps and restraints, valves, structural steel, reinforced precast concrete, and construction materials. The de minimis waiver, pig iron and nuts and bolts all apply to this contract."
  - B. Instruction to Bidders (C-200)
    1. Article 5.01.C: Delete the semicolon at the end of the article and insert the following "included but not limited to the AIS requirements as mandated and any subsequent statutes mandating domestic preference which apply to the following products made primarily of iron or steel: lined or unlined pipes and fittings, manhole covers and other municipal castings, hydrants, tanks, flanges, pipe clamps and restraints, valves, structural steel, reinforced precast concrete, and construction materials.
    2. Article 11.01: Modify article as previously amended by Kentucky Bulletin 1780-1 by inserting the following sentence after "Each such request shall comply with the requirements of Paragraphs 7.04 and 7.05 of the General Conditions. Each such request shall include the Manufacturer's Certification Letter (Attachment 4) for compliance with AIS requirements and any subsequent statutes mandating domestic preference, if applicable.

3. Article 24.03: Add paragraph 24.03 :Section 746 of Title VII Consolidated Appropriations Act of 2017 (Division A- Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act, 2017) and any subsequent statues mandating domestic preference applies an American Iron and Steel requirement to this project. All iron and steel products used in this project must be procured in the United States. "Iron and Steel Products" is defined in Section 1.b.2. The de minimis waiver {add project specific waivers as applicable} applies to this contract."
- C. Bid Form (C-410)
1. Article 3.01.C: Add language at the end of the sentence "...and including all AIS requirements.
  2. Article 7.01: Add 7.01.K "Manufacturer's Certification Letter (Attachment 4) on any approved "or equal" or substitute request to ensure compliance with AIS requirements and any subsequent statutes mandating domestic preference.
- D. Supplementary General Conditions (C-800)
1. SC 1.01.A.51: "Manufacture's Certification Letter (Attachment 4) is documentation provided by the manufacturer, supplier, distributor, vendor, fabricator, etc. to various entities stating that the AIS products to be used in the project are produced in the U.S. in accordance with the AIS requirements.
  2. SC 1.01.A.52: "AIS refers to requirements mandated by Section 746 Title VII of the Consolidated Appropriation s Act of 2017 and any subsequent statutes mandating domestic preference. "Iron and Steel Products" is defined in Section 1.b.2.
  3. SC 7.03: Add sentence "all iron and steel must meet AIS requirements.
  4. SC 7.04.B.1: "Contractor shall include the Manufacturer's Certification Letter (Attachment 4) for compliance with AIS requirements to support data, if applicable. In addition, Contractor shall maintain an updated AIS Materials List (Attachment 10), to ensure that for de minimis waiver, cost is less than 5% of total materials cost for project." An excel version that will compute all totals can be obtained from the RD State Office that can be used as a working copy.
  5. SC 7.05.A.3.a4: "4) comply with AIS by providing the Manufacturer's Certification Letter (Attachment 4), if applicable.
  6. SC 7.11.A: Modify by inserting the following after "written interpretations and clarifications, "; "Manufacturer's Certification Letter (Attachment 4) is documentation provided by the manufacturer, supplier, distributor, vendor, fabricator, etc. to various entities stating that the iron and steel products to be used in the project are produced in the U.S. in accordance with AIS requirements.
  7. SC 7.16.A.1.e: "e. obtain the Manufacturer's Certification Letter (Attachment 4) for any item in the submittal subject to AIS requirements and include the certificate in the submittal.
  8. SC 7.16.D.9: Add the following paragraph: "Engineer's review and approval of shop drawings or sample shall include review of compliance with AIS requirements, as applicable."

9. SC 7.17.E: "Contractor shall certify, upon substantial completion, that all work and materials have complied with AIS requirements as mandated and any subsequent statutes mandating domestic preference. Contractor shall provide Contractor's Certification Letter (Attachment 3) to Owner.
10. SC 10.10.A: "A: Services required to determine and certify that, to the best of the Engineer's knowledge and belief, all iron and steel products referenced in the engineering analysis, the plans, specifications, bidding documents, and associated bid addenda requiring design revisions are either produced in the U.S. or are the subject of an approved waiver. Services required to determine, to the best of the Engineer's knowledge and belief, that approved substitutes, equals, and all iron and steel products proposed in the shop drawings, change orders, and partial pay estimates are either produced in the U.S. or are the subject of an approved waiver under the Consolidate Appropriations Act of 2017.
11. SC 11.06.A.1: Modify by inserting the following sentence after "within 15 days after the submittal of the change proposal..." "Include supporting data (project name, name of manufacturer, city and state where the product was manufactured, description of product, signature of authorized manufacturer's representative) in the Manufacturer's Certification Letter (Attachment 4), as applicable."
12. SC 14.03G: Installation of materials that are non-compliant with AIS requirements shall be considered defective work.
13. SC 15.01.B.4: "4. By submitting materials for payment, Contractor is certifying that the submitted materials are compliant with AIS requirements. Manufacturers' Certification letter for Materials satisfy this certification. Refer to Manufacturer's Certification Letter provided in these Contract Documents.
15. SC 15.01.C.2d: "d. The materials presented for payment comply with AIS requirements.
14. SC 15.01.D.2: An updated AIS Materials List (Attachment 10) included in these contract documents must be dated and signed and submitted with each pay request prior to payment being authorized with any applicable manufacturer's certification. An excel version that will compute all totals can be obtained from the RD State Office that can be used as a working copy.
16. SC 15.03.A: Modify by adding the following "Services required to determine and certify that, to the best of the Contractor's knowledge and belief, all substitutes, equals, and iron and steel products proposed in the shop drawings, change orders, and partial payment estimates are produced in the U.S. or are the subject of an approved waiver. Services required to certify that, to the best of the Contractor's knowledge, all those products installed for the project are either produced in the U.S. or are the subject of an approved waiver."
17. SC19.14: Section 746 of Title VII of the Consolidated Appropriations Act of 2017 (Division A- Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act, 2017) and any subsequent statutes mandating domestic preference applies in AIS requirement to this project. All iron and steel products used in this project must be produced in the U.S. The term "iron and steel products" is defined in Section 1.b.2. The de minimis waiver, pig iron and nuts and bolts waivers apply to this contract."

18. SC 19.15: add Definitions:

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

"Certifications" means the following:

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

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

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

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

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

"De minimis incidental components" are various miscellaneous low-cost components that are essential for, but incidental to, the construction and are incorporated into the physical structure of the project. Examples of incidental components could include small washers, screws, fasteners (such as "off the shelf" nuts and bolts, miscellaneous wire, corner bead, ancillary tube, signage, trash bins, door hardware etc.

Costs for de minimis incidental components cumulatively may comprise no more than a total of five percent of the total cost of the materials used in and incorporated into a project. The cost of an individual item may not exceed one percent of the total cost of the materials used in and incorporated into a project.

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

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

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

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

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

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

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

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

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

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



For example, the cost of a fire hydrant includes:

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

Not included in the cost are:

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

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

"Project" is the total undertaking to be accomplished for the applicant by consulting under the contract is a part. A project includes all activity that an applicant is avoid AIS requirements is prohibited.

used "Reinforced Precast Concrete" may not consist of at least 50 percent iron or steel, but product must take place in the United States. The cement and other raw materials in concrete production are not required to be of domestic origin. If the reinforced

The "Steel" means an alloy that includes at least 50 percent iron between 0.02 and 2 percent purpose of enhancing properties such as corrosion resistance, hardness, or strength. definition of steel covers carbon steel, alloy steel, stainless steel, tool steel, and other

"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, and zees. Other shapes include but are not limited to, H-piles, sheet piling, tie plates,

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

## 12. PURCHASE OF EQUIPMENT AND MATERIALS

Irrespective of who purchases AIS products, owner, contractor or other parties must ensure that the products were supersede any regulation on full and open free competition stated in 7 CFR 1780.70(b) and (d) and 2 CFR Part 200.319. F

## 13. WAIVER PROCESS

### A. General

Each entity that receives financial assistance for the construction, alteration, maintenance, or

non- granting a project an exception to AIS requirements, to use iron and steel products of domestic origin specified in the waiver(s). More than one waiver could be applied to a

Any funding recipient subject to AIS requirements are eligible to apply for waivers as outlined

"A waiver may be granted by the Secretary of Agriculture or designee, if one or more of the

1. Applying the American Iron and Steel requirements of the Act would be inconsistent with
2. Iron and Steel products are not produced in the United States in sufficient and reasonably
3. Inclusion of iron and steel products produced in the United States will increase the overall

Until a waiver is granted by USDA, the AIS requirement stands except with respect to

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

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#### B. Application

To request a project specific waiver, proper and sufficient documentation must be provided by the assistance recipient (see Attachment 8).

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

To apply for a waiver under special condition two (quality or quantity), applicants and their consulting engineers must submit information outlined in Attachment 9 and 10 to the National Office (via [ESEEngineering@wdc.usda.gov](mailto:ESEEngineering@wdc.usda.gov)).

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

#### C. Timing

Waivers should be submitted prior to and no later than the submission of final plans, specifications, and bidding documents for any iron and steel products of known foreign origin. All waiver requests must be approved by the Agency prior to authorization to advertise for

bids. In the event that a waiver is requested during construction such as via change order, it must be approved by the Agency prior to installation.

#### D. Evaluation by USDA

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

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

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

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#### 14. MONITORING

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

#### 15. NON-COMPLIANCE

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

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

##### Process for Noncompliance

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

## 16. INTERNATIONAL AGREEMENTS

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

## 17. USE OF ATTACHMENTS

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

1. **AMERICAN IRON AND STEEL:** Attachment 1 is to be read by the RD Specialist at the pre-construction and signed by all parties' subject to the AIS requirements on the project. Signature of this form will serve as certification of advisement and acknowledgement of the AIS requirements.
2. **ENGINEER'S CERTIFICATION OF COMPLIANCE:** Attachment 2 consists of a letter to be completed and signed by the consulting engineer certifying that he/she will ensure that plans,

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specifications, bidding documents, and associated bid addenda, executed contracts and change orders for this project will comply with the AIS requirements. This certification letter is to be submitted to the Agency for approval **prior** to the Advertisement for Bids and must be kept in the engineer's project file and on-site during construction.

3. **GENERAL (PRIME) CONTRACTOR'S CERTIFICATION OF COMPLIANCE**  
Attachment 3 consists of a letter to be completed and signed by the general contractor certifying that he/she will ensure that all iron and steel products installed for this project, comply with the AIS requirements. This includes not only installation and/or construction by their own company, but any and all subcontractors and manufacturers their company has contracted with on this project. This certification letter is to be submitted upon substantial completion of the project to the project engineer.
4. **REQUIRED MANUFACTURER'S CERTIFICATION LETTER OF COMPLIANCE:** Attachment 4 is the certification letter to be completed and signed by the manufacturer certifying that he/she will ensure that all iron and steel products and/or materials shipped or provided for the subject project are in full compliance with the AIS requirements. This includes listing each individual item/product/material provided to the project and providing the location of this/these item(s) being manufactured, including assembly. All manufacturers' certification letters must be in this format or the format EPA provides and kept in the engineer's project file and on site during construction.
5. **EXAMPLES OF MUNICIPAL CASTINGS:** Attachment 5 provides a sample list of iron and steel products that are subject to the AIS requirements. This list is not exhaustive and is meant only

to provide examples. A unique list should be completed for each specific project/contract.

6. **EXAMPLES OF CONSTRUCTION MATERIALS:** Attachment 6 provides a sample list of construction materials that are subject to the AIS requirements. This list is not exhaustive and is meant only to provide examples.
7. **EXAMPLES OF NON-CONSTRUCTION MATERIALS:** Attachment 7 provides a sample list of items that are not subject to AIS requirements. This list is not exhaustive and is meant only to provide examples.
8. **INFORMATIONAL CHECKLIST FOR PROJECT SPECIFIC WAIVER REQUEST:** Attachment 8 is a checklist that is to be completed by the applicant and/or consulting engineer to help ensure that all appropriate and necessary information is submitted with the request to USDA. This checklist should not be used for public interest waiver. It is for informational purposes only and does not need to be included as part of the waiver application. Project specific waivers may be requested if one or more of the following conditions applies: (1) The iron and/or steel products are not produced in the United States in sufficient and reasonably available quantities and of satisfactory quality; (2) The inclusion of iron and/or steel products produced in the United States will increase the overall cost of the project by more than 25 percent. All approved waivers must be included in the bidding documents, any bid addenda, change orders, and partial estimates. All information presented in waiver requests are subject to evaluation. Waiver requests deliberately containing false information will be rejected.

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9. **EXAMPLE COST TABLE FOR A PROJECT COST WAIVER:** Attachment 9 is an example of a table that must be included with any cost-based project waiver request. Information included in the table; product reference in the specification, brief description of the product, quantity, unit, unit price and two costs of the item: (1) cost of an AIS compliant product and (2) cost of a non-domestic product. The total cost for all items will be part of the evaluation. Waiver requests deliberately containing false information in order to receive a project cost waiver will be rejected.
10. **AIS MATERIALS TRACKING:** Attachment 10 is a spreadsheet to track all AIS products, de minimis components. An updated list must be signed and dated and submitted to the Engineer by the Contractor with each pay request unless no qualifying AIS materials have been delivered on the pay request (a statement to that effect must be included on the pay request). Once reviewed for accuracy, the signed and updated list must be submitted to the Agency with each pay request. If an AIS qualifying or de minimis material is delivered more than once, a new line will be required for each delivery of that material. An excel version that will compute all totals can be obtained from the RD State Office that can be used as a working copy.

Total cost of all materials as specified in the bid tab is required to be provided on the AIS tracking sheet to calculate the De Minimis amount allowable. It can be difficult to estimate the total cost of materials that will be used throughout the entire construction project to set up the spreadsheet. With this in mind, using 50% of the total construction cost as the amount used for material costs has proven to be a fairly accurate estimate and can be used on the AIS

materials tracking sheet.

AMERICAN IRON AND STEEL COMPLIANCE STATEMENT

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

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

\_\_\_\_\_  
**RD Representative Signature**

\_\_\_\_\_  
Date

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

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

\_\_\_\_\_  
Date

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

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

\_\_\_\_\_  
Date

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

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

\_\_\_\_\_  
Date

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

**ENGINEER'S CERTIFICATION LETTER**

DATE:

RE: APPLICANT  
PROJECT NAME  
CONTRACT NUMBER

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

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

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

\_\_\_\_\_  
By Authorized Representative (Signature)

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

\_\_\_\_\_  
Title

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



**CONTRACTOR'S CERTIFICATION LETTER**

DATE:

**RE: APPLICANT  
PROJECT NAME  
CONTRACT NUMBER**

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

---

Name of Construction Company (Print)

---

By Authorized Representative (Signature)

---

Title

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

**REQUIRED FORMAT AND WORDING FOR  
MANUFACTURER'S CERTIFICATION LETTER**

Date:

Company Name:

Company Address:

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

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

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

- 1.
- 2.
- 3.

Such process for AIS took place in the following location:

---

City, State

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

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

---

Authorized Company Representative

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

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

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

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

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

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

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

Pumps  
Motors  
Gear Reducers  
Drives (including variable frequency drives (VFD's))  
Electric/pneumatic/manual accessories used to operate valves (such as electric valve actuators).  
Mixers  
Gates (e.g. sluice and slide gates)  
Motorized screens (such as traveling screens)  
Blowers/aeration equipment  
Compressors  
Meters (flow and water meters)  
Sensors  
Controls and switches  
Supervisory control data acquisition (SCADA)  
Membrane filtration systems (includes RO package plants)  
Filters  
Clarifier arms and clarifier mechanisms  
Rakes  
Grinders  
Disinfection systems  
Presses (including belt presses)  
Conveyors  
Cranes  
HVAC (excluding network)  
Water heaters  
Heat exchangers  
Generators  
Cabinetry and housing (such as electrical boxes/enclosures)  
Lighting fixtures  
Electrical conduit  
Emergency life systems  
Metal office furniture  
Shelving  
Laboratory equipment  
Analytical instrumentation  
Dewatering equipment

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Date of Issuance:

Effective Date:

Owner:

Owner's Contract No.:

Contractor:

Contractor's Project No.:

Engineer:

Engineer's Project No.:

Project:

Contract Name:

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

Description:

Attachments: *[List documents supporting change]*

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

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

Approved by Funding Agency (if applicable)

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

## SECTION 01500

### CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

#### PART 1 GENERAL

##### 1.01 SANITARY FACILITIES

- A. The CONTRACTOR shall construct and maintain, in a sanitary condition, sanitary facilities for the CONTRACTOR'S employees and also employees of the Subcontractors. The CONTRACTOR shall, at completion of the Contract Work, properly dispose of these sanitary facilities.

##### 1.02 UTILITIES

- A. The obtaining of all utilities for construction, including power and water, shall be the responsibility of the CONTRACTOR, and he shall bear the cost of all utilities used for construction. Cost of all connections and facilities for use of utilities shall be borne by the CONTRACTOR.

##### 1.03 MAINTENANCE OF SERVICE IN EXISTING UTILITIES

- A. Where the existing utilities, including in-plant process piping and plant water piping, must be disturbed during construction under this Contract, their operation and function shall be maintained by the CONTRACTOR to such a degree that service to customers will be interrupted for minimum time periods only. Such disturbances and any maintenance use of these lines shall constitute no cost to the OWNER. **The OWNER shall be notified of interruptions in sufficient time to prepare for them and shall agree to the hour, date, and duration of them before they are undertaken.**
- B. Should shutdowns in service be in excess of the time of duration agreed upon, and such excessive shutdown time be due to the CONTRACTOR's negligence, faulty Work and/or inability to perform, then and in that event, the CONTRACTOR shall be held liable to the OWNER for any and all damages that may accrue to the OWNER, by reason of such excessive shutdown periods.
- C. Digging through services with trenching machines will not be permitted. Upon damage to utility services, such services shall be repaired immediately and tested to the satisfaction of the ENGINEER. The CONTRACTOR shall notify all utility users of impending interruption of service and shall be responsible for all damage resulting from same. Payment for necessary disconnection and reconnection of utility services shall be included as a part of the CONTRACTOR'S bid and no extra compensation will be made for same.
- D. The CONTRACTOR shall at all times maintain on hand an adequate supply of repair materials and tools with which to make repair to damaged water, gas and sewer lines. Should the CONTRACTOR inadvertently damage existing utilities, he shall make immediate repair thereto and in no event shall he leave the site before such repair has been made and proven to be successful.



- E. As far as possible, the locations and sizes of existing mains are indicated on the Drawings; however, exact locations, pipe materials and sizes cannot be guaranteed. It shall be the responsibility of the CONTRACTOR to locate and uncover existing lines, to which new mains are to be connected, and provide all connecting fittings of the correct size and type for each connection. Payment for the above shall be included in the unit price bid for each item used for the connection as indicated on the Drawings or as specified.
- F. Where existing structures and equipment at the treatment plant or station are disturbed during construction under this Contract, their operation and function shall be maintained by the CONTRACTOR to such degree that the treatment process will not be impaired. Such maintenance shall constitute no extra cost to the OWNER.

#### 1.04 PROPERTY PROTECTION

- A. Care is to be exercised by the CONTRACTOR in all phases of construction, to prevent damage and/or injury to the OWNER's and/or other property. Payments for the repair and restoration are limited as set forth in "Conflict With or Damage to Underground Facilities" of the Supplementary General Conditions.
- B. The CONTRACTOR shall avoid unnecessary injury to trees and shall remove only those **authorized** to be removed by written consent of the OWNER. Fences, gates, and terrain damaged or disarranged by the CONTRACTOR's forces shall be immediately restored in their original condition or better.

#### 1.05 CONSTRUCTION WARNING SIGNS

- A. The CONTRACTOR shall provide construction warning signs for each location where he is working in the State highway right-of-way or in City streets. He will further provide flagmen as required and shall abide by all Kentucky Transportation Cabinet, Department of Highways safety rules, including size, type and placement of construction signs. All signs shall be of professional quality.

#### 1.06 RESIDENT PROJECT REPRESENTATIVE OFFICE

- A. Not required this Contract.

#### 1.07 ACCESS ROADWAYS

- A. The CONTRACTOR shall construct all access roadways needed during construction, and the planned access roadways for the completed project. The CONTRACTOR shall maintain access roadways continuously during the construction period.
- B. The CONTRACTOR shall maintain all existing roadways within the project site which are used for any purpose by his construction operations. The degree and frequency of maintenance shall be adequate to keep existing roadways in a condition at least equal to their condition prior to construction. Road maintenance shall include dust control and grading as necessary.

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#### 1.08 RESPONSIBILITY FOR TRENCH SETTLEMENT

- A. The CONTRACTOR shall be responsible for any settlement caused by the construction that occurs within 1 year after the final acceptance of this Contract by the OWNER. Repair of any damage caused by settlement shall meet the approval of the OWNER.

#### 1.09 DAMAGE TO CROPS, LIVESTOCK AND VEGETATION

- A. The CONTRACTOR shall protect crops, livestock and vegetation against damage or injury from construction operations at all times. Crops damaged or equipment access obtained outside of the easements provided shall be the responsibility of the CONTRACTOR. Temporary fences shall be provided at no extra cost to the OWNER wherever necessary to keep livestock away from the construction area. Ornamental shrubbery and tree branches shall be temporarily tied back, where appropriate, to minimize damage. Damaged limbs shall be trimmed and damaged tree trunks shall be treated with wound dressing.

#### 1.10 WASTE DISPOSAL

- A. The CONTRACTOR shall dispose of waste, including any hazardous waste, off-site in accordance with all applicable laws and regulations.

#### 1.11 CONTRACTOR'S TRAILERS AND MATERIAL STORAGE

- A. The location of the CONTRACTOR'S and Subcontractors' office and work trailers and parking areas on the project site shall be subject to the OWNER's approval.
- B. The location of the CONTRACTOR's and Subcontractors' material storage yards on the project site shall be subject to the OWNER's approval.

#### 1.12 CONSTRUCTION IDENTIFICATION SIGNS

- A. The CONTRACTOR shall furnish and erect project identification signs if such are required by the funding agency.
- B. The CONTRACTOR shall obtain the OWNER'S permission before erecting any construction signs not specifically required by the Contract.

### **PART 2 PRODUCTS**

Not used.

### **PART 3 EXECUTION**

Not used.

**END OF SECTION**

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## SECTION 01600

### SPECIAL PROVISIONS FOR MATERIAL AND EQUIPMENT

#### PART 1 GENERAL

##### 1.01 SERVICES OF MANUFACTURERS' REPRESENTATIVE AND OPERATING MANUALS

- A. Bid prices for equipment furnished under this Contract, shall include the cost of written operation and maintenance instructions and the cost of a competent representative of the manufacturers of all equipment to supervise the installation, adjustment, and testing of the equipment and to instruct the OWNER'S operating personnel and the ENGINEER'S representative on operation and maintenance. This supervision and instruction may be divided into two or more time periods as required by the installation program, and shall be scheduled at the convenience of the OWNER.
- B. Unless otherwise specified with the equipment, equipment manufacturers shall provide a minimum of 2 separate repeated training sessions for the OWNER'S staff. Each session shall be at least 2 hours in length, but not more than 4 hours. Manufacturer's agenda and schedule for the training shall be submitted to and approved by the OWNER prior to conducting the training. No training will be scheduled until the equipment has been installed, satisfactorily tested, and is ready for operation.
- C. The manufacturer's representative shall have complete knowledge of the proper installation, lubrication, operation and maintenance of the equipment provided and shall be capable of instructing the representatives of the OWNER and ENGINEER on proper startup, shutdown, online operations, lubrication and preventive maintenance of the equipment. Outlines of lesson plans and proposed training schedule shall be submitted to the ENGINEER for review 30 days prior to the desired instructional period. Specific requirements for furnishing the services of manufacturer's representatives are indicated under detailed Specifications. This work may be conducted in conjunction with Inspection and Testing, whenever possible, as provided under Part 3 of EXECUTION of detailed specification. Should difficulties in operation of the equipment arise due to the manufacturer's design or fabrication, additional services shall be provided at no cost to the OWNER.
- D. A certificate from the manufacturer stating that the installation of the equipment is satisfactory, that the unit has been satisfactorily tested, is ready for operation, and that the operating personnel have been suitably instructed in the operation, lubrication, and care of the unit shall be submitted to the ENGINEER.
- E. For equipment furnished under other Divisions, the CONTRACTOR, unless otherwise specified, shall furnish the services of accredited representatives of the manufacturer only when some evident malfunction or overheating makes such services necessary.

F. Three complete sets of operation and maintenance instructions, covering all equipment furnished under this Contract, shall be delivered directly to the ENGINEER.

1. The manual for each piece of equipment shall be a separate document with the following specific requirements:

a. Contents

Table of contents and index

Brief description of each system and components

Starting and stopping procedures

Special operating instructions

Routine maintenance procedures

Manufacturer's printed operating and maintenance instructions, parts list, illustrations, and diagrams. These shall be specific to the material supplied under the Contract, and not a manufacturer general brochure.

One copy of each wiring diagram

One final accepted copy of each shop drawing and each CONTRACTOR'S coordination and layout drawing

List of spare parts, manufacturer's price, and recommended quantity

Manufacturer's name, address, web site, and telephone number

Name, address, and telephone number of manufacturer's local representative

b. Material

Loose leaf on 60 pound, punched paper

Holes reinforced with plastic, cloth or metal

Page size, 8-1/2 inch by 11-inch

Diagrams and illustrations, attached foldouts as required

Of original quality, reproducible by dry copy method

Covers: oil, moisture, and wear resistant 9 x 12 size

c. Submittals to the ENGINEER

- (1) Two preliminary copies of manuals, no later than 15 days following final review and approval of the shop drawings, for each piece of equipment.

1.02 INSTALLATION OF EQUIPMENT

- A. Special care shall be taken to ensure proper alignment of all equipment with particular reference to the pumps, blowers and electric drives. The units shall be carefully aligned on their foundations by qualified millwrights after their sole plates have been shimmed to true alignment at the anchor bolts. The anchor bolts shall be set in place and the nuts tightened against the shims. After the foundation alignments have been reviewed by the ENGINEER, the bedplates or wing feet of the equipment shall be securely bolted in place. The alignment of equipment shall be further checked after securing to the foundations, and after conformation of all alignments, the sole plates shall be finally grouted in place. The CONTRACTOR shall be responsible for the exact alignment of equipment with associated piping, and under no circumstances, will "pipe springing" be allowed.
- B. All wedges, shims, filling pieces, keys, packing, red or white lead grout, or other materials necessary to properly align, level, and secure apparatus in place shall be furnished by the CONTRACTOR. All parts intended to be plumb or level must be proven exactly so. Any grinding necessary to bring parts to proper bearing after erection shall be done at the expense of the CONTRACTOR.

1.03 GREASE, OIL AND FUEL

- A. All grease, oil, and fuel required for testing of equipment shall be furnished with the respective equipment. The OWNER shall be furnished with a 1 year's supply of required lubricants including grease and oil of the type recommended by the manufacturer with each item of equipment supplied under this Contract.
- B. All lubricants and fuels shall be properly labeled, using an indelible marker and writing on the lubricant container or drum, specifying the type and brand name of the lubricant supplied. A Master Lubrication list must be submitted to the ENGINEER for approval clearly stating which lubricants are to be used in the various pieces of plant equipment and the quantity supplied for 1 year's use by each unit. The Master Lubrication list shall be submitted in the following format:

MASTER LUBRICATION SCHEDULE - EXAMPLE  
(for format and content example ONLY)

<b>Equipment</b>	<b>Lubricant</b>	<b>Quantity (One Years' Supply)</b>
Blower	50 weight oil, Shell XY2, or equal	6 Quarts per unit
Comminutor Drive	90 weight lubricant, Chevron Products G-66, Shell, or equal	4 Gallons per unit

1.04 TOOLS AND SPARE PARTS

- A. Any special tools (including grease guns or other lubricating devices) which may be necessary for the adjustment, operation, and maintenance of any equipment shall be furnished with the respective equipment.
- B. All spare parts shall be properly protected for long periods of storage (contained in plastic bags or cardboard containers) and labeled for easy identification without opening. The labels shall be written with an indelible marker, in the following example format:

Item: shaft sleeve

No. of units: 1

Re-order No.: ACD2614

Supplier: K&S

Supplied for: Main Aeration Blowers

1.05 MAINTENANCE AND LUBRICATION SCHEDULES

- A. The CONTRACTOR'S attention is directed to the General Conditions for all requirements relative to the submission of shop drawings for the mechanical equipment. For all mechanical and electrical equipment furnished, the CONTRACTOR shall provide a list including the equipment name, and address and telephone number of the manufacturer's representative and service company so that service and/or spare parts can be readily obtained. In addition, a maintenance and lubrication schedule for each piece of equipment shall be submitted along with shop drawings. Submission shall be in 3 copies. This schedule shall be in the form indicated below.

**TYPICAL MAINTENANCE SCHEDULE**  
(for format and content example ONLY)

<b>Item</b>	<b>Action</b>	<b>Frequency</b>	<b>Remarks</b>
CLARIFIERS: Equipment	Check removal of scum, washdown, if required; remove any debris, etc.	Daily	
	Dewater, examine structure, scrape and paint all exposed metals, examine scraping shoes.	6 mos.	Scrape and clean walls of suitable repair any damage to scraping shoes.
Sludge Collector Drive Unit	Remove shear pin, clean off rust, grease and replace	6 mos.	
Overflow Weir	Check Serviceability	Daily	

**TYPICAL LUBRICATION SCHEDULE**  
(for format and content example ONLY)

<b>Item</b>	<b>Manufacturer's Recommendations</b>	<b>Type Lubricant</b>	<b>Frequency</b>
Spur and Worm gearing	Check oil level as for oil change	See below; same	Weekly
	Change oil	75-80 NSMP Gem Oil (Winter) 80-90 NSMP Gem Oil (Summer)	6 mos.
	Flush out drives before oil change	Kendall Flushing Oil	Prior to oil change
Gear Motors*	Change oil	Kenoil 053 R&O (Winter) Kenoil 072 R&O (Summer)	2,000 hrs. or 6 mos.

\*See manufacturer's instructional manual for initial operation instructions.  
(IMPORTANT)

#### 1.06 STORAGE AND HANDLING OF EQUIPMENT

- A. Special attention shall be given to the storage and handling of equipment. As a minimum, the procedure outlined below shall be followed:
1. Equipment shall not be shipped until all pertinent shop drawings are reviewed by the ENGINEER.
  2. All equipment having moving parts such as gears, electric motors, etc., and/or instruments shall be properly stored until such time as the equipment is to be installed.
  3. All equipment shall be stored fully lubricated with oil, grease, etc. unless otherwise instructed by the manufacturer.
  4. Manufacturer's storage instructions shall be carefully studied by the CONTRACTOR and reviewed with the ENGINEER. These instructions shall be followed and a written record of this kept by the CONTRACTOR.
  5. Moving parts shall be rotated a minimum of once weekly to ensure proper lubrication and to avoid metal-to-metal "welding." Upon installation of the equipment, the CONTRACTOR shall start the equipment, at least half load, once weekly for an adequate period of time to ensure that the equipment does not deteriorate from lack of use.
  6. Lubricants shall be changed upon completion of installation and as frequently as required thereafter during the period between installation and acceptance. New lubricants shall be put into the equipment at the time of acceptance.
  7. Prior to acceptance of the equipment, the CONTRACTOR shall have the manufacturer inspect the equipment and certify in writing that its condition has not been detrimentally affected by the long storage period. Such certifications by the manufacturer shall be deemed to mean that the equipment is judged by the manufacturer to be in a condition equal to that of equipment that has been shipped, installed, tested and accepted in a minimum time period. As such, the manufacturer will guarantee the equipment equally in both instances. If such a written certification is not given, the equipment shall be judged to be defective. It shall be removed and replaced at the CONTRACTOR'S expense.
- B. The OWNER reserves the right to withhold payment for any materials improperly stored and maintained.

#### 1.07 PARTIAL UTILIZATION

- A. During the course of construction partial occupation and utilization of completed portions of the work may be required.
- B. When deemed necessary, the OWNER or the CONTRACTOR may request use of completed work.



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C. Partial utilization shall be practiced in accordance with the General Conditions.

#### 1.08 EQUIPMENT WARRANTY

A. The CONTRACTOR shall provide the OWNER a minimum 1 year warranty on all equipment, or a warranty of the length as is specified in the specific equipment section of the Specifications, in accordance with the General Conditions, Section 00700, Articles 13.06 through 13.09. The warranty period for each item of equipment shall be a minimum of 1 year, or as specified otherwise, from the date of the OWNER'S acceptance of the equipment item.

#### 1.09 ADJUSTMENTS AND CORRECTIONS OF EQUIPMENT AND APPURTENANCES DURING OPERATION

A. Some items of functional nature included in this Contract cannot be tested as to performance and quality at the time of completion of their installation. They must wait for necessary testing and proper performance until such functions are possible during later portions of this Contract. Such testing, specified performance and proper instructions to the OWNER's operators (as to their maintenance and operation) is deemed a portion of this Contract, and payment shall be retained by the OWNER for equipment delivered to the site and for Work completed to cover such service. Such service replacements and performance shall take precedence over expiration of the 1 year guarantee period.

B. The CONTRACTOR shall expedite the completion of such service by all Suppliers and Subcontractors and shall render competent supervision of such service. The CONTRACTOR shall also expedite the replacement of defective and unaccepted parts and equipment. Unnecessary delay in delivery and installation of corrective parts and equipment may constitute damage to the OWNER for which the CONTRACTOR can be held liable.

**END OF SECTION**

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**SECTION 02050**  
**SELECTIVE DEMOLITION**

**PART 1 GENERAL**

**1.01 SCOPE OF WORK**

- A. Furnish all labor, materials, equipment, and incidentals required to perform all demolition and removal work as shown on the Drawings and as specified herein. All work shall be carried out in accordance with the Department of Labor regulations and per the following:
  - 1. Occupational and Health Hazards (29 CFR - Part 1910).
  - 2. Safety and Health Regulations for Construction (29 CFR - Part 1518).
  - 3. Any applicable local ordinances or codes.
- B. All materials, piping, fittings, valves and equipment resulting from the demolition shall become the property of the OWNER, unless otherwise noted on the Drawings. These materials shall be stored on the site promptly by the CONTRACTOR for the OWNER.
- C. All removal work shall be carried to the limits necessary for construction of the new work, and as specified herein.

**1.02 RELATED WORK**

- A. Removal and disposal of electrical, instrumentation, heating and ventilating, and plumbing work is included in Divisions 13, 15, and 16.

**1.03 SUBMITTALS**

**A. Demolition and Removal Plan**

- 1. The CONTRACTOR shall submit to the ENGINEER for his review and acceptance a plan for demolition and removal work, in accordance with the requirements of Section 00700. After the contract is awarded and prior to the commencement of the work, the CONTRACTOR shall meet with the ENGINEER and OWNER and discuss the demolition and removal plan. The plan shall include a schedule for disconnection of utility services and procedures for the careful removal and disposal of materials, coordination with other work in progress, and coordination with plant routine. Included in the plan must be a detailed description of the methods and equipment to be used for each operation and the sequence of operations.
  - a. Do not proceed with demolition until the ENGINEER has given written acceptance of the demolition plan.

- b. Obtain all demolition permits required, including any necessary transportation permits, and submit copies of these to the ENGINEER.
- B. The demolition and removal plan submitted for approval shall specifically describe in detail the proposed methods and sequences of implementation of demolition work to be performed in connection with facilities, processes, and systems or parts thereof, the operation of which cannot be interrupted. The CONTRACTOR shall provide and operate at his own expense any temporary equipment, connections, bypasses, or other means necessary to assure continuous operation of facilities, equipment, machinery, or systems, which in the opinion of the OWNER cannot be interrupted. Following the completion of work, any such temporary provisions shall be removed from the site to the satisfaction of the OWNER, unless otherwise directed.

#### 1.04 PROTECTION

- A. Erect barriers, fences, guardrails, enclosures, chutes, and shoring to protect personnel, structures, and utilities remaining intact.
- B. Protection of Existing Work
  - 1. Existing work to remain shall be protected from damage. Work damaged by the CONTRACTOR shall be repaired to match existing work at no additional cost to the OWNER, as directed by the ENGINEER. Provide temporary support and shoring as required for existing materials until new work is installed.
- C. Protection of Utility Lines
  - 1. Existing utility lines that are indicated or the locations of which are made known to the CONTRACTOR prior to demolition work shall be protected from damage. Damaged utility lines shall be repaired as directed by the ENGINEER at no additional cost to the OWNER.
- D. Protection of Personnel
  - 1. Where the safety of personnel is endangered in the area of removal work, barricades for traffic shall be used and advance notice shall be given to the ENGINEER prior to beginning any such work.
- E. Wherever piping is removed for disposition, adjacent pipe and headers that are to remain in service shall be blanked off or plugged and then anchored in an approved manner.
- F. Use of Saw Cuts and Pneumatic Hammers
  - 1. Saw cuts shall be used wherever applicable. Pneumatic hammers shall only be used with the approval of the ENGINEER.

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G. Use of Explosives

1. Use of explosives will not be allowed for purposes of demolition.

H. Carry out all demolition work in accordance with the accepted demolition plan and applicable permit requirements.

**PART 2 PRODUCTS**

None this Section.

**PART 3 EXECUTION**

3.01 INSPECTION

- A. Verify that the use of the facilities and related equipment to be demolished has been discontinued.
- B. Do not commence work until conditions are acceptable to the ENGINEER.

3.02 PREPARATION

- A. Perform demolition in accordance with the accepted demolition plan, and applicable permit requirements.
- B. Existing Facilities to be Removed (as applicable)
  1. Structures, Walls, Doors, and Partitions: Openings made in the existing structure shall be cut to limits indicated on Drawings to maintain structural soundness and not disturb remaining structure.
  2. Piping: Remove existing piping, valves, meters, fittings, and supports as indicated on the Drawings and terminate with permanent, non-projecting plugs or seals.
  3. Equipment: Remove existing package secondary treatment unit, pump drives, etc., as shown on Drawings.
  4. Slabs: Remove concrete pads and walks and subsurface materials to limits and depths indicated on Drawings. Remove pump bases flush with floor surface.
  5. Remove structural supports, brackets, and hangers as shown on Drawings.
  6. Remove control panels, conduits, lighting fixtures, and instrumentation as indicated on Drawings.
  7. Certain equipment, items, and materials shall be removed from their present locations and either relocated or reused as shown on Drawings.

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### 3.03 DISPOSAL

- A. Remove demolition debris immediately from site, according to Section C-800, Supplementary Conditions.
- B. Clean up the site in accordance with Section C-800, Supplementary Conditions.
  - 1. Debris and Rubbish Control: Debris and rubbish shall be removed and transported in a manner that will prevent spillage on streets or adjacent areas.
  - 2. Regulations: Comply with federal, state, and local regulations regarding hauling and disposal.

**END OF SECTION**

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02050-4

**SECTION 02110**  
**SITE CLEARING AND GRUBBING**

**PART 1 GENERAL**

1.01 WORK INCLUDED

- A. Furnish all labor and equipment required and perform all clearing, grubbing and stripping of topsoil complete as shown on the Drawings and as specified herein.

1.02 RELATED WORK

- A. Earth and rock work are included in Section 02200.

1.03 SUBMITTALS

- A. None required for this Section.

**PART 2 PRODUCTS**

None in this Section.

**PART 3 EXECUTION**

3.01 GENERAL

- A. The proposed building sites, paved areas, areas designated for ditches and channel changes, borrow pits, etc., (except any portions thereof that may be reserved) shall be cleared of all trees, timber, brush, stumps, rubbish and other debris. All this material, unless otherwise specified, shall be removed and disposed of away from the site.
- B. Open burning is not allowed.
- C. Where clearing is to be done, stumps shall be grubbed where embankments are less than 5 feet in height, where the profile indicates excavation, in all areas designated for the construction of other facilities and in borrow areas. In all other areas the stumps may be cut off even with the ground. In areas to be grubbed, all stumps and roots must be removed.
- D. No debris will be allowed to be left under or in the embankments.
- E. In felling trees near tracks, structures and wire lines, necessary precaution must be exercised in order to prevent damage to wire lines, structures, the facilities of others, or obstruct tracks.
- F. No extra payment for clearing and grubbing shall be included in the lump sum bid.

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3.02 TREES

- A. Trees (3-inch caliper and larger) shall not be disturbed by construction without written permission from the OWNER, except in those areas to be cleared. Trees disturbed by construction shall be replaced by the CONTRACTOR with same size and type at no additional cost to the OWNER.

**END OF SECTION**

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02110-2

**SECTION 02140**

**DEWATERING**

**PART 1 GENERAL**

**1.01 WORK INCLUDED**

- A. Furnish all labor and equipment required to dewater all excavations. Dewatering of all excavations shall be the responsibility of the CONTRACTOR, and no additional compensation will be allowed for same unless specifically included as a bid item.
- B. Leaking pipes and structures are to be anticipated on this project. For this reason, no additional payment will be made for dewatering associated with leakage from any existing facility.

**1.02 RELATED WORK**

- A. Earthwork is included in Section 02200.
- B. Crushed stone and DGA are included in Section 02235.

**[SPECWRITER: Delete paragraph C below unless you will have an erosion and sedimentation control specification. In that case, fill in the specification number for the draft version you plan to copy from another job.]**

- C. Erosion and sedimentation control is included in Section \_\_\_\_\_.
- D. Foundation drainage is included in Section 02713.

**1.03 SUBMITTALS**

- A. None.

**PART 2 PRODUCTS**

None in this Section.

**PART 3 EXECUTION**

**3.01 GENERAL**

- A. Dewatering equipment shall be of adequate size and quantity to assure maintaining proper conditions for installing pipe, concrete, backfill or other material or structure in the excavation. Dewatering shall include proper removal of any and all liquid, regardless of source, from the excavation and the use of all practical means available to prevent surface runoff from entering any excavation.

**END OF SECTION**

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**SECTION 02200**  
**EARTH AND ROCK WORK**

**PART 1 GENERAL**

**1.01 SCOPE OF WORK**

- A. Extent of earthwork is indicated on the Drawings.
  - 1. Preparation of subgrade for tanks, basins, building slabs, walks and pavements is included as part of this work.
  - 2. Engineered fill course for support of building or basin slabs is included as part of this work.
  - 3. Backfilling of tanks, basins, basements, and trenches within building lines is included as part of this work.
- B. Excavation for Mechanical/Electrical Work
  - 1. Excavation and backfill required in conjunction with underground mechanical and electrical utilities, and buried mechanical and electrical appurtenances is included as work of this Section.

**1.02 RELATED WORK**

- A. Dewatering is included in Section 02140.
- B. Crushed Stone and DGA is included in Section 02235.
- C. Foundation Drainage is included in Section 02713.
- D. Pressure Pipe is included in Section 02610.
- E. Sewer and Drain Pipe is included in Section 02700.
- F. Sodding and Seeding is included in Section 02930.

**1.03 QUALITY ASSURANCE**

- A. Perform excavation work in compliance with applicable requirements of governing authorities having jurisdiction.
- B. Employ, at CONTRACTOR'S expense, testing laboratory acceptable to the OWNER to perform soil testing and inspection service for quality control testing during earthwork operations.

**1.04 SUBMITTALS**

- A. Submit following reports directly to the ENGINEER from the testing services, with copy to CONTRACTOR:

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1. Test reports on borrow material.
2. Verification of each footing subgrade.
3. Field density test reports.
4. One optimum moisture-maximum density curve for each type of soil encountered.
5. Report of actual unconfined compressive strength and/or results of bearing tests on each strata tested.

1.05 JOB CONDITIONS

A. Site Information

1. Data on indicated subsurface conditions are not intended as representations or warranties of accuracy or continuity between soil borings. It is expressly understood that OWNER will not be responsible for interpretation or conclusions drawn therefrom by CONTRACTOR. Data are made available for convenience of CONTRACTOR.
2. Additional test borings and other exploratory operations may be made by CONTRACTOR at no cost to OWNER.

B. Existing Utilities

1. Prior to commencement of work, the CONTRACTOR shall locate existing underground utilities in areas of the work. If utilities are to remain in place, provide adequate means of protection during earthwork operations.

C. Use of Explosives

1. No blasting permitted.

D. Protection of Persons and Property

1. Barricade open excavations occurring as part of this work and post with warning lights.
2. Operate warning lights as recommended by authorities having jurisdiction.
3. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

## **PART 2 PRODUCTS**

### **2.01 SOIL MATERIALS**

#### **A. Definitions**

1. Satisfactory soil materials are defined as those complying with ASTM D2487-85 soil classification groups GW, GP, GM, SM, SW, SP, GC, SC, ML, and CL.
2. Unsatisfactory soil materials are defined as those complying with ASTM D2487-85 soil classification groups MH, CH, OL, OH and PT.
3. Subbase material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, crushed slag, natural or crushed sand.
4. Drainage fill: Washed, evenly graded mixture of crushed stone, or crushed or uncrushed gravel, with 100 percent passing a 1-1/2 inch sieve and not more than 5 percent passing a No. 4 sieve.
5. Backfill and fill materials: Satisfactory soil materials free of debris, waste, frozen materials, vegetable, and other deleterious matter.
6. Engineered fill: (Refer to this Section, paragraph 3.07.)

## **PART 3 EXECUTION**

### **3.01 STRIPPING AND TOPSOILING**

- A. Before excavation and grading is commenced for buildings, structures or other work described hereinafter (except pipelines and manholes) or before material is removed from borrow pits, the material meeting the topsoil specification in Section 02930 of these Specifications shall be removed from the areas affected and stockpiled.
- B. When final grading is accomplished, particularly around buildings and other structures, the topsoil shall be spread evenly over the excavated area. Rough grading above excavated areas shall have been carried approximately 6 inches below finished grade (except solid rock, where it shall be carried 12 inches below finished grade) and brought back up to grade with topsoil as set out herein.

### **3.02 EXCAVATION**

- A. Excavation includes excavation to subgrade elevations indicated including excavation of earth, rock, bricks, wood, cinders, and other debris. All excavation of materials in the lump sum portion of the work will be unclassified and no additional payment will be made regardless of type material encountered.
- B. Differing Site Conditions
  1. Refer to Section 00700, paragraph 5.04.

C. Excavation Classifications

1. All excavation is classified.

D. Unauthorized excavation consists of removal of materials beyond subgrade elevations or dimensions without specific direction of ENGINEER. Unauthorized excavation, as well as remedial work directed by ENGINEER, shall be at 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 the ENGINEER.
2. Elsewhere, backfill and compact unauthorized excavations as specified for authorized excavations of same classification.

E. Additional Excavation

1. When excavation has reached required subgrade elevations, notify the ENGINEER who will make an inspection of conditions.
  - a. If unsuitable bearing materials are encountered at required subgrade elevations, carry excavations deeper and replace excavated material as directed in writing by the ENGINEER.
  - b. Removal of unsuitable material and its replacement as directed will be paid on basis of Contract conditions relative to changes in work.

F. Stability of Excavations

1. Slope sides of excavations to comply with codes and ordinances having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated.
2. Maintain sides and slopes of excavations in safe condition until completion of backfilling.

G. Shoring and Bracing

1. Provide materials for shoring and bracing, such as sheet piling, uprights, stringers, and cross-braces, in good serviceable condition.
2. Establish requirements for trench shoring and bracing to comply with codes and authorities having jurisdiction.
3. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Carry down shoring and bracing as excavation progresses.

4. Provide permanent steel sheet piling or pressure creosoted timber sheet piling wherever subsequent removal of sheet piling might permit lateral movement of soil under adjacent structures. Cut off tops as required and leave permanently in place. In the event the OWNER directs the CONTRACTOR to leave shoring materials in place, the OWNER will reimburse the CONTRACTOR for the reasonable cost of leaving such materials in place.

H. Dewatering

1. Refer to Section 02140 for dewatering requirements.

I. Material Storage

1. Stockpile satisfactory excavated materials where directed, until required for backfill or fill. Place, grade, and shape stockpiles for proper drainage.
2. Dispose of excess soil material and waste materials as herein specified.

J. Excavation for Structures

1. Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10 feet and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, other construction, and for inspection.
2. In excavating for footings and foundations, take care not to disturb bottom of excavation. All loose material shall be removed from the excavation just before concrete reinforcement is placed. Trim bottoms to required lines and grades to leave solid base to receive other work.

K. Excavation for Pavements

1. Cut surface under pavements to comply with cross-sections, elevations, and grades as shown.

L. Trench Excavation

1. The CONTRACTOR shall include in his lump sum bid all trenching and backfill necessary for installation of all pipelines as planned and specified unless specific unit prices are set up for specific pipeline. Trenching shall include clearing and grubbing of all trash, weeds, briars, trees and stumps encountered in the trenching. The CONTRACTOR shall dispose of such material at no extra cost to the OWNER. Shrubs shall be removed, maintained and replanted in the same or adjacent location. Trenching also includes such items as railroad, street, road, sidewalk, pipe, and small creek crossings; cutting, moving or repairing damage to fences, posts, gates, and other surface structures regardless of whether shown on the Drawings.

2. All existing facilities shall be protected from danger or damage while pipelines are being constructed and backfilled, and from damage due to settlement of the backfill.
3. In the event any existing structure is damaged, repair and restoration shall be made at once and backfill shall not be replaced until this is done. Restoration and repair shall be such that the damaged structure is equal to or better than its original condition and can serve its purpose as completely as before. All such restoration and repair shall be done without extra cost to the OWNER.
4. Trenches must be dug to lines and grades shown on the Drawings. Hand trenching may be required in areas where machine trenching would result in undue damage to existing structures and facilities.
5. Excavation shall be open trenches, except where otherwise shown on the Drawings, for tunneling, boring, or jacking under structures, railroad, sidewalks and roads.
6. Sheeting and shoring of trenches shall be provided at the expense of the CONTRACTOR where necessary to protect life, property and the new or existing structures from damage or to maintain maximum permissible trench widths at top of pipe. All necessary materials, including, but not limited to, sheeting, sheet piling, trench jacks, braces, shores and stringers, shall be used to hold trench walls. Sheeting and shoring may be withdrawn as the trenches are being backfilled, after backfill has been tamped over top of the pipe at least 18 inches. If removal before backfill is completed to surface endangers adjacent structures, such as buildings, pipelines, street paving, and sidewalks, then the sheeting and shoring shall be left in place until such danger has passed, and then pulled if practical. Voids caused by sheeting withdrawal shall be backfilled and tamped. If not withdrawn, sheeting shall be cut off at least 18 inches below final surface grade, so there is no obstruction at the ground level. In the event the OWNER directs the CONTRACTOR to leave shoring materials in place, the OWNER will reimburse the CONTRACTOR for the reasonable cost of leaving such materials in place.
7. Where subgrade of trench has insufficient stability to support the pipeline and hold it to its original grade, the ENGINEER may order stabilization by various means. Exclusive of dewatering normally required for construction, and instability caused by neglect of the CONTRACTOR, the necessary stabilization shall be paid for at unit prices established in the Contract. In the event no particular bid price is applicable, then the payment for stabilization will be negotiated.
8. The location of the pipelines and their appurtenances as shown are those intended for the final construction. However, conditions may present themselves before construction on any line is started that would indicate desirable changes in location. The OWNER reserves the right to make reasonable changes in line and structure locations without extra cost, except as may be determined by extra units of materials and construction

actually involved. The OWNER is under no obligation to locate pipelines, so they may be excavated by machine.

9. Tunneling may be used at the CONTRACTOR'S option as an alternate to open-cut trenching, at no extra cost to the OWNER. The annular space between plates and excavation shall be either permanently placed pea gravel or sand, pumped grout (3 parts sand and 1 part Portland cement by volume) or other suitably installed material approved by the ENGINEER. Backfilling shall be kept close to the heading and completed after each day's work. Where grout is used for backfill, injection holes with threaded plugs shall be provided in liner plates at various levels and in sufficient number to effectively grout the void around the tunnel. A minimum of 3 grout holes shall be provided in each 8 feet of tunnel length. Grout shall be injected in the lower holes first, proceeding upward as the void is filled. Plugs shall be installed after each hole is filled and grout stops shall be provided behind plates as necessary to ensure complete filling of the void. In tunneling under buildings, the CONTRACTOR will be responsible for all damage resulting from his operations and methods of excavation and backfilling. Boring may also be used at the CONTRACTOR'S option as an alternate to tunneling or open-cut trenching, at no extra cost to the OWNER.
10. Dig trenches to the uniform width required for the particular item to be installed, sufficiently wide to provide ample working room. Provide 6-inch to 9-inch clearance on both sides of pipe or conduit.
  - a. Excavate trenches to depth indicated or required. Carry depth of trenches for piping to establish indicated flow lines and invert elevations. Keep bottoms of trenches sufficiently below finish grade to avoid freeze-ups.
  - b. Where rock is encountered, carry excavation 6 inches below required elevation and backfill with a 6-inch layer of crushed stone or gravel prior to installation of pipe.
  - c. For pipes or conduit 4 inches or smaller in nominal size, excavate to subbase depth indicated or, if not otherwise indicated, to 4 inches below bottom of work to be supported.
  - d. For pipes or conduit 6 inches or larger in nominal size, tanks, and other mechanical/electrical work indicated to receive subbase, excavate to subbase depth indicated or, if not otherwise indicated, to 6 inches below bottom of work to be supported.
  - e. Except as otherwise indicated, excavation for exterior water-bearing piping (water, steam, condensate, drainage) so top of piping is no less than 2 feet 6 inches below finish grade.
  - f. Grade bottoms of trenches as indicated, notching under pipe bells to provide solid bearing for entire body of pipe.

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- g. Backfill trenches with concrete where trench excavations pass within 18 inches of column or wall footings and which are carried below bottom of such footings, or which pass under wall footings. Place concrete to level of bottom of adjacent footing.
- h. Do not backfill trenches until tests and inspections have been made and backfilling authorized by the ENGINEER. Use care in backfilling to avoid damage or displacement of pipe systems.
- i. For piping or conduit less than 2 feet 6 inches below surface of roadways, furnish and install steel casing pipe, minimum wall thickness of 1/4-inch, of sufficient diameter to carry the pipe or conduit to at least 2 feet beyond outside edge of pavement.

#### M. Cold Weather Protection

- 1. Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees Fahrenheit (1 degree Celsius).

### 3.03 COMPACTION

#### A. General

- 1. Control soil compaction during construction providing minimum percentage of density specified for each area classification indicated below:
  - a. Percentage of maximum density requirements: Compact soil to not less than the following percentages of maximum density for soils which exhibit a well-defined moisture density relationship (cohesive soils) determined in accordance with ASTM D698; and not less than the following percentages of relative density, determined in accordance with ASTM D4253 and D4254, for soils which will not exhibit a well-defined moisture-density relationship (cohesionless soils).
  - b. Structures, building slabs and steps, pavements: Compact top 12 inches of subgrade and each layer of backfill or fill material at 95 percent standard proctor density at +2 percent to -2 percent optimum moisture content.
  - c. Lawn or unpaved areas: Compact top 6 inches of subgrade and each layer of backfill or fill material at 90 percent standard proctor density.
  - d. Walkways: Compact top 6 inches of subgrade and each layer of backfill or fill material at 95 percent standard proctor density at +2 percent to -2 percent optimum moisture content.



B. Moisture Control

1. Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface or subgrade, or layer of soil material, to prevent free water appearing on surface during or subsequent to compaction operations.
2. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.
3. Soil material that has been removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry. Assist drying by discing, harrowing, or pulverizing until moisture content is reduced to a satisfactory value.

3.04 BACKFILL AND FILL

A. General

1. Place acceptable soil material in layers to required subgrade elevations, for each area classification listed below. Backfill material shall be no larger than the specified depth of the layer to be placed and/or compacted.
  - a. In excavations, use satisfactory excavated or borrow material.
  - b. Under grassed areas, use satisfactory excavated or borrow material.
  - c. Under walks and pavements, use subbase material, or satisfactory excavated or borrow material, or combination of both.
  - d. Under steps, use subbase material.
  - e. Under building slabs, use subbase material for a minimum depth of 6 inches.

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, dampproofing, waterproofing, and perimeter insulation.
2. Inspection, testing, approval, and recording locations of underground utilities.
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.

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5. Removal of trash and debris.
6. Permanent or temporary horizontal bracing is in place on horizontally supported walls.

#### C. Ground Surface Preparation

1. Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills. Plow, strip, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so that fill material will bond with existing surface.
2. When existing ground surface has a density less than that specified under "Compaction" for particular area classification, break up ground surface, pulverize, moisture condition to optimum moisture content, and compact to required depth and percentage of maximum density.

#### D. Placement and Compaction

1. Place backfill and fill materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers. Crushed stone shall be installed in accordance with Section 02235.
2. Before compaction, add moisture or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
3. Place backfill and fill materials evenly adjacent to structures, piping, or conduit to required elevations. Take care to 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. Backfilling Trenches

1. Refer to Section 02610 or Section 02700 as appropriate for trench backfill requirements.

### 3.05 GRADING

#### A. General

1. Uniformly grade areas within limits of grading under this Section, including adjacent transition areas. 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

1. All materials used for backfill around structures shall be of a quality acceptable to the ENGINEER and shall be free from large or frozen lumps, wood and other extraneous material. All spaces excavated and not occupied by footings, foundations, walls or other permanent work shall be refilled with earth up to the surface of the surrounding ground, unless otherwise specified, with sufficient allowance for settlement.
2. In making the fills and terraces around the structures, the fill shall be placed in layers not exceeding 12 inches in depth and shall be kept smooth as the work progresses. Each layer of the fill shall be rolled with an approved type roller and/or be compacted. When it is not practicable to compact sections of the fill immediately adjacent to buildings or structures by rolling, then such sections shall be thoroughly compacted by means of mechanical tamping or hand tamping as may be required by the conditions encountered.
3. All fills shall be placed so as to load structures symmetrically.
4. As set out hereinbefore, rough grading shall be held below finished grade and then the topsoil which has been stockpiled shall be evenly spread over the surface. The grading shall be brought to the levels shown on the Drawings or to the elevations established by the ENGINEER. Final dressing shall be accomplished by hand work or machine work, or a combination of these methods as may be necessary to produce a uniform and smooth finish to all parts of the regrade. The surface shall be free from clods greater than 2 inches in diameter. Excavated rock may be placed in the fills, but it shall be thoroughly covered. Rock placed in fills shall not be closer than 12 inches from finished grade.
5. Grade areas adjacent to building lines to drain away from structures and to prevent ponding.
  - a. Finish surfaces to be 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 feet 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 0.0 inch above or 1.0 inch below required subgrade elevation.
    - (3) Pavements: Shape surface of areas under pavement to line, grade, and cross-section, with finish surface not more than 0.0 inch above or 1 inch below required subgrade elevation.

C. Grading Surface of Fill Under Building Slabs

1. Grade smooth and even, free of voids, compacted as specified, and to required elevation. Provide final grades within a tolerance of 0.0 inch above or 1 inch below required subgrade elevation when tested with a 10-foot straightedge.

D. Compaction

1. After grading, compact subgrade surfaces to the depth and indicated percentage of maximum or standard proctor density for each area classification.

3.06 PAVEMENT SUBBASE COURSE

A. General

1. Subbase course consists of placing subbase material, in layers of specified thickness, over subgrade surface to support a pavement base course.

B. Grade Control

1. During construction, maintain lines and grades including crown and cross-slope of subbase course.

C. Shoulders

1. Place shoulders along edges of subbase course to prevent lateral movement. Construct shoulders of acceptable soil materials, placed in such quantity to compact to thickness of each subbase course layer. Compact and roll at least a 12-inch width of shoulder simultaneously with compacting and rolling of each layer of subbase course.

D. Placing

1. Place subbase course material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting subbase material during placement operations.
2. When a compacted subbase course is shown to be 6 inches thick or less, place material in a single layer. When shown 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 in thickness when compacted.

### 3.07 BUILDING SLAB ENGINEERED FILL COURSE

#### A. General

1. Engineered fill course consists of placement of crushed stone of size and type shown on Drawings, in layers of indicated thickness, over subgrade surface to support concrete building slabs.

#### B. Placing

1. Place fill material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting material during placement operations.
2. When a compacted course is shown to be 6 inches or less, place material in a single layer. When shown 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 in thickness when compacted.

### 3.08 FIELD QUALITY CONTROL

#### A. Quality Control Testing During Construction

1. Allow testing service to inspect and report to the ENGINEER on findings and approve subgrades and fill layers before further construction work is performed. A minimum of 3 tests per layer shall be performed on compacted soil fill. The placement of rock for the purpose of structure fill shall be observed and approved by testing service.
2. Perform field density tests in accordance with ASTM D1556 (sand cone method), ASTM D2167-84 (rubber balloon method), or ASTM D2992-87 (nuclear density method), as applicable.
3. Footing subgrade: For each strata of soil on which footings will be placed, conduct at least one test to verify required design bearing capacities. Subsequent verification and approval of each footing subgrade may be based on a visual comparison of each subgrade with related tested strata, when acceptable to ENGINEER.
4. Paved areas and building slab subgrade: Make at least one field density test of subgrade for every 2,000 square feet of paved area or building slab, but in no case less than 3 tests. In each compacted fill layer, make one field density test for every 2,000 square feet of overlaying building slab or paved area, but in no case less than three tests.
5. Foundation wall backfill: Take at least 2 field density tests, at locations and elevations as directed.

- B. If in opinion of the ENGINEER, based on testing service reports and inspection, subgrade or fills which have been placed are below specified density, provide additional compaction and testing at no additional cost to the OWNER.

### 3.09 MAINTENANCE

#### A. Protection of Graded Areas

1. Protect newly graded areas from traffic and erosion. Keep free of trash and debris. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.

#### B. Reconditioning Compacted Areas

1. 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.

#### C. Settling

1. 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.

### 3.10 DISPOSAL OF EXCESS NON-ORGANIC SOIL AND ROCK

#### A. General

1. The OWNER'S property as designated on the Drawings and/or specified herein shall be used for disposal of all acceptable excess excavated material, including acceptable demolition materials. The CONTRACTOR shall place and compact all acceptable excess excavated and/or demolition material at this location, with the cost of hauling, placing, compacting and covering, included in the CONTRACTOR'S lump sum bid.

#### B. Material Classification and Description

1. Acceptable fill material shall consist of all excess non-organic soil and rock available at the site. The non-organic soil and rock may be composed of earth, shale, limestone, weathered rock, waste crushed aggregate or other approved materials. Excess non-organic soil and rock shall contain no particle whose largest dimension exceeds 12 inches.

#### C. Foundation Preparation

1. The CONTRACTOR shall proof roll the fill area a minimum of 2 passes. Any soft spots found shall be removed prior to fill placement.

#### D. Placement

1. The distribution and gradation of material throughout the fill shall be such that the fill will be free from lenses, pockets, streaks or layers of material differing substantially in texture or gradation from the surround-

ing material. The combined excavation and placing operations shall be such that the materials when compacted in fill will be blended sufficiently to secure the best practicable degree of compaction and stability. Successive loads of material shall be placed on the fill so as to produce the best practicable distribution of the material.

2. The material shall not be dumped into final position but shall be distributed by blading or dozing in a manner that will ensure proper placement in the embankment so that voids, pockets and bridging will not occur.
3. No fills shall be placed upon a frozen surface, nor shall snow, ice or frozen materials be incorporated in the fill.

E. Spreading and Compacting

1. The material shall be spread in uncompacted lifts 12 to 16 inches in thickness, depending on the amount of earth, over the entire length and width of the specified area. The material shall then be compacted by a minimum of 6 passes of a smooth drum vibratory roller. The roller shall have a total static weight of not less than 20,000 pounds. The diameter of the drum shall be between 5.0 and 5.5 feet and the width between 6.0 and 6.5 feet. The frequency of vibration during operation shall be between 1,200 and 1,500 vibrations per minute and the dynamic force at 1,400 vibrations per minute shall not be less than 16,000 pounds. Rollers shall be operated at speeds not to exceed 1.5 miles per hour.

F. Earth Cover

1. The surface of the waste area shall be covered with a minimum of 12 inches of material suitable for growing grass, trees, shrubs, etc., and shall be relatively free of rocks and other debris, satisfactory to the OWNER. The material shall be placed and spread in accordance with this Specification.

**END OF SECTION**

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**SECTION 02270****GEOTEXTILES****PART 1 GENERAL**

## 1.01 SCOPE OF WORK

- A. Provide all labor, materials, equipment and services required to install geotextiles as shown on the Contract Drawings and as specified herein.

## 1.02 SUBMITTALS

- A. The CONTRACTOR shall submit to the ENGINEER in accordance with Section 00700 of the Specifications detailed material, performance and installation information on the geotextile fabric proposed for use. The ENGINEER shall review the submittal for acceptability prior to shipment of the fabric to the job site.

**PART 2 PRODUCTS**

## 2.01 MATERIAL

- A. The geotextile fabric shall consist of long chain polymeric filaments of either polyester or polypropylene formed into a stable network. Fabric shall be tear and puncture resistant and maintain the following minimum physical properties, when wet or dry, and be inert to commonly encountered chemicals in the soil.
- B. The geotextile fabric shall meet the following minimum requirements:

<b>Property</b>	<b>Requirement</b>	<b>Specification</b>
Weight	4.0± 0.5 oz./sq.yd.	---
Grab Tensile	110 lbs.	ASTM D 1682-64 (1975)
Modulus	900 lbs.	ASTM D 1682-64 (1975)
Trapezoidal Tear	40 lbs.	ASTM D 2263-68
Mildew, Rot Resistance	100%	---
Coeff. of Permeability (K)	1 x 10 <sup>-3</sup> cm/sec.	EURM-100

- C. The fabric shall be TYPAR Style 3401 as manufactured by DuPont, Wilmington, Delaware; Bidim as manufactured by Monsanto Textiles Co., St. Louis, Missouri, or equal, unless otherwise specified or shown on the Drawings.

**PART 3 EXECUTION**

## 3.01 INSTALLATION

- A. The fabric shall be installed as recommended by the manufacturer for the application specified and/or shown on the Drawings. Manufacturer's printed instructions shall be strictly followed including storage of fabric rolls; subgrade preparation to prevent puncture; unrolling and positioning fabric; installing



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loosely to allow for settlement without rupture under crushed rock and riprap fills; and fabric lap distances which shall be a minimum of 1 foot unless otherwise required.

**END OF SECTION**

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02270-2

**SECTION 02326**  
**STEEL COVER PIPE**

**PART 1 GENERAL**

1.01 SCOPE OF WORK

- A. Steel cover pipe shall be furnished and installed as shown on the Drawings and specified herein.

1.02 RELATED WORK

- A. Sewer and Drain Pipe is specified in Section 02700.
- B. Pressure pipe is specified in Section 02610.

**PART 2 PRODUCTS**

2.01 STEEL COVER PIPE

- A. Steel cover or jack pipe shall be plain end steel pipe with minimum yield strength of 35,000 psi and tensile strength of 60,000 psi per API-5L Grade B material. The steel pipe supplied shall be manufactured by the seamless, electric-weld, submerged arc weld or gas metal-arc weld process as specified in API-5L. Certification of 35,000 psi minimum yield strength shall be furnished by the supplier through the CONTRACTOR to the ENGINEER in sufficient copies before pipe is shipped to job to permit the ENGINEER to retain 3 copies.
- B. Used pipe shall be acceptable if it meets the minimum requirements for size, thickness and strength for new pipe. Supplier shall furnish through the CONTRACTOR to the ENGINEER 3 copies of certification of test results of strength tests conducted on the used pipe prior to shipment to job site. Used pipe with excessive corrosion and pitting present shall not be supplied.
- C. The inside diameter of steel cover pipe shall be at least 2 inches greater than the largest outside diameter of the carrier pipe, joints or couplings, except for carrier pipe 6 inches or greater in diameter under railroads, the difference shall be 4 inches instead of 2 inches.
- D. Cover pipe shall have a **minimum** wall thickness as shown in the following table:

Nominal Diameter Inches	Nominal Thickness Inches	Nominal Diameter Inches	Nominal Thickness Inches
Under 10	0.188	24	0.438
10 & 12	0.250	26	0.438
14 & 16	0.281	28 & 30	0.500
18	0.312	32	0.500
20	0.344	34 & 36	0.562
22	0.375	38 & 42	0.562

### PART 3 EXECUTION

#### 3.01 TUNNELING, BORING OR JACKING

- A. Boring or jacking as specified herein will be allowed at locations other than those noted on the Drawings, where advantageous to lay pipe under streets, driveways, and sidewalks, without their monolithic structure being destroyed.
- B. Tunneling under paving, railroads, buildings and underground structures is included as an alternate to boring or repaving required by open cut trenching at no extra cost to the OWNER. Bore and cover pipe is also included as an alternate to tunneling. Backfilling of tunnels shall be mechanically tamped in not more than 3 inch layers and with materials rendered suitable for tamping before being placed in tunnel unless otherwise shown on the Drawings. No payment will be made for tunnels less than 3 feet long.
- C. In tunneling under buildings, the CONTRACTOR will be held responsible for all damage by his operations and methods of excavation and backfilling. No payment will be made for tunnels less than 3 feet in length.
- D. Should the CONTRACTOR elect and receive permission to tunnel or bore, other than at locations designated on the Drawings or required by the ENGINEER to be tunneled or bored, the entire compensation therefor shall be the same as the unit prices bid for installation in open trench, including paving replacement, but not including bore or tunnel unit prices.
- E. At locations where tunneling or boring or jacking is called for on the Drawings, in addition to the unit prices for permanent tunnel, tunnel liner, temporary tunnel, boring or jacking and/or cover pipe, payment will be made for furnishing and laying sewer lines inside the tunnel or cover pipe. No payment will be made for separate trench and backfill unit price items where permanent tunnel, tunnel liner, temporary tunnel, boring or jacking and/or cover pipe unit prices are paid.
- F. Boring or jacking under highways, railroads, sidewalks, pipelines, etc., shall be done at the locations shown on the Drawings. It shall be performed by mechanical means and accurate vertical and horizontal alignment must be maintained. When shown on the Drawings, cover pipe shall be used and shall be installed inside bored holes concurrently with boring, or jacking.

### 3.02 STEEL COVER PIPE INSTALLATION

- A. Steel cover pipe shall be of the size and wall thickness as shown on the Drawings.
- B. When cover pipe is jacked, concurrent with boring, all joints shall be solidly welded. The weld shall be such that the joint shall be of such strength to withstand the forces exerted from the boring and jacking operation as well as the vertical loading imposed on the pipe after installation. The weld shall also be such that it provides a smooth, nonobstructing joint in the interior of the pipe which will allow easy installation of the carrier pipe without hanging or abrasion to the carrier pipe upon installation.
- C. When cover pipe is installed in open trench or permanent tunnel, it shall be bedded and backfilled per Specifications applying to sewer pipe in such locations. When cover pipe is installed in temporary tunnel, it shall be laid accurately to alignment of proposed sewer and at an elevation below sewer necessary to support it at the planned elevation. Bedding and backfill for cover pipe in temporary tunnel shall be per Specifications for sewer in temporary tunnel.
- D. Cover pipe in open trench, permanent tunnel and temporary tunnel shall be joined in such manner that they will not be moved out of alignment or grade and that will prevent backfill material from entering joint. Where cover pipes are shown on the Drawings to be equipped with vent pipes, vents shall be installed as shown on the Drawings with cost of same included in the price bid for the cover pipe unless otherwise specified.

### 3.03 CARRIER PIPE IN COVER PIPE INSTALLATION

#### A. Pipeline Spacers

- 1. Pipes installed inside cover pipes shall be centered throughout the length of cover pipe. Centering shall be accomplished by the installation of bolt on style spacers with a 2-piece solid shell made from T-304 stainless steel of a minimum 14 gauge thickness. The shell shall be lined with a ribbed PVC sheet of a 0.090 inch thickness that overlaps the edges. Runners, made from UHMW polymer, shall be attached to the pipe in such a manner as to prevent the dislodgement of the spacers as the carrier pipe is pulled or pushed through the cover pipe. Risers shall be made from T-304 stainless steel of a minimum 14 gauge thickness and shall be attached to the shell by MIG welding. All welds shall be fully passivated. All fasteners shall be made from T-304 stainless steel.
- 2. Spacers shall be of such dimensions to provide 1) full supportive load capacity of the pipe and contents; 2) of such thickness to allow installation and/or removal of the pipe; and 3) to allow no greater than 1/2-inch movement of the carrier pipe within the cover pipe after the carrier pipe is installed.

3. Spacers shall be located immediately behind each bell and at a maximum spacing distance as shown below unless a lesser maximum spacing distance is recommended by the pipe manufacturer:

<b>Pipeline Diameter (in.)</b>	<b>Maximum Spacing (ft.)</b>
2 to 2-1/2	4
3-8	7
10-26	10
28	9
30	8
32	7
34	6
36-38	5.5
40-44	5
46-48	4

4. The materials and spacing to be used shall be accepted by the ENGINEER prior to installation. The pipeline spacers shall be manufactured by Cascade Waterworks Manufacturing Co., of Yorkville, Illinois; Pipeline Seal and Insulator, Inc., of Houston, Texas; or equal. Installation shall be in accordance with manufacturer's recommendations.

**B. End Seals for Carrier Pipe**

1. Upon completion of installation of the carrier pipe, the annular space at the ends of the cover pipe shall be sealed to prevent the entrance of groundwater, silt, etc., into the cover pipe. The seal shall be a manufactured product specially made for this purpose. The seal shall be Link Seal, Model "C" or "L," as manufactured by the Thunderline Corporation, or equal.
2. The device (Model "C" or "L") shall have composite pressure plates and modular seals to be corrosion resistant EPDM suitable for use in water, direct ground burial, and atmospheric conditions. In areas where hydrocarbon resistant is specified, the seals shall be of nitrile and rated for the application (Model OS-316). All nuts and bolts for all models shall be 316 stainless steel (ANSI Type 316 per ASTM F695-95, 85,000 psi average tensile strength).
3. Seal sizes shall be per manufacturer's recommendations for each size of cover pipe and installed per manufacturer's recommendations to provide a watertight seal.

**END OF SECTION**

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**SECTION 02400**  
**STREETS, ROADS AND PARKING AREAS**

**PART 1 GENERAL**

1.01 SCOPE OF WORK

- A. Provide all labor, materials, equipment, and services required to construct pump station access road and parking/maintenance area as shown on the Contract Drawings and as specified herein.

1.02 RELATED WORK

- A. Crushed stone, DGA, paving and concrete are specified in other sections of Divisions 2 and 3.

1.03 SUBMITTALS

- A. Shop drawings, manufacturer's data and other items needed to establish compliance with the Drawings and these Specifications shall be submitted to the ENGINEER in accordance with Section 00700.

1.04 WARRANTY

- A. Refer to Section 00700 for general warranty requirements.
- B. Special warranty requirements are stated as follows:

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**PART 2 PRODUCTS**

2.01 CONSTRUCTION MATERIALS

- A. Concrete materials and methods of installation are specified in Section 03300.
- B. Drainage pipe and methods of installation are specified in Section 02700.
- C. Crushed stone and dense graded aggregate materials are specified in Section 02235.
- D. Geotextiles are specified in Section 02270.
- E. Bituminous paving materials and methods of placement are specified in Section 02500.
- F. Concrete paving materials and methods of placement are specified in Section 02510.
- G. Fencing materials and methods of installation are specified in Section 02830.

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H. Sodding and seeding materials and methods of construction are specified in Section 02930.

### **PART 3 EXECUTION**

#### **3.01 DELIVERY, STORAGE AND HANDLING**

##### **A. Clearing and Grubbing**

1. Clearing and grubbing requirements shall be as stated in Section 202 of KTCSSRBC except that the method of payment as stated therein shall not apply.

##### **B. Removal of Structures and Obstructions**

1. Removal of structures and obstructions requirements shall be as stated in Section 203 - KTCSSRBC.

##### **C. Roadway and Drainage Excavation**

1. The requirements for roadway and drainage excavation shall be as stated in Section 204 of KTCSSRBC.

##### **D. Borrow Excavation**

1. The requirements for borrow excavation shall be as stated in Section 205 of KTCSSRBC.

##### **E. Roadway Structure Excavation**

1. The requirements for roadway structure excavation shall be as stated in KTCSSRBC Section 206.

##### **F. Roadway Embankment**

1. The requirements for roadway embankments shall be as stated in KTCSSRBC Section 207.

##### **G. Roadway Subgrade**

1. The requirements for roadway subgrade shall be as stated in KTCSSRBC Section 208.

##### **H. Roadway Shoulders**

1. The requirements for roadway shoulder construction shall be as stated in KTCSSRBC Section 209.

##### **I. Ditching and Shouldering**

1. The requirements for ditching and shouldering shall be as stated in KTCSSRBC Section 210.

J. Final Dressing

1. The requirements for final roadway dressing shall be as stated in KTCSSRBC Section 211. Final dressing shall meet the requirements under Final Dressing - Class A.

K. Erosion Control

1. Requirements for erosion control shall be as delineated in Section 02930 - Sodding and Seeding of these Specifications. When work is located within Department of Highways rights-of-way, the requirements for erosion control shall be as delineated in KTCSSRBC - Section 212.

L. Water Pollution Control

1. The requirements for water pollution control shall be per KTCSSRBC Section 213.

M. Drainage Structures and Conduits

1. The requirements for drainage structures and conduits shall be as specified in Section 03300 - Cast-in-Place Concrete and in Section 02700 - Sewer and Drain Pipe.

N. Aggregate Surfaces and Base Courses for Paved Surface

1. The requirements for crushed stone aggregate and base courses for paved surfaces are specified in Section 02235.

O. Paved Surfaces

1. Bituminous Pavements
  - a. The requirements for bituminous paving are as shown in Section 02500 of these Specifications.
2. Concrete Pavements
  - a. The requirements for concrete pavements are as shown in Section 02510 of these Specifications.

**END OF SECTION**

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**SECTION 02500**  
**ASPHALT PAVING**

**PART 1 GENERAL**

1.01 SCOPE OF WORK

- A. The CONTRACTOR shall be required to supply all materials and equipment and perform all work for the placement of the base and surface course(s) for restoring to the preconstruction condition the surface of the existing streets, roads, drives and parking areas to the depths as shown in the detailed Drawings and as specified herein.

1.02 REFERENCES

- A. Unless noted, all Specifications designations denoted KTCSSRBC refer to the Kentucky Transportation Cabinet Department of Highways Standard Specification for Road and Bridge Construction. Appropriate technical portions of the referenced sections of the Specifications shall apply, but all work and method of payment shall be as described herein unless otherwise specified or shown on the Drawings.

1.03 RELATED WORK

- A. Special sequence or schedule requirements (if any) are specified in Section 01010 - Summary of Work.
- B. Special requirements for materials and equipment are given in Section 00700 and 01600.
- C. Crushed stone surfacing requirements, temporary and permanent replacement, are specified in Section 02235 of these Specifications.
- D. New streets, roads and parking area material and construction are specified in Section 02400.

1.04 WORK DESCRIPTION

- A. Asphalt shall be used for replacement of city streets, drives, and state highways of asphalt construction and for resurfacing existing roads and state highways at locations shown on the Drawings or specified.

1.05 QUALIFICATIONS

- A. The pavement design mixture shall be used as determined by local plant mix availability. The design mixture shall have been approved recently by the Kentucky Transportation Cabinet Department of Highways and used recently on a state paving project.
- B. The design mix shall be submitted to the ENGINEER for review and acceptance. The submittal shall include the following:

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1. The last date the mixture was approved by the Kentucky Transportation Cabinet Department of Highways for use on a state road project.
2. The location where the mixture was recently used, and the name and address of the paving contractor.

#### 1.06 SUBMITTALS

- A. Prebid submittals, when required, are specified in Section 00820 - Special Conditions of these specifications.
- B. Shop Drawings, manufacturers data and other items needed to establish compliance with the Drawings and Specifications shall be submitted to the ENGINEER in accordance with Section 00700.

#### 1.07 WARRANTY

- A. Refer to Section 01600 for warranty requirements.

### **PART 2 PRODUCTS**

#### 2.01 ASPHALT PAVING

- A. Mixture
  1. The asphaltic paving provided for use on this Contract shall conform to the applicable requirements of KTCSSRBC Section 401, Asphalt Plant Requirements; Section 402, Control and Acceptance of Asphalt Mixtures; and Section 403, Production and Placement of Asphalt Mixtures. The pavement mixture shall meet the requirements of Section 403.03.03.
- B. Fine aggregates shall meet the requirements of KTCSSRBC Section 804.
- C. Coarse aggregates shall meet the requirements of KTCSSRBC Section 805.
- D. Asphaltic materials shall meet the requirements of KTCSSRBC Section 806.
- E. Asphaltic materials for tack coat shall be one of the following: SS-1, SS-1h, CSS-1, CSS-1h, AE-60, RS-1, or CRS-1, conforming to Section 406.

### **PART 3 EXECUTION**

#### 3.01 GENERAL

- A. Construction requirements shall conform to applicable requirements of Section 403 of KTCSSRBC.
- B. A tack coat shall be required to bond new paving to the surface of concrete or brick pavements and bases or existing asphalt surfaces. It shall be applied at the rate of 0.8 pound (0.1 gallon) per square yard at the following range of application temperatures:

SS-1, SS-1h, CSS-1, CSS-1h, AE-60	70-160°F
RS-1	70-140°F
CRS-1	120-185°F

- C. When SS1, SS1h, CSS1, CSS1h, or AE60 is furnished for tack material, it shall be diluted with an equal quantity of water conforming to Section 803, shall be thoroughly mixed prior to application, and shall be applied a sufficient time in advance of the paver to ensure that all water has evaporated before the asphalt mixture is placed. The application rate shall be 0.8 pound (0.1 gallon) per square yard of the diluted SS1, SS1h, CSS1, CSS1h, or AE60.
- D. Where asphalt paving is placed against vertical surfaces such as curbs, gutters, manhole frames, valve boxes, etc., the vertical face shall be tack coated in order to seal the surface. Where these surfaces are inaccessible to pressure distributor, the tack coat may be brushed or broomed into place. The tack coat shall not be allowed to spill over onto any horizontal surface outside the area to be paved.
- E. Unless otherwise indicated on the Drawings or in these Specifications, the compacted thickness of the asphalt paving shall be a minimum of 1 inch and the minimum ambient temperature for mixing and laying temperatures shall be as follows:
 

Open Graded Friction Course	60°F
Asphalt Mixture (1-Inch Thick)	45°F
Asphalt Mixture (thicker than 1-inch)	40°F
Asphalt Mixture (Base and Binder)	35°F
Leveling and Wedging	45°F
- F. Trucks for hauling asphaltic mixtures shall have tight, clean, and smooth metal beds that have been sprayed with a minimum amount of soap emulsion, paraffin oil, or other approved material which is not detrimental to the mixture to prevent the mixture from adhering to the beds. All trucks shall be equipped with covers of sufficient size to completely cover the loaded material, and all covers shall be securely fastened in place before the truck leaves the plant. Truck beds shall be insulated, when necessary, to maintain the specified temperature to the point of delivery. Any truck causing excessive segregation of material by its spring suspension or other contributing factors, shall be discharged from the work, until such conditions are corrected.
- G. The CONTRACTOR shall have an accurate thermometer on the job at all times for verifying all temperature requirements and for taking temperature measurements whenever requested by the ENGINEER or OWNER. The CONTRACTOR shall closely control temperature and compaction requirements in order to achieve quality asphalt paving and related work.
- H. Asphalt paving which fails as the result of not meeting the requirements of these Specifications shall be removed and replaced as directed by the ENGINEER at the CONTRACTOR'S expense.
- I. Where manhole frames, valve boxes, drainage grates, etc., are located within the area to receive asphalt paving replacement, those facilities shall be adjusted to final pavement grade prior to the placement of the asphalt surface. Where the

facilities to be adjusted are the property of the OWNER, the CONTRACTOR shall adjust the facilities with the cost included in the CONTRACTOR'S bid for asphalt replacement. Where the facilities to be adjusted are the property of other utility companies, i.e., gas, water, electric, telephone, the CONTRACTOR shall notify each utility company of the schedule for repaving of the particular area to allow those companies sufficient time to adjust their facilities prior to beginning the repaving process.

- J. Where pavement striping is destroyed or damaged, it shall be replaced per the requirements stated herein. The cost of all striping, unless stated otherwise in these specifications, shall be included in the price bid for pavement replacement.
- K. Damaged or destroyed traffic control loops shall be replaced per the requirements of the traffic control operator with the cost incorporated into the CONTRACTOR'S bid for pavement replacement.

### 3.02 TRENCH WIDTH REPAVING-CITY AND COUNTY STREETS, ROADS AND PARKING AREAS

- A. The cut edges of the existing paving surface shall be trimmed a depth of at least 2 inches to straight lines for uniform appearance and clean surface at joints. The area between the cut edges of the paving shall be removed to a depth of 2 inches (minimum) or to the bottom of the existing paving. All unstable material in the trench shall be removed and replaced with compacted dense graded aggregate and dense graded aggregate added as needed to bring the base surface to the bottom of existing paving or 2 inches below the existing surface, whichever is the lower. Dense graded aggregate required for stabilizing the subgrade will be paid for as an extra, but no extra payment will be allowed for removal of unstable back-fill.
- B. The paving subgrade shall be compacted under the wheel of a roller, until there is no observed settlement of the subgrade.
- C. The sides of existing pavement shall be covered with a tack coat and asphalt paving shall be hot applied as previously described. Final surface shall be finished to 1/4-inch above existing paving surface at edges and crowned to 1/2-inch above existing surface at the center.
- D. Payment for asphalt repaving shall be per linear foot of pipeline covered to any width the CONTRACTOR shall find necessary to remove plus width of cut back to secure clean straight edges, and shall include excavation to subgrade, preparation of subgrade, cleaning edges of existing paving, tack coat, and all operations and materials planned and specified for this type of repaving. The CONTRACTOR shall maintain such repaving up to grade of existing street surface until final completion and acceptance of work under his Contract. During the guarantee period of one year, the CONTRACTOR will be responsible for defective materials or workmanship, and natural settlement.
- E. In case additional asphalt paving is to be added due to settlement, the surface which has experienced settlement shall be cut out, additional dense graded aggregate added if necessary, tack coat applied to the existing sides of existing pavement, and the paving in the settled area(s) replaced. Additional payment will not be allowed for the repair work required.

**3.03 TRENCH WIDTH REPAVING-STATE MAINTAINED STREETS AND HIGHWAYS**

- A. Streets, roads and highways maintained by the Kentucky Transportation Cabinet Department of Highways shall be repaved in accordance with details shown on the attached Department of Highways Drawing No. TD 99-13, latest revision.
- B. Concrete base slab shall be cleaned and tack coated, and asphalt paving shall be hot applied as previously described.
- C. Payment for replacement of asphalt paving on state maintained streets and roads, where concrete base slab and asphalt surface are required, shall be per foot of pipeline covered, and shall include excavation, crushed rock or flowable fill backfill, base courses, concrete base slab, tack coat, and asphalt surfacing. Widths, depths, and other details and methods of application shall be as shown on attached drawing and as required by the Kentucky Transportation Cabinet Department of Highways.
- D. The CONTRACTOR shall maintain the surface of all state highways and state maintained streets to grade during the entire guarantee period of the Contract.

**3.04 CROSSWALK MARKINGS**

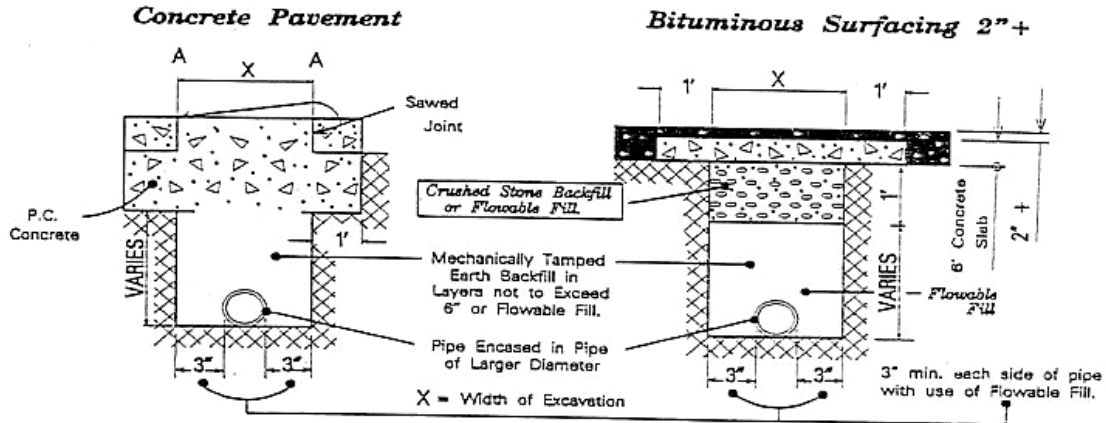
- A. Crosswalk marking shall meet the requirements Section 3B.18 of the Manual of Uniform Traffic Control Devices (MUTCD).

**END OF SECTION**

Attachment: Kentucky Department of Highways drawing No. TC 99-13.

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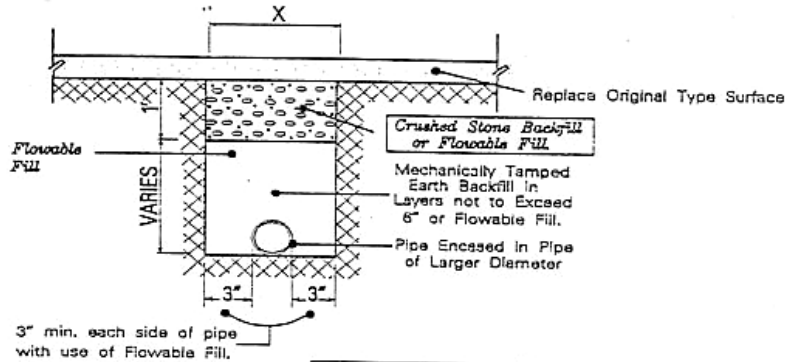
**SURFACE RESTORATION METHODS**



*Replace Concrete Pavement with new pavement same thickness of existing pavement.*

*Repace Bituminous Pavement with same type and depth as existing pavement.*

**Bituminous Surface Less Than 2" & Traffic Bound Macadam**



**NOTE:**

1. Distance From points "A" (Concrete Pavement) to nearest joint or break in pavement must be six (6) feet or more. If less than six (6) feet, remove pavement to joint or break and replace entire slab.
2. Concrete slab under Bituminous Surface to extend twelve (12) inches on each side of trench.
3. An approved joint sealer to be applied between new and existing pavement.

**KENTUCKY TRANSPORTATION CABINET**

**Department of Highways**

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Methods of Surface Restoration Due to  
Open trench Pipe Installation

**SECTION 02510**  
**CONCRETE PAVING**

**PART 1 GENERAL**

1.01 SCOPE OF WORK

- A. Provide all labor, materials, equipment and services required to construct trench-width repair of driveways as shown on the Contract Drawings and as specified herein.

1.02 RELATED WORK

- A. Special sequence or schedule requirements (if any) are specified in Section 01010 - Summary of Work.
- B. Special requirements for materials and equipment are given in Sections 00700 and 01600.
- C. Grading and drainage of streets, roads and parking areas are as specified in Section 02400.
- D. Crushed stone bases, if required, are as specified in Section 02235.
- E. Concrete drainage structures are specified in Sections 03300 and 03400.
- F. Castings are specified in Section 05540.

1.03 SUBMITTALS

- A. Prebid submittals, if required, are specified in Section 00820 - Special Conditions.
- B. Shop drawings and other items needed to establish compliance with the Drawings and these Specifications shall be submitted to the ENGINEER in accordance with Section 00700.

1.04 WARRANTY

- A. Refer to Section 00700 for warranty requirements.

**PART 2 PRODUCTS**

2.01 CONCRETE MATERIALS

- A. Concrete and related materials are specified in Section 03300.

**PART 3 EXECUTION**

3.01 CONCRETE ROADWAY PAVING

- A. Concrete surface paving shall meet the requirements of Section 501 of the Kentucky Transportation Cabinet, Department of Highways Standard Specifications for Road and Bridge Construction.

586-19-01 (10/19)

- B. Concrete base paving shall meet the requirements of Section 502 of the Kentucky Transportation Cabinet, Department of Highways Standard Specifications for Road and Bridge Construction.

**END OF SECTION**

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02510-2



## SECTION 02610

### WATER AND SEWAGE FORCE MAIN PIPE

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. For Cover Pipe and Boring and/or Jacking see Section 02326.
- B. For Tunnel Liner Plates and Tunneling see Section 02300.
- C. All pipe, fittings, and jointing materials shall be of one manufacturer unless different types are shown on the Drawings or otherwise accepted by the ENGINEER.

##### 1.02 SUBMITTALS

###### A. General

- 1. Prior to the shipment of any water and/or sewage force main piping to the project site, the CONTRACTOR shall submit to the ENGINEER a bill of materials, shop drawings, and descriptive literature for all piping, in the number of copies listed in Section 00700 of these Specifications.

###### B. Plant and Site Piping

- 1. Submit shop drawings of all interior and exterior piping.
- 2. Submit testing and certifications for interior and exterior piping.

###### C. Water Main and Sewage Force Main Projects

- 1. Shop drawings for line work are not required unless project contains pumping station, valve vault piping or similar items.
- 2. Submit descriptive literature for all piping.
- 3. Submit testing and certifications for all piping.

#### PART 2 PRODUCTS

##### 2.01 MATERIALS-WATER MAIN AND SEWAGE FORCE MAIN PIPE

###### A. Ductile Iron Pipe-Mechanical and Rubber Slip Joint Type

###### 1. Pipe

###### a. General

- (1) Ductile iron pipe shall be furnished for all piping 3 inches and over in size designated "D.I." on Drawings and shall be designed in accordance with ANSI/AWWA C150/A21.50 and

ANSI/AWWA C151/A21.51 specifications and supplements thereto.

b. Design Conditions

- (1) Pressure: Minimum 200 to 350 psi operating pressure, plus 100 psi water hammer allowance.
- (2) Trench Loading: Laying Condition Type 3, depth of cover as shown on Drawings.

c. Metal Design Strength PSI (Minimum)

Tensile Strength	60,000
Yield Strength	42,000
Percent Elongation	10

d. Minimum Nominal Thickness

- (1) Minimum design thicknesses for 200 through 350 psi operating pressures, depths of cover, trench loading and other conditions shall be per ANSI/AWWA C150/ A21.50 specifications.

e. Lengths

- (1) Pipe may be furnished in 18 or 20 foot nominal laying lengths.

f. Marking

- (1) The net weight, class or nominal thickness, and casting period shall be shown on each pipe. The manufacturer's mark, the year in which the pipe was produced, and the letters "DI" or "DUCTILE" shall be cast or stamped on the pipe.

g. Weighing

- (1) Each pipe shall be weighed before application of lining or coating other than standard coating and the weight shown on the outside or inside of the bell or spigot end.

h. Spigot End of Pipe

- (1) The spigot end of the pipe shall be free of blemishes and defects which, in the opinion of the ENGINEER, might be responsible for a poor fit with the rubber ring gasket and result in leakage.

2. Fittings

a. General

- (1) Ductile iron mechanical joint, restrained joint and fittings shall conform to ANSI/AWWA C110/A21.10 Standard for Gray Iron and Ductile Iron Fittings – 3-inch through 48-inch. Mechanical joints and push on joints shall also conform in all respects to ANSI/AWWA C111/A21.11.
- (2) Ductile iron compact fittings, meeting the requirements of ANSI/AWWA C153/A21.53, will also be accepted.
- (3) Fittings shall be 350 psi pressure rating for sizes through 24-inch and shall be 250 psi rating for sizes above 24 inches unless a higher operating pressure is shown on the Drawings, and in such cases the fitting pressure rating shall be equal to or above the operating pressure. The pressure rating for all compact fittings shall be 350 psi.
- (4) Fittings shall be ductile iron meeting the above requirements and shall be furnished complete with all joint accessories.

b. Lining and Coating

- (1) All fittings shall be lined and coated the same as adjacent pipe.

3. Joints

a. General

- (1) Pipe joints shall be mechanical joint, rubber ring slip joint or restrained joint as shown on the Drawings.
- (2) All items used for jointing pipe shall be furnished with the pipe. The joints shall be made with tools and lubricant in strict conformity with the manufacturer's instructions. Copies of the instructions shall be delivered to the ENGINEER at start of construction in sufficient numbers that will permit the ENGINEER to retain 3 copies.

b. Mechanical Joints

- (1) Mechanical joints are to be furnished according to ANSI/AWWA C111/A21.11. All pipe joints must be furnished complete with all accessories. Mechanical joint bolts and nuts shall be of alloy cast iron or alloy steel (Corten type such as U.S. Alloy) or equal. Rubber gaskets shall be made of plain first grade rubber, free of imperfections and porosity. Hardness shall be 75 X 5 durometer.

- c. Rubber Ring Slip Joint (Push On)
  - (1) Rubber ring slip joint shall be equal to ANSI/AWWA C111/A21.11. The joints shall be of the following materials and assembled in the sequence outlined below:
    - (a) Rubber ring gasket compressed in groove in bell of pipe.
    - (b) Beveled spigot end of pipe for initial centering into rubber gasket in bell.
  
- d. Restrained Joints
  - (1) For Pipe
    - (a) Restrained joint for push-on type bell with rubber O-ring shall meet the applicable requirements of ANSI/AWWA C 111/A21.11. The bell/spigot configuration for the restrained joint shall be such that restraint shall be provided for the joint based on a sustained pressure equal to the pressure class of the pipe.
    - (b) The restrained joint shall allow the same deflection as standard push-on joint pipe.
    - (c) Where field welding is required for restrained field cut pipe, the welder shall be properly instructed in the methods and materials for welding on ductile iron pipe.
  
  - (2) For Fittings
    - (a) Where restrained joint fittings are called for, the bell configuration for the fittings shall be the same as for the pipe.
    - (b) Where fittings with restrained joint bell configuration are not available, restrained materials for use with mechanical joint bell configurations shall be used as follows:
      - (i) Connect mechanical joint bell assemblies with stainless steel all-thread rods.
      - (ii) Install restraints glands on each side of the fitting. The restraining glands shall be "Meg-a-Lug," as manufactured by EBAA Iron Sales, Inc., of Eastland Texas; "Grip Ring," as manufactured by Romac Industries, Inc., of Seattle, Washington; or equal.

e. Special Gaskets

- (1) Where a water main is located within a 200-foot radius of an underground storage tank (UST), special rubber gaskets shall be provided for the water main joints.
- (2) These gaskets shall be manufactured of “nitrile rubber” material or other acceptable material possessing superior resistance to deterioration from petroleum based products.
- (3) This requirement will apply to the gaskets supplied for mechanical joints, restrained joints, and push-on joints when located within the 200-foot radius of a UST.
- (4) The cost of the special gasket shall be incorporated into the cost of the installed pipe.

4. Lining and Coating

a. Water Service

- (1) All ductile iron pipe for water service shall have manufacturer's standard outside bituminous or asphaltic base coating and a cement lining and bituminous seal coat on the inside. Cement mortar lining and bituminous seal coat inside shall conform to ANSI/AWWA C104/A21.4.

b. Sewer Force Main Service

- (1) All ductile iron pipe for sewer force main service shall be bituminous coated outside and shall be cement lined with seal coat on the inside per the above specifications.

c. Bitumastic Finish Coat

- (1) Only a coal tar outside coating, or other compatible coating, shall be applied to pipe which is to receive a bitumastic finish coat.

B. Ductile Iron Pipe-Flanged, Grooved and Special Coupling

1. Pipe

a. Flanged Pipe

- (1) Flanged pipe shall be made in accordance with ANSI/AWWA C115/A21.15 Specifications, and shall be thickness Class 53.
- (2) Where plain ends of flanged and plain end pipe fit into mechanical joint bells, centrifugally cast pipe shall be used.

b. Grooved Pipe

- (1) Where flanged ductile iron pipe is shown on the Drawings, grooved joint piping may be substituted where acceptable to the ENGINEER.
- (2) Grooved joint piping shall conform to ANSI/AWWA Specification C 606.

2. Fittings

a. Flanged Pipe

- (1) Flanged joint fittings shall conform to ANSI/AWWA C110/A21.10 Standard for Gray Iron and Ductile Iron Fittings- 3-inch through 48-inch.
- (2) Fittings shall be 250 psi pressure rating for all sizes unless a higher operating pressure is shown on the Drawings and in such cases the fitting pressure rating shall be equal to or above the operating pressure.
- (3) Fittings shall be ductile iron meeting the above requirements and shall be furnished complete with all joint accessories.

3. Joints

a. General

- (1) Pipe joints shall be as shown on the Drawings.
- (2) All items used for jointing pipe shall be furnished with the pipe. The joints shall be made with tools and lubricant in strict conformity with the manufacturer's instructions. Copies of the instructions shall be delivered to the ENGINEER at start of construction in sufficient numbers that will permit the ENGINEER to retain 3 copies.

b. Flanged Pipe

- (1) All ductile iron flanged pipe shall have flanges faced and drilled, 125 pound in accordance with ANSI/AWWA C110/A21.10 unless otherwise specified.
- (2) Flanges may be cast integrally with the pipe or they may be screwed on specially designed long hub flanges, refaced across both face of flange and end of pipe.
- (3) Flanged joints are to be furnished according to ANSI/AWWA C115/A21.15 and shall be ductile iron only. Flanged joints shall have 1/8-inch rubber full face gaskets made especially

for water pipe use. Bolts for ductile iron flanged pipe must be of standard sizes for pipe to be fitted, and must be black steel, machine bolts with heavy hexagon heads and nuts meeting ANSI B18.2.1 and ANSI B18.2.2, respectively. In unheated vaults, submerged and/or damp locations, bolts and nuts for ductile iron flanged pipe shall be stainless steel. Prior to stainless steel nuts being placed on stainless steel bolts, the bolt threads shall be coated with anti-seize.

- (4) The American Toruseal Flange Gasket Manufactured by American Cast Iron Pipe Company is an acceptable alternate to the above described gasket.

c. Grooved Pipe

- (1) Victaulic Style 31 couplings, or equal, with flush seal gaskets shall be used. Rigid cut grooves shall be used except where flexible couplings are shown on the Drawings. In such case, flexible cut grooves shall be substituted.

d. Special Coupling

- (1) Flexible couplings for flanged pipe shall be a mechanical joint cast to a special flanged joint using a neoprene O-ring in place of the usual 1/16-inch rubber ring gasket. The mechanical bell and special flanged joint piece shall be of ductile iron (ANSI/AWWA C110/A21.10) with bolt circle, bolt size and spacing conforming to ANSI/AWWA C110/A21.10 specifications. Mechanical joint follower flange shall be of ductile iron ASTM A 536 or malleable iron ASTM A 47, Grade 35018 or 32510, with high strength/weight ratio design. Bolts shall be fine grained high tensile malleable iron with malleable iron hexagon nut. Stainless steel bolts and nuts shall be used in vaults and wet wells. Where pressures may exceed 20 psi, anchor studs shall be included with spigots of pipes connected drilled to receive ends of studs.
- (2) At locations in flanged pipe where adaptors are not shown on the Drawings, the CONTRACTOR may, at his own cost and for flexibility of installation, use a coupling adapter after acceptance by the ENGINEER. In no event shall unrestrained mechanical joints or dresser type couplings be substituted for flanged joints.

4. Lining and Coating

a. Flanged Pipe

- (1) Flanged pipe for water and wastewater service shall be cement lined and bituminous coated the same as written herein for ductile iron pipe, mechanical and rubber slip joint type.

b. Grooved Pipe

- (1) Lining and coating shall be as specified for flanged pipe.

C. Polyvinyl Chloride (PVC) Pipe (AWWA)

1. Pipe

a. Distribution Mains

- (1) This Specification covers 4-inch through 12-inch PVC pressure pipe made from Class 12454-B material as defined in ASTM D1784 and conforming with the outside diameter dimensions of ductile iron pipe and with wall thicknesses of DR series 14, 18 or 25.
- (2) The pipe shall be manufactured to meet the requirements of ANSI/AWWA Specification C900 and these Specifications. It shall be furnished in the size and pressure class as shown on the Drawings, and in 20-foot lengths.
- (3) The pipe shall have an integral bell end and gasket seal which is in compliance with the requirements of ASTM D 3139 and F 477.

b. Transmission and Distribution Mains

- (1) This Specification covers 14-inch through 48-inch PVC pressure pipe made from Class 12454-B material, as defined in ASTM D1784, and conforming with the outside diameter dimensions of ductile iron pipe. Wall thicknesses shall conform to DR Series 14, 18, 21, 25 or 26 as shown on the Drawings.
- (2) The pipe shall be manufactured to meet the requirements of ANSI/AWWA Specification C905 and these specifications. It shall be furnished in 20-foot lengths in the size and pressure class as shown on the Drawings.
- (3) The pipe shall have an integral bell end and gasket seal which is in compliance with the requirements of ASTM D3139 and F477.



- c. The marking of each piece shall include:
  - (1) Nominal size and O.D. base.
  - (2) PVC.
  - (3) Dimension ratio number.
  - (4) AWWA pressure class.
  - (5) AWWA standard designation number.
  - (6) Manufacturer's name or trademark and production record code.
  - (7) Seal (mark) of the testing agency that verified the suitability of the pipe material for potable water service.

2. Fittings and Couplings

- a. Fittings for use with PVC pipe shall be ductile iron, slip-on or mechanical joint type.
- b. If couplings are required, they shall be of the elastomeric-gasket type and shall conform with ANSI/AWWA C900.

D. Polyvinyl Chloride (PVC) Pipe (ASTM)

1. Pipe

- a. This Specification covers rigid polyvinyl chloride pipe and fittings, hereinafter called PVC pipe and PVC fittings, for sizes 3/4-inch through 12-inch.
- b. PVC pipe shall be extruded from Class 12454-B polyvinyl chloride material with a hydrostatic design stress of 2000 psi for water at 73.4 degrees Fahrenheit, designated as PVC 1120, meeting ASTM Specifications D 1784 for material. Three-fourths inch through 1-1/2 inch water service piping shall be PVC Schedule 40 as specified in ASTM D 1785. Two inch through 12-inch pipe for water and sewage force main service shall be SDR 21 for 200 psi allowable working pressure at 73.4 degrees Fahrenheit and a safety factor of 2.0, as specified in ASTM D 2241.
- c. The pipe shall be homogeneous throughout and free from cracks, holes, foreign inclusions or other defects. The pipe shall be as uniform as commercially practical in color.
- d. The workmanship, pipe dimensions and tolerances, outside diameters, wall thickness, eccentricity, sustained pressures, burst pressures, flattening, extrusion quality, marking and all other

requirements of ASTM D 2241 shall be conformed with in all respects.

- e. Pipe shall be furnished in 20-foot lengths. The pipe shall be plain end with bell on one end. Male ends of pipe must be beveled on the outside.
- f. Pipe shall have a ring painted around the male end in such a manner as to allow field checking of setting depth of pipe in the socket. This requirement is made to assist construction superintendents and inspectors in visual inspection of pipe installation.
- g. Pipe must be delivered to job site by means which will adequately support it, and not subject it to undue stresses. In particular, the load shall be so supported that the bottom rows of pipe are not damaged by crushing. Pipe shall be unloaded carefully and strung or stored as close to the final point of placement as is practical.
- h. Pipe must not be exposed to the direct rays of the sun for an extended period of time. If pipe is not to be installed shortly after delivery to the job site, it must be stored in a shaded location.

## 2. Fittings

### a. Ductile Iron

- (1) Ductile iron mechanical joint or push-in type fittings with appropriate adapters may be used with exterior PVC pipe. All such fittings shall be approved by the pipe manufacturer, and complete data sent to the ENGINEER, including the manufacturer's approval, for review.

## 3. Joints

### a. Exterior Buried Pipe - Slip Joint Type

- (1) Exterior buried pipe shall be jointed with slip-type joints with rubber gaskets.
- (2) Pipe with bell end shall have all parts of the bell, including the gasket groove, made from the same extruded piece, integral with the pipe, and shall be thickened to meet standard dimension ratios of wall thickness to outside diameter. The gasket groove shall be constructed such that gasket rollout will not occur. Rubber gasketing shall conform to ASTM D 3139.

### b. Interior - Solvent Weld

- (1) Interior pipe shall be jointed by solvent welds.

- (2) Since PVC welding solvent is engineered and formulated to perform with a given joint design, all solvent must be purchased from the manufacturer of the pipe.
- (3) The PVC welding solvent shall be compounded to conform with the socket fit and the weather conditions at the time of installation and be such as to assure minimum installation cost and a weld of maximum strength.

c. Couplings

- (1) Couplings shall be of the same material as the pipe and may be of the molded, or extruded type. They shall have a beveled entrance to prevent the wiping off of the lubricant from the male end of the pipe.
- (2) PVC couplings shall have a minimum rating of 200 psi for continuous operation at 73.4 degrees Fahrenheit.
- (3) The couplings shall have a positive pipe stop that will automatically and accurately position the pipe ends within the couplings. The pipe stop shall also permit the thermal expansion or contraction of the pipe ends.

E. Polyethylene Pipe for Water Mains and Force Mains

1. Pipe

a. General

- (1) Polyethylene pipe and fittings shall comply with the requirements of ASTM D 1248, D 1505, D 1693, D 1928, D 2657, D 3035, D 2837 and D 2321.

b. Resins

- (1) Only virgin polyethylene resins classified as Type III, Category 5, Grade P34 per ASTM D 3035 with densities of 0.955 p/cc maximum and melt index of 0.15 g/10 minutes maximum shall be used in the process of making the pipe. The resin shall contain antioxidants and be stabilized with carbon black.

c. Design

- (1) The pipe shall have a long-term strength rating of 1,600 psi or more and be resistant to environmental stress cracking per procedure C of ASTM D 1928 for not less than 200 hours. The maximum allowable deflection is 5 percent with the pipe installed in accordance with these Specifications, using backfill material at 130 pounds per cubic foot, H-20 live load plus 50 percent impact but no

internal pressure. The live load and impact may be disregarded in the calculations for trench conditions with 8 feet or more cover. Operating pressures are shown on the Drawings. Hydrostatic loading shall be considered when the pipe is to be installed below a permanent water table or body of water.

d. Wall Thickness Calculations

- (1) The pipe manufacturer shall furnish calculations to support the pipe wall thickness for these various conditions for the ENGINEER'S review/acceptance before the materials are sent to the job site.

e. Quality

- (1) No cracks, holes, foreign material, blisters or other deleterious faults are permitted in the polyethylene pipe. It shall be homogeneous throughout including the heat fused joint. Polyethylene pipe will not be installed containing gouges or cuts that penetrate more than 10 percent of the wall thickness.

f. Water Stops

- (1) The pipe manufacturer shall furnish a waterstop assembly for use with the pipe where the pipe passes through a structure wall so as to provide a watertight seal. The assembly shall be attached to the pipe with noncorroding materials.

g. Marking

- (1) Each length of polyethylene pipe shall contain the manufacturer's brand name, pipe size and other data to enable an accurate tracing of the raw material source. Polyethylene pipe will not be installed containing gouges or cuts that penetrate more than 10 percent of the wall thickness.

2. Joints

a. Fusion

- (1) Polyethylene pipe shall be joined by the heat fusion welding process. Welding equipment may be either gas fired or electric as the CONTRACTOR may select. The welding equipment must be capable of attaining the temperature recommended by the manufacturer for the particular polyethylene extrusion used on the project.

(2) The fusion equipment shall have hydraulic controls and gauges for monitoring fusion pressures. Also, an engine powered facing unit to trim the irregularities of the pipe ends shall be provided. The heated and thermostatically controlled plate shall contain a temperature gauge for monitoring the heat temperature throughout the fusion process.

b. Flange Adapters

(1) Threaded or solvent weld joints and connections are not permitted. Flange adapters as manufactured by the pipe supplier shall be used, butt-fused to the pipe and connected to other pipe material using a rubber gasket for sealing.

## 2.02 MATERIALS-SERVICE LINE PIPE

### A. Copper Pipe and Fittings

#### 1. Inside, Rigid with Solder Joint Connections

a. Small piping inside structures shall consist of standard copper tubing for water; Type "L" for general plumbing purposes. All fittings shall be "solder joint connection" cast or wrought bronze for water service for inside diameter of pipe sizes given. All stops, valves, hose bibbs, and unions shall be made with same joints or threaded iron pipe standard, and be of brass or copper. Use 95-5 tin-antimony solder for "solder joints."

#### b. Buried Copper Tubing with Compression Joints

(1) Small copper piping for buried service shall be of standard soft copper tubing for water service pipe, ASTM Specifications B 88, Type "K," with bronze fittings, stops, and valves having compression connections for flared copper tubing.

### B. Polyethylene Pipe for Water Service

#### 1. Pipe

a. Polyethylene flexible pipe (I.P.O.D. or PVC O.D.) for sizes 2-inch through 3-inch water service piping shall be PE 3408, Type III, Grade P34 Class C, DR-9, OD Based for 200 psi working pressure at 73.4 degrees Fahrenheit, meeting ASTM Specification D 1248 for material, D 3350 for cell classification and AWWA C901 Specification for pipe.

b. Polyethylene flexible pipe (copper pipe O.D.) for sizes 2-inch through 2-inch water service piping shall be PE 3408, Type III, Grade P34 Class C, DR, OD Based for 200 psi working pressure at 73.4 degrees Fahrenheit, meeting ASTM Specification D 1248 for

material, D 3350 for cell classification and AWWA C901 Specification for pipe.

- c. Pipe shall meet all applicable provisions of the Commercial Standards and shall bear the National Sanitation Foundation (NSF) seal of approval.

2. Fittings

- a. Fittings shall be standard bronze fittings as specified for copper tubing in this Section of these Specifications.

2.03 SERVICE CONNECTIONS

A. General

1. All service connections shall be made by means of tees, factory tapped couplings, or bronze service clamps manufactured specifically for use with the pipe upon which it is to be installed. Whenever possible, corporation stops shall be placed in the service connection prior to conduction hydrostatic tests on the mains.

B. Service Clamps

1. Service clamps for use on ductile iron mains shall be bronze, double strap, Mueller BR 2 B Series, Ford, or equal.
2. Service clamps for use on PVC and polyethylene pipe shall be bronze, wide strap, 2 piece for 2-inch through 8-inch mains, Ford S912 or equal.

2.04 WALL AND FLOOR SLEEVES WITH RUBBER MECHANICAL SEAL FOR CARRIER PIPE SIZES 2 INCHES THROUGH 48 INCHES

A. General

1. Sleeves shall be required for 2-inch through 48-inch carrier pipes penetrating poured concrete walls and floor slabs. The use of sleeves will require the use of rubber links, mechanical type seal assembly around the carrier pipe.
2. The CONTRACTOR shall determine the required inside diameter of each individual wall opening or sleeve before ordering, fabricating or installing. The inside diameter of each wall or floor sleeve shall be sized as recommended by the closure assembly manufacturer to fit the carrier pipe, and seal to assure a watertight joint. The CONTRACTOR shall follow the manufacturer's instructions for installing and tightening the seal to provide a watertight pipe penetration.

B. Description

1. The pipe closure assembly shall consist of a heavy wall welded or seamless steel pipe with 4 inches larger than sleeve O.D. continuous

water stop plate, modular mechanical type interlocking synthetic rubber links shaped to continuously fill the annular space between the carrier pipe and wall or floor opening sleeve. Links shall be loosely assembled with stainless steel bolts to form a continuous sealing element of EPDM rubber belt around the carrier pipe with glass reinforced nylon plastic pressure plate under each bolt head and nut. Tightening of the bolts shall cause the sealing element to expand and provide absolute watertight seal between the carrier pipe and wall or floor sleeve. The entire closure assembly shall be tagged for location to match the nomenclature on the Drawings.

2. The sleeve shall be factory primed per Paint Specifications, Section 09900.

C. Manufacturers

1. Thunderline Corporation, Link-Seal Century Line Model CS-100, Model LS, FS, and WS. All models used shall be for Type S corrosive service, or equal.

2.05 SOURCE QUALITY CONTROL

A. Ductile Iron Pipe (Mechanical Joint and Rubber Slip Joint Type)

1. Hydrostatic and physical properties acceptance tests shall be in accordance with ANSI/AWWA Specification C151/A21.51 for ductile iron pipe centrifugally cast in metal molds or sand lined molds for water or other liquids.
2. The ENGINEER shall be provided with sufficient copies of each of the tests for each Contract to permit the ENGINEER to retain 3 copies.
3. All items used for jointing pipe shall be tested before shipment.

B. Polyvinyl Chloride (PVC) Pipe (AWWA)

1. The manufacturer shall furnish an affidavit that all delivered materials comply with the requirements of this Specification.
2. Each length of pipe shall be proof tested at four times its rated class pressure.

C. Polyvinyl Chloride (PVC) Pipe (ASTM)

1. Samples of pipe and physical and chemical data sheets shall be submitted to the ENGINEER for review and acceptance before pipe is delivered to job.
2. Samples of solvents and the recommended instruction for their use must be submitted for the ENGINEER'S review and acceptance before delivery of solvent to the job.

D. Polyethylene Pipe for Water Mains and Force Mains

1. Results of tests on the raw materials and the polyethylene pipe in accordance with ASTM standards and the Plastic Pipe Institute shall be furnished along with catalogs and other descriptive literature in the number of copies required by the listing in Section 00700 before the materials are sent to the job site.

**PART 3 EXECUTION**

3.01 TRENCH EXCAVATION-WATER AND SEWAGE FORCE MAINS

A. General

1. Trenching shall include all clearing and grubbing, including all weeds, briars, trees and stumps encountered in the trenching, regardless of size. The CONTRACTOR shall dispose of any such material by burning, burial or hauling away or as noted on the Drawings, at no extra cost to the OWNER. Ornamental shrubs, hedges and small trees (3 inches in diameter or less) shall be removed, protected and replanted, at no extra cost to the OWNER.
2. Trenching also includes such items as railroad, street, road, sidewalk, pipe and small creek crossings; cutting, moving or repairing damage to fences, poles or gates and other surface structures, regardless of whether shown on the Drawings. The CONTRACTOR shall protect existing facilities against danger or damage while pipeline is being constructed and backfilled or from damage due to settlement of the backfill.
3. Materials encountered in excavation will be divided into 2 classes only: solid rock excavation and other materials. Solid rock excavation is defined as material requiring the use of specialty equipment for removal, such as "hoe ramming," or the use of explosive materials for breakage prior to removal. Other materials shall include earth, loose rock, street or road surfacing and base concrete, and boulders less than 1/3 cubic yard in one piece.
4. In case of "unclassified excavation," as designated in the Drawings and/or Specifications, the price bid shall include earth, solid rock, roots, street or road surfacing and base concrete and boulders.
5. In case of "classified excavation," as designated in the Drawings and/or Specifications, the CONTRACTOR will be paid an additional cost for the removal of solid rock over that bid for other materials.
6. All excavation shall be open trenches, except where the Drawings call for tunneling, boring or jacking under structures, railroads, sidewalks, roads or highways.



B. Trees and Shrubs

1. Where pipelines run through wooded terrain, cutting of trees within limits of maximum permissible trench widths, as set forth in this article, will be permitted. However, cutting of additional trees on sides of trench to accommodate operating of trenching machine will not be permitted. The CONTRACTOR shall obtain specific permission of the OWNER before cutting any tree larger than 4 inches in diameter.

C. Highways, Streets and Railroads

1. Construction equipment injurious to paving encountered shall not be used. Curbs, sidewalks, and other structures shall be protected by the CONTRACTOR from damage by his construction equipment.
2. Where trenching is cut through paving which does not crumble on edges, trench edge shall be cut to at least 2 inches deep to straight and neat edges, before excavation is started, and care taken to preserve the edge to facilitate neat repaving.
3. The CONTRACTOR shall so coordinate his work as to produce a minimum of interference with normal traffic on highways and streets. He may, with the approval of the governing agency, close a street to traffic for such length of time considered necessary, provided persons occupying property abutting the street have an alternate route of access to the property which is suitable for their needs during the time of closure. It shall be the responsibility of the CONTRACTOR to give 24 hours advance notice to fire and police departments and to occupants of a street which will be closed, in a manner approved by the governing body.
4. The CONTRACTOR shall maintain road crossings in a passable condition for traffic until the final acceptance of the work, being paid only by unit price for crushed rock used, within limitations as hereinafter specified.
5. The amount of crushed stone placed shall be paid for at the unit price per ton up to the maximum limits of 225 pounds per linear foot of trench over which it is placed for pipe sizes through 16 inches, 300 pounds per linear foot for pipe sizes 18 inches through 24 inches and 400 pounds per linear foot for sizes 27 inches through 48 inches. The ENGINEER shall have control of thickness and width to be placed and paid for, and may order changes in depth and width as conditions dictate. No payment will be made for crushed rock surfacing required as a result of unnecessarily wide trenches, omission of sheeting and shoring, or damage by the CONTRACTOR'S equipment, or for maintenance of surface level.
6. Railroad and Highway Department requirements in regard to trenching, tunneling, boring and jacking shall take precedence over the foregoing general specifications and the tunneling and boring or jacking specifications, where they are involved. Where work is within railroad right-of-way, Railroad Protective Insurance shall be carried by the CONTRACTOR in the amounts required by the Railroad Company.

7. The insurance policy shall name the railroad as the insured and the original policy shall be delivered to the railroad after submitting same to the OWNER for review. The cost of flagmen required by the railroad and highway departments and railroad inspectors shall be paid by the CONTRACTOR.
8. Uneven surfaces or humps in the ground encountered and high driveways and road crossings shall be dug through to such depth that pipe may be laid to a reasonably even grade and have minimum cover at the low places. Such places requiring extra depths shall be included in the bid and no extra payment will be made for such extra depths required, which are evident from an examination of the ground before bidding, as required for 1 foot cover over valve nuts, or are indicated on the Drawings.

#### D. Existing Utilities

1. The CONTRACTOR shall determine, as far as possible in advance, the location of all existing sewer, culvert, drain, water, electric, telephone conduits, and gas pipes, and other subsurface structures and avoid disturbing same in opening his trenches. In case of sewer, water and gas services and other facilities easily damaged by machine trenching, same shall be uncovered without damage ahead of trenching machine and left intact or removed without permanent damage ahead of trenching and restored immediately after trenching machine has passed, without extra cost to the OWNER. The CONTRACTOR shall protect such existing facilities, including power and telephone poles and guy wires, against danger or damage while pipeline is being constructed and backfilled, or from damage due to settlement of his backfill. It shall be the responsibility of the CONTRACTOR to inform the customers of utilities of disruption of any utility service as soon as it is known that it has been or will be cut off.
2. The CONTRACTOR shall, at all times during trenching operations, carry a stock of pipe and fittings likely to be needed for replacement of pipelines to facilitate immediate repair.

#### E. Pipelines in Same Trench

1. Pipelines, force mains, and sewers laid in same trench shall, in all cases, be bedded on original earth, or other specified bedding materials, regardless of divergence in their elevations, unless otherwise specified. They shall never be laid in unsupported backfill or one above the other. The CONTRACTOR shall receive full trenching and backfilling unit prices for each pipeline, force main, and sewer so laid, the same as if laid in widely separated trenches.

#### F. Location of Proposed Pipelines

1. The location of pipelines and their appurtenances as shown are those intended for the final construction. However, conditions may present

themselves before construction on any line is started that would indicate desirable changes in location. Also, development of property traversed may require location changes. In such cases, the OWNER reserves the right to make reasonable changes in line and structure locations without extra cost, except as may be determined by the application of the unit prices bid to the quantities actually involved. The OWNER is under no obligation to locate pipelines so that they may be excavated by machine.

G. Trench Requirements

1. All trenches must be dug neatly to lines and grades.
2. The opening of more than 500 feet of trench ahead of pipe laying and more than 500 feet of open ditch left behind pipe laying, before backfilling, will not be permitted, except upon written consent of the OWNER. No trench shall be left open or work stopped on same for a considerable length of time. In case of objectionable delay trench shall be refilled according to backfill specifications.
3. Where subgrade of trench has insufficient stability to support the pipeline and hold it to its original grade, the ENGINEER may order stabilization by various means. Exclusive of dewatering normally required for construction and instability caused by neglect of the CONTRACTOR, it shall be paid for at unit prices set up in the Contract, such as extra excavation, crushed rock for pipe bedding, concrete cradle or piling.
4. Excavation for pipe laying must be made of sufficient width to allow for proper jointing and alignment of the pipe, but not greater than the maximums permitted in the following table:

**MAXIMUM TRENCH WIDTH AT TOP OF PIPE**

Nominal Pipe Size (Ins.)	Trench Width (Ins.)	Nominal Pipe Size (Ins.)	Trench Width (Ins.)
4	28	20	44
6	30	24	48
8	32	30	54
10	34	36	60
12	36	42	66
14	38	48	72
16	40	54	78
18	42		

5. Trenches in earth or rock shall be dug as shown on the Drawings and be sufficiently deep to insure a 30 inch or 36 inch minimum cover over water lines and force mains, as noted on the Drawings. Depths of trenching shall also be adequate for at least 1 foot minimum cover over valve nuts. In order to eliminate the necessity for digging bell holes into the trench subgrade by hand and to insure an earth cushion under the pipe for

uniform bearing, trench depth shall be the cover requirement plus outside diameter of barrel of pipe plus the required bedding cushion. The cushion construction requirement shall also apply to tunnels.

6. Wherever it is deemed necessary by the ENGINEER to lay the pipes to an extra depth exceeding the depths required by the Drawings and Specifications and not apparent from unevenness of ground, the CONTRACTOR will be paid for such excavation under extra excavation in earth at the price bid per cubic yard, computed on the basis of maximum trench widths in the preceding table. In unclassified excavation contracts the same width limitations will apply.
7. Trench line stations and locations of accessories will be set ahead of the trenching. These will be set at least each 100 feet of pipeline. Trenches must be dug true to alignment of stakes. Alignment of trenches or pipes in trench must not be changed to pass around obstacles such as poles, fences and other evident obstructions without the permission of the ENGINEER. Lines will be laid out to avoid obstacles as far as possible, contingent with maintenance of alignment necessary to finding pipeline in the future and avoiding obstruction to future utilities.

#### H. Damage to Existing Structures

1. Hand trenching is required, at no extra payment, where undue damage would be caused to existing structures and facilities by machine trenching.
2. In case of damage to any existing structures, repair and restoration shall be made at once and backfill shall not be replaced until this is done. In all cases, restoration and repair shall be such that the damaged structure will be in as good condition and serve its purpose as completely as before, and such restoration and repair shall be done without extra charge, except as set forth under the applicable provisions of the General and Special Conditions. Where there is the possibility of damage to existing utility lines by trenching machine, the CONTRACTOR shall make hand search excavation ahead of machine trenching, to uncover same, at no extra cost to the OWNER.

#### I. Excavation Unclassified

1. Excavation for pipelines shall be unclassified and the cost of all excavation of whatever nature and state, including solid rock, shall be included in the CONTRACTOR'S unit price bid for furnishing, trenching, laying and backfilling the pipe.
2. Excavation for structures such as manholes, pump stations, and vaults is likewise unclassified and the cost of all excavation of whatever nature and state, including solid rock, shall be included in the CONTRACTOR'S lump sum or unit price bid, as the case may be.

J. Dewatering of Trenches

1. Dewatering of trenches shall be considered a part of trenching, at no extra cost to the OWNER. Dewatering of trenches shall include groundwater and storm or sanitary sewage. Suitable pumping and other dewatering equipment is to be provided by the CONTRACTOR, to insure the installation of the pipeline structure in a dewatered trench and under the proper conditions. Dewatering shall include all practical means available for prevention of surface runoff into trenches and scouring against newly laid pipe.
2. Piles of excavated materials shall be trenched or temporarily piped to prevent, as far as practical, blockage of drainage ditches and gutters, and water carriage of excavated materials over street and highway surfaces.

3.02 LAYING WATER AND SEWAGE FORCE MAINS

A. General

1. Inspection of Materials
  - a. All pipe, fittings and accessories shall be subject to an inspection by the OWNER at the job site. Any damaged materials shall be repaired or replaced to the satisfaction of the OWNER. Should repairs to the piping materials be necessary, then same shall be made in the presence of the ENGINEER using proven methods prescribed by the pipe manufacturer.
  - b. The OWNER'S inspection of materials shall in no way relieve the CONTRACTOR of his responsibility.
2. Laying Requirements
  - a. Water and sewage force main pipe shall be laid to lines, cover or grades shown on the Drawings.
  - b. Pipes must be swabbed out before lowering into trench. In the case of pipelines 4 inch through 20 inch, a swab must also be dragged through the pipe after it is in place. Larger size pipe shall be visually inspected for cleanliness and proper jointing.
  - c. The points insisted upon in the laying of pipe will be: Proper alignment, evenness of width and depth of joints, perfection in jointing, and care of the pipe in handling.
  - d. Precautions must be taken to prevent flotation of the pipe should water enter the trench prior to putting the pipeline into operation.
  - e. In wet, yielding and mucky locations where pipe is in danger of sinking below grade or floating out of grade or alignment, or where the backfill materials are of such a fluid nature that such movements of the pipe might take place during the placing of the

backfill, the pipe must be weighted or secured permanently in place by such means as will prove effective. If crushed rock fill beneath the pipe is necessary for stability, it will be paid for at the unit price bid per ton of such material in place except in cases where instability is caused by neglect of the CONTRACTOR.

- f. Whenever pipe laying is stopped, the end of the pipe shall be securely plugged with the manufacturer's standard plug held in place by bracing and/or blocking.
- g. Elbows, plugs, dead end valves, and tees shall be firmly blocked, as shown on the Drawings, to prevent internal pressure from springing the pipe from the intended alignment, with permanent materials solidly placed without covering pipe joints. Restrained type pipe joints may be substituted for thrust blocks with the ENGINEER'S permission. Pipe shall be free of all structures, other than manholes, vaults or planned entries into other structures.
- h. No pipe shall be laid resting on solid rock, blocking or other unyielding objects. Jointing before placing in the trench and subsequent lowering of more than one section jointed together may be allowed, subject to the ENGINEER'S permission.
- i. For PVC and polyethylene pipe, there shall be installed with the pipe #12 AWG insulated wire for the entire length of the pipeline. The wire shall be installed on top of the 12-inch initial backfill and weighted at locations along the wire sufficient to prevent dislodgement during the backfilling process. The wire shall be accessible at valve boxes or at locator stations along the route of the pipeline, as shown on the Drawings.
- j. Concrete line markers shall be installed at property lines or at bends in the pipeline. Markers may be long markers or short markers as shown on the Drawings or as called for in these Specifications.
- k. Fiberglass line markers shall be installed at valve locations or at locations as shown on the Drawings. Fiberglass markers shall be Carsonite Utility Marker, Style No. 375, or approved equal. Markers shall be equipped with the OWNER'S standard logo.

## B. Laying Ductile Iron Pipe

### 1. Bedding and Backfilling

- a. The laying condition shall be Type 3 specified in ANSI/AWWA C600. The pipe shall be bedded in 4 inches minimum loose soil and the hand placed loose soil backfill lightly consolidated to the top of the pipe. "Loose soil" or "select material" is defined as native soil excavated from the trench, free of rocks, foreign materials and frozen earth.

- b. The selected material shall be hand placed to a point 12 inches above the barrel of the pipe. After the specified backfill is hand placed, rock may be used in machine placed backfill in pieces no larger than 8 inches in any dimension and to an extent not greater than 1/2 the volume of the backfill materials used.
- c. The top 12 inches of backfill shall contain no rock over 1-1/2 inches in diameter nor pockets of crushed rock.
- d. Larger rock fill will be allowed in wide trenches where side slopes are low enough to prevent rock from dropping over pipeline. If additional earth is required, it must be obtained and placed by the CONTRACTOR. Filling with rock and earth shall proceed simultaneously, in order that all voids be filled with earth.
- e. If select material is not available from the trench excavation, or if the CONTRACTOR so desires, he may use crushed stone bedding and backfill to the top of the pipe at no extra cost to the OWNER.
- f. Sufficient space, limited to a maximum of 2 feet length, shall be left out of the specified earth or crushed stone bedding to facilitate proper jointing of the pipe.

2. Installation of Pipe

- a. Ductile iron pipe shall first be thoroughly cleaned at joints, then joined according to instructions and with tools recommended by the pipe manufacturer. Sufficient copies of the manufacturer's installation instructions shall be furnished the ENGINEER to permit the ENGINEER to retain 3 copies. One copy shall be available at all times at the site of the work.
- b. All pipes must be forced and held together or "homed" at the joints before bolting. Pipe must be aligned as each joint is placed, so as to present as nearly true, straight lines and grades as practical, and all curves and changes in grades must be laid in such manner that 1/2 of the maximum allowable deflection shown in the pipe manufacturer's catalog is not exceeded.
- c. Concrete blocking of fittings shall be as specified hereinafter in this Specification Section 02610.
- d. Cutting of pipe may be done by special pipe cutters as the CONTRACTOR may elect, but the CONTRACTOR will be held responsible for breakage or damage caused by careless cutting or handling. Cut edges of the pipe shall be made smooth and a bevel formed on the exterior of the pipe barrel when using rubber gasket type pipe.

C. Laying Copper Pipe and Fittings

1. Bedding and Backfilling

- a. The pipe shall be bedded in 4 inches minimum of loose soil and the hand placed backfill lightly consolidated to a depth of 12 inches above the top of the pipe. "Loose soil" or "select material" is defined as native soil excavated from the trench, free of rocks, foreign materials and frozen earth. The machine placed backfill may contain rock no larger than 8 inches in any dimension and to an extent no greater than twice the volume of backfill materials used. The top 12 inches of backfill shall contain no rocks over 1-1/2 inches in diameter nor pockets of crushed rock.

2. Installing Copper Pipe and Fittings

- a. Exterior copper pipe shall be laid of type K pipe, with brass compression fittings. Joints shall be neatly reamed and flared and joints drawn up firmly. Pipe shall have at least 30 inch cover. Joints shall be tested and all leakage stopped before backfilling the pipe trench.
- b. Interior copper pipe shall be installed of Type L pipe, with sweat joint fittings. Pipe shall be tested and all leaks stopped before the system will be accepted. The pipe shall be free of dents and bends. The sweat joints shall present a neat appearance. All pipe shall be parallel to walls and floors with unions on all runs and branches. The pipe shall be secured to the walls and ceilings by clamps and hangers manufactured for the purpose. Strap hangers are not acceptable. Unions and valves shall be placed on each outlet to facilitate dismantling and shutting off.
- c. All copper pipe shall be installed by experienced workmen.

D. Installation of Flanged or Threaded Pipe and Fittings (Interior)

1. Installation - General

- a. The CONTRACTOR shall thoroughly clean the pipe and fittings before starting erection. All scale, rust and dirt shall be removed by power brushing and/or solvent cleaning.
- b. The erection of piping requires that it progress from the equipment it is connected to, after the equipment has been accurately leveled and aligned, without putting a strain on same. The pipe shall be erected in a workmanlike manner with runs in the true horizontal or vertical plane or as shown on the Drawings.
- c. The piping shall be supported by standard pipe hangers or piers rather than by the equipment. The pipe shall be free of all



openings in walls and slabs when the final position of the piping is attained and before sealing the annular space about the pipe.

2. Flanged Joint Connection

- a. All flanged type connections shall be made using an acceptable gasket and bolts. The bolts shall be tightened evenly to compress the gasket. Care is to be taken not to distort the flanges and/or piping by overtightening the bolts. Final tightening of bolts shall be done with a properly adjusted torque wrench.

3. Interface with Other Products

- a. When a pipe transitions from ductile iron to pipe of another material, a transition fitting shall be used. The transition material shall be a dielectric material or insulator. For pressure applications above 20 psi the transition fitting shall be a Straub pipe joint, a Dresser type coupling, or equal. For low pressure or gravity applications, the transition fitting shall be a Straub pipe joint, a Dresser type coupling, a Fernco fitting, or equal. All transition couplings shall be approved by the ENGINEER prior to installation.

E. Laying Plastic Pipe

1. Bedding and Backfill

- a. The pipe shall be bedded in 4 inches minimum depth (for pipe sizes through 16 inches) of "loose soil" or "select material" meeting the requirements of Class II or III of ASTM D 2321. For pipe sizes greater than 16 inches in diameter, the pipe bedding shall be a minimum depth of one-fourth the pipe diameter or 6 inches minimum.
- b. Similar material shall be used for haunching up to the spring line of the pipe and it shall be worked under the haunch of the pipe to provide adequate side support. The same material shall then be hand placed to a point 12 inches above the top of the pipe.
- c. After the placement of each lift of the Class II or III bedding, haunching and initial backfill material, the material shall be compacted to 85 percent and/or 90 percent Standard Proctor Density, respectively.
- d. The remaining backfill, except for the top 12 inches which shall contain no rock over 1-1/2 inch diameter nor pockets of crushed rock, may be excavated material containing no rock over 8 inches in any dimension. Larger rock will be allowed in wide trenches where side slopes are low enough to prevent rock from dropping over pipeline. If additional earth is required, it must be obtained and placed by the CONTRACTOR. Filling with rock and earth shall

proceed simultaneously, in order that all voids may be filled with earth.

- e. In trenches in solid rock or where flowing water is present, crushed stone bedding and backfill to 12 inches above the top of the pipe shall be substituted for the select material. Kentucky Department of Highways No. 9 stone shall be used for pipe up to 16 inches in diameter.
- f. If select material is not available from the trench excavation, or if the CONTRACTOR so desires, he may use crushed stone bedding and backfill to a point 12 inches above the top of the pipe at no extra cost to the OWNER.
- g. Sufficient space, limited to a maximum of 2 feet length, shall be left out of the bedding to facilitate proper jointing of the pipe.
- h. No pipe shall be laid resting on solid rock, blocking, or other unyielding objects. Jointing before placing in the trench and subsequent lowering of more than one section may be allowed subject to the ENGINEER'S permission.

2. Installation of Polyvinyl Chloride (PVC) Pressure Pipe

- a. Prior to laying, all PVC pipe shall be stored in a shaded place for protection from the direct rays of the sun. Pipe shall be distributed from storage as the work progresses as permitted by the ENGINEER.
- b. The pipe, fittings, and valves shall be placed in the trench with care. Under no circumstances shall pipe or other materials be dropped or dumped into the trench. The pipe shall not be dragged in a manner which would cause scratching of the pipe surface. An excessive amount of scratching on the surface of the pipe will be considered cause for rejection.
- c. Sufficient copies of the pipe manufacturer's instructions for installing the pipe and accessories shall be furnished the ENGINEER by the CONTRACTOR to permit the ENGINEER to retain 3 copies. A copy is to be available at the job site at all times.
- d. Concrete blocking of fittings, as hereinafter specified, shall be required for PVC pipe with slip joints and rubber gaskets.
- e. All dirt, dust and moisture shall be removed from the bell and spigot ends of pipes to be jointed. Insert gasket in bell. Apply the lubricant to spigot and gasket being careful to keep both ends free of dirt. The joint shall be homed to stop mark on spigot end of pipe. All jointing shall be done in accordance with pipe manufacturer's recommendations.

- f. All cutting of the pipe shall be done in a neat and workmanlike manner with the least amount of waste of pipe involved and without damage to existing or new lines. A fine tooth saw, tubing cutter or similar tool can be used to cut the pipe. Cut must be square and ragged edges removed with a cutting tool and/or file. A bevel or taper on the exterior of each spigot is required.

3. Installation of Polyethylene Pressure Pipe

- a. Polyethylene pipe for water lines or force mains shall be joined using tools and equipment specifically manufactured for use with polyethylene pipe. Heat fusion temperature, heating time and cooling time shall be per the pipe manufacturer's requirements. Pouring of water on completed joints to speed cooling will not be allowed.
- b. The pipe shall be snaked into the trench, employing the natural snaking tendency of the pipe. All short radius bends shall be made with fittings rather than bending the pipe. The pipe will be rejected if it contains kinks and gouges or gouges/cuts penetrating to a depth of 10 percent of the wall thickness.
- c. Sufficient copies of the pipe manufacturer's instructions for installing the pipe and accessories shall be furnished the ENGINEER by the CONTRACTOR to permit the ENGINEER to retain 3 copies. A copy is to be available at the job site at all time.
- d. Because of the high coefficient of expansion of polyethylene, the pipe shall not be attached to rigid structures at the ends until at least 48 hours have elapsed after backfilling and the pipe temperature has had an opportunity to stabilize.

4. Installing Polyethylene Pipe for Water Service

- a. The pipe shall be bedded in 4 inches minimum of loose soil and the hand placed backfill lightly consolidated to a depth of 12 inches above the top of the pipe. "Loose soil" or "select material" is defined as native soil excavated from the trench, free of rocks, foreign materials and frozen earth. The machine placed backfill may contain rock no larger than 8 inches in any dimension and to an extent no greater than 2 the volume of backfill materials used. The top 12 inches of backfill shall contain no rocks over 1-1/2 inches in diameter nor pockets of crushed rock.
- b. Polyethylene pipe for water services shall have the same outside diameter as copper tubing and shall be compatible for flared compression fittings. The joints to brass fittings shall be made by cutting the pipe with a tube cutter, keeping it clean and square, thence flaring the pipe and completing the joining in accordance with the manufacturer's instructions (a copy of the instructions

shall be at the job site at all times). All joints shall be tested and all leakage stopped before backfilling the pipe trench.

- c. The pipe shall be snaked into the trench, employing the natural snaking tendency of the pipe. All short radius bends shall be made with fittings rather than with the pipe alone. The pipe shall be bent to a radius of not less than 12 inches.
- d. The pipe will be rejected if it contains kinks and gouges.

#### F. Installation of Water Service Accessories

##### 1. Water Service Meters

- a. Water service meters and accessories shall be installed as shown on the Drawings, with meter box centered over the meter.
- b. The location of water service connections will be determined in the field, as the work progresses, thereby necessitating the use of pipe saddles and the appropriate tapping equipment. Earth backfill shall be thoroughly tamped around meter boxes to prevent subsequent movement.

##### 2. Air Valves and Corporation Stops

- a. The location of air valve assemblies, while being noted on the Drawings, could possibly be shifted in actual construction. For this reason, the same statements relative to the methods of installation of meters and water service connections apply to the installation of air valve assemblies. Air valve assembly boxes shall be installed in the same manner as water meter boxes except that the box will be located slightly off center of the air valve, in order to give better access to the stopcock between the valve and water main.
- b. Corporation stops, as shown on the Drawings, are required between the water main and the meter, and between the main and the air valve assembly.

#### G. Installation of Fire Hydrants

- 1. Fire hydrants shall be installed in the general location as shown on the Drawings. Exact location shall be determined in the field. Hydrants shall be set such that the lowest nozzle shall be high enough above the ground to allow the uninhibited 360° swing of a 15-inch hydrant wrench.
- 2. Hydrant drainage pits shall be excavated below the hydrant to the depth shown on the Drawings. Crushed stone drainage media shall be of the size shown on the Drawings. Hydrant shall be set vertical and anchored as hereinafter specified.
- 3. Hydrants installed on this project shall be anchored to prevent the hydrant from blowing off the feeder line when suddenly opened or

closed. Likewise, the hydrant pilot valve shall be anchored to prevent blowoff when the hydrant is removed. The CONTRACTOR shall anchor the hydrant and pilot valve utilizing one of the following procedures:

- a. Where the hydrant is located immediately adjacent to the water main, install all thread rods from the main line branch tee to the valve inlet and from the valve outlet to the mechanical joint of the hydrant inlet piece.
  - b. Provide locked mechanical joint and/or restrained joint piping from the main to the hydrant including the main line tee.
  - c. Use method a or b from the water main to the pilot valve and provide a concrete thrust block on the hydrant.
  - d. Method b may not be used when the hydrant feed line is PVC pipe.
4. The additional cost of providing all-thread rods, locked mechanical joint pipe and fittings, restrained joint pipe and fittings, and/or the concrete thrust block at the hydrant shall be included in the CONTRACTOR'S unit price bid for the hydrant.

#### H. Blocking of Pipe at Bends and Ends

##### 1. Horizontal Bends

- a. Concrete backing and/or blocking required at bends in the horizontal plane shall be accomplished per detail on the Drawings. The square footage of blocking area shall be obtained from Tables "A" and "B" through the following procedure:

Step No. 1 - From Table "A," select type soil and bearing area factor for particular fitting to be blocked.

Step No. 2 - From Table "B," select multiplier to be used for the size pipe being blocked and its test pressure.

Step No. 3 - Calculate actual bearing area required by multiplying bearing area factor from Table "A" by multiplier from Table "B" (e.g. - 16 inch tee with 250 psi test pressure in sandy clay -  $9.42 \times 1.78 = 16.7$  S.F. of bearing area required). Bearing area shall in no case be less than the minimum shown in Table "B."

**TABLE "A"**

Type Soil	Soil Bearing Pressure (PSF)	Bearing Area Factor for Degree of Bend (Square Feet)				
		90°	Plug/Tee	45°	22 1/2°	11 1/4°
Sandy Clay	3,000	13.33	9.42	7.21	3.68	1.85
Hard Clay	6,000	6.66	4.71	3.61	1.84	0.92
Shale	12,000	3.33	2.36	1.80	0.92	0.46
Solid Rock	16,000	2.50	1.77	1.35	0.69	0.35

**TABLE "B"**

Pipe Dia. (In.)	Min. Bearing Area (S.F.)	Multiplier for Pipe Test Pressure (TP)						
		(TP) 350 psi	(TP) 300 psi	(TP) 250 psi	(TP) 200 psi	(TP) 150 psi	(TP) 100 psi	(TP) 50 psi
4	1.0	0.16	0.13	0.11	0.09	0.07	0.04	0.02
6	1.0	0.35	0.30	0.25	0.20	0.15	0.10	0.05
8	1.0	0.62	0.53	0.44	0.36	0.27	0.18	0.09
10	1.0	0.97	0.83	0.69	0.56	0.42	0.28	0.14
12	1.3	1.40	1.20	1.00	0.80	0.60	0.40	0.20
14	1.5	1.91	1.63	1.36	1.09	0.82	0.54	0.27
16	1.8	2.49	2.13	1.78	1.42	1.07	0.71	0.36
18	2.3	3.15	2.70	2.25	1.80	1.35	0.90	0.45
20	2.5	3.89	3.33	2.78	2.22	1.67	1.11	0.56
24	3.6	5.60	4.80	4.00	3.20	2.40	1.60	0.80
30	5.2	8.75	7.50	6.25	5.00	3.75	2.50	1.25
36	7.0	12.60	10.80	9.00	7.20	5.40	3.60	1.80
42	9.1	17.15	14.70	12.25	9.80	7.35	4.90	2.45
48	11.4	22.40	19.20	16.00	12.80	9.60	6.40	3.20
54	13.5	28.35	24.30	20.25	16.20	12.15	8.10	4.05
60	16.0	35.00	30.00	25.00	20.00	15.00	10.00	5.00

- b. Consideration will be given to the use of restrained type mechanical joint pipe and fittings in lieu of concrete blocking. Use of the restrained joint pipe and fittings is subject to review and acceptance by the ENGINEER of the locking-method and adequacy of design for pressures involved.

2. Vertical Bends

- a. The use of vertical bends in lieu of extra depth trenching shall be subject to permission by the ENGINEER.

- b. Where the CONTRACTOR elects to use vertical bends, or where vertical bends are called for on the Drawings, the CONTRACTOR shall submit the blocking design, including calculations, to the ENGINEER for review and acceptance. Anchorages shall be designed to resist thrusts caused by the internal test pressure in the pipe. Protection against corrosion shall be inherent in the design.

I. Supplemental Backfilling Information

1. General

- a. Excavated materials from trenches, tunnels, and structure excavation in excess of quantity required for trench backfill or site regrade, shall be disposed of by the CONTRACTOR. It shall be the responsibility of the CONTRACTOR to obtain location or permits for its disposal. The price bid for trench excavation and backfill, or site excavation and regrade, shall include the cost of disposition of excess excavated materials, as set forth herein, with no additional compensation being allowed for hauling.
- b. For water line and sewage force main contracts where sod is destroyed in areas maintained equivalent to residence yards, it shall be replaced on slightly ridged backfill on trench, and where destroyed in areas adjacent to the trench, it shall be replaced by the CONTRACTOR with fresh sod, all of which will be paid for at a unit price bid per foot of pipeline. The timing of resodding shall be controlled by the ENGINEER. Ground shall be prepared and fertilized as herewith specified for seeded areas. In small patches, supplying of 3 inches of topsoil and raking may be substituted for disking.
- c. For plant or site based contracts, sodding shall be placed to the extent shown on the Drawings. Refer to Section 02930 of these Specifications for detailed instructions for the placement of sod. The cost for sodding of site based areas shall be included in the lump sum bid for the project.
- d. Where pastures, thin grass or cover crops are destroyed by trenching, laying, backfilling, or tunneling operations, surface shall be prepared by disking, fertilizing, and seeding, as specified in Section 02930. Seeding and fertilizing shall be included in the price for trenching and backfilling. The timing of this operation shall be controlled by the ENGINEER. Requirements of the Department of Highways for reseeding shall take precedence over these Specifications where they are involved.
- e. No extra charge shall be made for backfilling of any kind, except as specified. Backfilling shall be included as a part of the price for trenching. No extra charge shall be made for supplying outside materials for backfill except where fills above existing ground are

necessary and payment is designated on Drawings or in Specifications. If backfilling of the trench or surface restoration is not properly completed, a proportionate part of the unit price for trenching shall be retained from payment estimates.

- f. Before completion of the Contract, all backfills shall be reshaped, holes filled, and surplus materials hauled away and all permanent walks, street, driveways, and highway paving and sod replacement (if such surface replacement items are included in the Contract) and reseeding performed.
- g. Backfill material must be uniformly ridged over trench, and excess hauled away. Ridged backfill shall be confined to the width of the trench and not allowed to overlap onto firm original earth, and its height shall not be in excess of needs for replacement of settlement of backfill.
- h. All rock, including crushed rock or gravel from construction, must be removed from yards and fields. Streets and walks shall be broomed to remove all earth and loose rock immediately following backfilling.

2. Special Requirements

- a. In case of street, highway, railroad, sidewalk and driveway crossings or within any roadway paving, or about manholes, valve and meter boxes located in such paving, the following backfill material and procedure is required.
- b. The pipe shall be bedded in 4 inches minimum depth (for pipe sizes through 16 inches) of crushed rock meeting the requirements of the Kentucky Department of Highways standard size No. 9. For pipe sizes greater than 16 inches in diameter, the pipe bedding shall be a minimum depth of 1/4 the pipe diameter and be of the material and gradation specified previously.
- c. Similar material shall be used for haunching up to the spring line of the pipe, and it shall be worked under the haunch of the pipe to provide adequate side support. The crushed rock shall then be hand placed to a point 12 inches above the top of the pipe.
- d. After the above bedding and selected backfill have been placed, fill trench to within 6 inches of the surface with Kentucky Department of Highways No. 57 crushed stone, uniformly distributed, or other gradation acceptable to the ENGINEER. In order to accommodate compacted temporary surfacing it may be necessary to bulkhead or otherwise confine the stone fill at the open end of the trench.
- e. Temporary surfacing of street, highway, railroad, sidewalk and driveway crossings, or within any roadway paving, or about manholes, valve and meter boxes located in such paving, shall



consist of 6 inches compacted dense graded aggregate as specified under Section 02235 for temporary walkway or road surfacing, placed and compacted in the trench. Compaction shall be accomplished by methods which shall be sufficient to confine stone to the trench under normal traffic. Backfills shall be maintained easily passable to traffic at original paving level until acceptance of project or replacement of paving or sidewalks.

- f. Railroad Company and Department of Highways requirements in regard to backfilling will take precedence over the above general specifications where they are involved.

#### J. Cut-Ins, Tie-Ins, and Cutting and Plugging

1. The OWNER shall not be responsible for extra costs of cut-ins, tie-ins, cutting and plugging, due to water not being entirely cut off by the existing water main valves.
2. A cut-in is defined as the removal of one section of existing pipeline (2 cuts of pipe) and insertion of one or more new pipeline connections therein.
3. A tie-in is defined as the removal of an existing plug or cap and the connecting of the new pipeline into the existing pipeline or fitting or valve at the joint opened by such removal.
4. A cutting and plugging is defined as the cutting and installation of a plug in an existing line.

### 3.03 FIELD QUALITY CONTROL

#### A. Testing Polyvinyl Chloride (PVC) Pressure Pipe During Construction Period

1. Prior to pressure testing the pipe shall be center loaded with backfill to prevent arching and whipping under pressure. Center loading shall be done carefully so that joints will be completely exposed for examination during testing unless conditions warrant complete backfill before testing.
2. During the general construction period the following pressure testing procedure shall be followed (on sections that can be separately isolated):
  - a. After the PVC pipe is assembled in the trench a test of not more than 30 percent above the system's anticipated working pressure shall be applied with either air or water. After 2 consecutive tests have been performed without any failure, the CONTRACTOR at his option and with the ENGINEER'S permission may discontinue testing until the system is completed. Testing shall then be performed as outlined herein in this Section.

B. Testing Water and Sewage Force Main Piping for Leakage

1. The CONTRACTOR will be required to test all pipelines and appurtenances with water. The maximum test pressure, measured at the lowest elevation of the pipeline being tested, shall be the pressure class of the pipe unless a specific test pressure is shown on the Drawings.
2. Prior to testing, the line shall be filled with water and any entrapped air in the line removed. This may be accomplished at a service tap for water service or air release valve. In any case, the CONTRACTOR shall be responsible for removal of air from the system at no additional cost to the OWNER.
3. When the line or section being tested is pumped up to the required pressure, it shall be valved off from the pump and a pressure gauge placed in the line. The pressure drop in the line, if any, shall be noted. If no pressure drop is noted in 4 hours, the ENGINEER, at his discretion, may accept the line or section as being tested, or he may require the test run the full 24 hours.
4. At the end of the 24 hour test period, the pressure shall be recorded. If there is a drop in pressure, the CONTRACTOR will be required to pump the section being tested up to initial test pressure and maintain that pressure for 24 hours, measuring the amount of water required to accomplish this. The line will not be accepted until the leakage shall prove to be less than 10 gallons per inch diameter per mile of pipe per 24 hours. The 24 hour test shall be charted by timed pressure recorder.
5. Should there be leakage over the allowable amount, the CONTRACTOR will be required to locate and repair the leaks and retest the section.
6. If the leakage of a section of pipeline being tested is below the allowable amount, but a leak is obvious, in the opinion of the ENGINEER, due to water at the surface of the ground, or any other means of determining a leak, the CONTRACTOR will be required to repair those leaks.
7. The CONTRACTOR shall furnish meter and suction tank, pipe test plugs, and bypass piping, and make all connections for conducting the above tests. The pumping equipment used shall be centrifugal pump, or other pumping equipment which will not place shock pressures on the pipeline. Power plunger or positive displacement pumps will not be permitted for use on closed pipe system for any purpose.
8. Inspection of pipe laying shall in no way relieve the CONTRACTOR of the responsibility for passing tests or correcting poor workmanship.

C. Disinfection (Water Mains and Services)

1. Upon completion of the work and cleaning up, and prior to final acceptance, the CONTRACTOR shall disinfect all water lines constructed which are to carry treated water.

2. Prior to starting disinfection, all water mains must be thoroughly flushed to remove mud, rocks, etc. Disinfection will then be accomplished by the adding of a chlorine solution while filling the main to obtain the initial 50 ppm of chlorine. The CONTRACTOR shall supply all equipment, labor, etc., necessary for flushing and disinfecting the mains. The CONTRACTOR shall submit, in writing, to the ENGINEER, the method he proposes to use for adding the chlorine.
3. The calcium hypochlorite granule or tablet method shall not be used. The placement of small amounts of disinfectant material in the main during construction will not be allowed.
4. Disinfection shall be accomplished by filling the new and/or repaired portions of the system with water having a chlorine content of at least 50 parts per million and at the end of a 24 hour contact time a residual of at least 25 parts per million shall remain. At the end of the 24 hour contact period, all the sterilized surfaces and areas shall be thoroughly flushed from the water system. Chlorinated water shall be disposed of in accordance with 401 KAR 5:031 and 8:020, which state that the allowable in stream concentration of chlorine is 10 ug/l, which is equal to 0.01 mg/l. The CONTRACTOR shall submit, in writing to the ENGINEER, the method he proposes for dechlorinating. Recommended chemicals, as given in AWWA C651, are sulfur dioxide, sodium bisulfate, sodium sulfite, and sodium thiosulfate.
5. For tie-ins to an existing system such as tapping valves or direct cut-in, disinfection shall, at the ENGINEER'S discretion, consist of thoroughly cleaning the new part(s) with a solution containing not less than 200 mg/l (ppm) chlorine.
6. After initial disinfection and flushing, the OWNER will collect water samples for bacteriological testing. A core zone, which includes up to the first 2 mile, shall be established. Two samples shall be taken from the core zone. Additionally, 1 sample taken from each mile of new distribution main shall be taken for analysis. A new or routine replacement main shall not be placed in service until negative laboratory results are obtained on the bacteriological analyses. Sample bottles shall be clearly identified as "special" construction tests. If any of the samples are found to be positive or contain confluent growth, the CONTRACTOR shall repeat the disinfection procedure until the required numbers of negative samples are obtained.
7. The new water main(s) shall not be accepted by the OWNER for operation until the above sterilization procedures have been completed. The cost of sterilization/dechlorination procedures shall be incorporated into the CONTRACTOR'S unit price and/or lump sum bid, as the case may be.

3.04 BASIS OF PAYMENT

A. Excavation and Backfilling

1. Trenching, Laying, and Backfilling Pipelines
  - a. Unit Price Contracts
    - (1) Payment for trenching and backfilling for pressure lines shall be included in the unit price bid for furnishing and installing the pipe, measured by the linear feet installed, including fittings and accessories length.
  - b. Lump Sum Contracts
    - (1) The CONTRACTOR'S lump sum bid shall include all costs for trenching, laying and backfilling pipelines.
2. Solid Rock Excavation
  - a. Unclassified Excavation
    - (1) Excavation shall be unclassified and the cost of all excavation of whatever nature and state, including solid rock, shall be included in the CONTRACTOR'S unit price bid for each item of construction requiring excavation or included in the lump sum bid for such type contracts.
3. Search and Extra Depth Trench Excavation
  - a. "Search" trench excavation shall be the actual measured excavation within limits as acceptable to the ENGINEER.
  - b. "Extra Depth" trench excavation shall be the calculated yardage below the lowest point of excavation which would normally have been required for construction.
  - c. Trench width limitations for either condition shall be as listed in the following table:

For 6" Pipe 2'-6"	For 16" Pipe 2'-11"	For 36" Pipe 5'-6"
For 8" Pipe 2'-9"	For 18" Pipe 3'-2"	For 42" Pipe 6'-0"
For 10" Pipe 2'-9"	For 20" Pipe 3'-5"	For 48" Pipe 6'-6"
For 12" Pipe 2'-9"	For 24" Pipe 3'-8"	For 54" Pipe 7'-0"
For 14" Pipe 2'-9"	For 30" Pipe 4'-4"	
  - d. The work of uncovering and backfilling required for locating existing sewers, water lines and other existing facilities for

avoidance in location of proposed pipelines where such uncovering and backfilling is not within trench for improvements, shall be paid for at a price per cubic yard for such excavation actually removed and backfilled under item for "Search or Extra Depth Trench Excavation." Such payment does not include uncovering existing utility lines for their protection during or after trenching operations for the proposed pipeline.

- e. Where pipelines, force mains and sewers are laid in the same trench, the CONTRACTOR shall receive full trenching and backfill unit prices for each pipeline, force main and sewer so laid, the same as if laid in widely separated trenches.

#### 4. Mechanical Tamping

- a. Mechanical tamping is defined as backfill placed and compacted by power driven mechanical equipment to a greater density than can be achieved by natural settlement or hand tamping methods. Mechanical tamping will be required when ordered by the ENGINEER with payment by the cubic yard so compacted. Measurement, but not actual extent of the mechanical tamping, shall be limited by the numerical maximum allowable trench width (for each size pipe) as shown in the table listed under "Search and Extra Depth Trench." Payment for mechanical tamping shall not include the specified bedding, haunching, or initial backfill required above and below the top of pipe.

### B. Tunneling, Boring or Jacking

#### 1. Permanent Tunnels

- a. The payment for permanent tunnels shall be the length measured along its centerline from the entrance face on one side to the exit face on the other side of the tunnel. Payment per linear foot for each size tunnel shall include excavation, tunnel liner, pressure grouting, tunnel subgrade, closure plates and backfilling, complete.

#### 2. Temporary Tunnels

- a. Payment for temporary tunnels shall be made per linear foot based on the measured distance along the centerline of tunnel from the inlet face on one side to the outlet face on the other side of the tunnel. Payment shall include all excavation, backfilling and all sheeting and shoring of tunnel, regardless of whether removed.

#### 3. Boring or Jacking

- a. In unit price Contracts, usable holes either bored or jacked shall be paid for per linear foot of hole actually bored or jacked, according to the diameter of the hole required, measured along the

centerline from the point of entrance on one side to the point of exit on the other side. When cover pipe is installed inside the bore, boring or jacking and cover pipe shall be paid per linear foot based on the length of the cover pipe installed, according to the diameter of the cover pipe required.

C. Trench and Pipe Stabilization

1. Extra Excavation
  - a. Extra excavation required for trench or pipe stabilization shall be paid by the cubic yard so excavated under the item "Search and/or Extra Depth Trench Excavation" based on the limitations for that item.
2. Crushed Stone for Trench Stabilization
  - a. Crushed stone ordered by the ENGINEER for trench stabilization shall be as specified in Section 02235 of these Specifications and paid by the ton so placed.
3. Crushed Stone for Pipe Bedding
  - a. Additional crushed stone bedding ordered by the ENGINEER for pipe stabilization shall be as specified in Section 02235 of these Specifications and paid by the ton so placed.
4. Plain or Reinforced Concrete Arch
  - a. Plain or reinforced concrete arch called for on the Drawings and/or ordered by the ENGINEER shall be paid for by the linear foot of pipeline upon which it is placed. The Form of Proposal will indicate which method is to be used.
5. Plain or Reinforced Concrete Cradle
  - a. Plain or reinforced concrete cradle called for on the Drawings and/or ordered by the ENGINEER shall be paid for by the linear foot so placed.

D. Water Lines or Sewage Force Mains

1. Unit Price Contracts
  - a. Water Lines or Sewage Force Mains
    - (1) Payment for furnishing, trenching, bedding, laying, and backfilling water lines or force mains shall be included in the unit price bid per linear foot of pipe laid, including length of fittings and valves, unless same are included in lump sum portions or assemblies noted on the Drawings. However, payments will not be made for branch lengths of

fittings within 2.5 feet of edge of main trench. The extra cost of trenching in difficult locations, such as stream, railroad, and highway crossings, if not covered in other contract unit prices, shall be included in unit price for furnishing, trenching, bedding, laying, and backfilling the pipe.

- (2) All blowoff or vent branches will be measured as pipe from center of connecting tee to end of pipe.
- (3) In the case of unit price contracts, unless otherwise stated in the Special Conditions, ductile iron fittings, laid outside lump sum assemblies, will be paid for by the pound of body castings, without joint accessories, at the weights listed in ANSI/AWWA C110/A21.10 or ANSI/AWWA C153/A21.53 in the case of ductile iron compact fittings.

2. Lump Sum Contracts

- a. All work shall be included in the CONTRACTOR'S lump sum bid.

E. Gas Lines

1. Unit Price Contracts

a. Gas Lines

- (1) Payment for furnishing, trenching, bedding, laying, and backfilling gas lines shall be included in the unit price per linear foot of pipe laid, including length of fittings and valves. However, payments will not be made for branch lengths of fittings within 2.5 feet of edge of main trench. The extra cost of trenching in difficult locations, such as stream, railroad, and highway crossings, if not covered in other contract unit prices, shall be included in unit price for trenching, laying, and backfilling.

2. Lump Sum Contracts

- a. All work shall be included in the CONTRACTOR'S lump sum bid.

F. Excess Materials

1. The unit prices for trench excavation, tunneling and backfill shall include the cost of disposition of excess excavated materials.

G. Valves

1. The unit price bid for the installation of valves shall include valve boxes, the cost of the concrete collar required around the valve boxes and extension stems if required.

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H. Testing and Purging

1. The unit price bid for installing pressure lines shall include cleaning, purging, and testing the line.

I. Blocking of Bends and End of Pipe

1. The payment for blocking of bends and ends of pipes shall be included in the price bid for furnishing and laying the pipe.

J. Disinfection and Dechlorination

1. The required disinfection of pipelines followed by disposal of the chlorinated water used in the disinfection process shall be included in the price bid for furnishing and laying the pipe.

K. Tracing Wire or Tape

1. The cost of tracing wire or tape installed with nonmetallic pipe shall be included in the price bid for furnishing and installing the pipe.

**END OF SECTION**

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**SECTION 02700**  
**SEWER AND DRAIN PIPE**

**PART 1 GENERAL**

1.01 SUMMARY

- A. All pipe and accessories supplied for use on this project shall be as specified herein.
- B. All pipe supplied for this Project shall be of the pipe material called for on the Drawings.

1.02 RELATED WORK

- A. For cover pipe and boring and/or jacking see Section 02326.
- B. For tunnel liner plates and tunneling see Section 02300.

1.03 REFERENCES

- A. Where referenced specifications (ASTM, AWWA, etc.), are mentioned, these standards are deemed to be the minimum standard of quality of materials or methods to apply to this project.

1.04 SUBMITTALS

- A. Copies of the manufacturer's directions for handling and installing the particular pipe supplied and accepted by the ENGINEER shall be furnished to the ENGINEER at the first delivery of pipe to the project in numbers that will permit the ENGINEER to retain three copies.
- B. The manufacturer's instructions shall be strictly followed unless a conflict exists between the manufacturer's instructions and those contained herein. In such cases, the ENGINEER shall determine which methods are to be followed and no pipe shall be installed until the CONTRACTOR has received written instruction from the ENGINEER as to which procedure to follow.

1.05 QUALITY ASSURANCE

- A. Where pipe enters manholes, the pipe manufacturer shall certify that their pipe is compatible with the watertight, flexible seal to be used at manhole openings as specified in Section 03480 of these Specifications, and that their combined use will produce a flexible watertight installation.

**PART 2 PRODUCTS**

2.01 MANUFACTURERS

- A. All pipe, fittings and jointing materials shall be of one manufacturer unless different types are shown on the Drawings or otherwise accepted by the ENGINEER.

## 2.02 MATERIALS-SEWER AND DRAIN PIPE

### A. Sewer Transition Joints

1. Where sewer pipes of different materials are to be joined, i.e., VC pipe to DI pipe, VC pipe to PVC pipe, or some other combination, an adapter made for this purpose shall be used. The adapter shall be made of polyurethane or polyvinyl chloride with stainless steel clamps and shall be equal to Can-Tex C-T Adapter, Can-Tex Industries, Cannelton, Indiana; or Fernco Adapter by Fernco Joint Sealer Company, Ferndale, Michigan.

### B. PVC (Polyvinyl-Chloride) Sewer Pipe

#### 1. Pipe

- a. PVC pipe 4-inch through 15-inch diameter supplied for use on this project shall be Type PSM Polyvinyl Chloride (PVC) Sewer Pipe as specified per ASTM D 3034. PVC pipe 18-inch through 27-inch diameter shall be as specified in ASTM F 679.
- b. The pipe shall be made of PVC plastic having a cell classification of 12454 as defined in ASTM D 1784. Compounds having different cell classifications due to one or more properties being superior to those of the specified compound are acceptable. Clean rework material, generated from the pipe manufacturer's pipe or fittings production may be used by the same manufacturer provided the reworked products meets the requirements stated herein.
- c. The pipe shall be homogeneous throughout, free of cracks, holes, foreign inclusions or other injurious defects. The pipe shall be uniform in color, wall thickness, density and other physical properties. The maximum laying length for all PVC pipe supplied shall be  $13.0 \pm$  feet. Wall thickness shall be SDR-35 per ASTM D 3034 or ASTM F 679. Marking and identification of pipe shall be per ASTM D 3034 or ASTM F 679 as applicable.
- d. The maximum laying length for all PVC pipe supplied shall be  $13.0 \pm$  feet.
- e. PVC pipe for use on interior piping shall meet the general specification for exterior piping with the socket dimensions conforming to Table 4 of ASTM D 3034.

#### 2. Fittings

- a. PVC fittings supplied for use on this project shall meet all the physical and quality requirements as hereinbefore specified for PVC pipe.
- b. Where 90° bends are used, they shall be the long radius type.

- c. PVC fittings for 4-inch through 15-inch diameter pipe shall meet the dimensional requirements of the tables as shown in ASTM D 3034 except that saddle type wyes or tee branches shall not be allowed for use on new sewer mains. Where 90° bends are used, they shall be the long radius type. PVC fittings for 15-inch through 27-inch diameter pipe shall conform to the requirements of ASTM F 679.
3. Joints - Exterior Piping
    - a. Joints for PVC pipe and fittings for sewer mains and exterior plant gravity sewers shall be of the "Push-On Type" composed of an elastomeric ring gasket compressed in the annular space between a bell end or socket and spigot end of the pipe.
    - b. All surfaces of the bell, socket or spigot end of the pipe against which the ring gasket may bear shall be smooth, free of cracks or other imperfections that could adversely affect the sealing capacity of the joint.
    - c. Lubricant for use in assembling joints shall be supplied with the pipe or be of the specific manufacturer as recommended by the pipe manufacturer for use with the specific pipe supplied. The lubricant shall not cause deterioration of either the elastomeric ring gasket or pipe material.
    - d. Where PVC pipe and fittings are connected to piping of other materials, the manufacturer's standard adapters or transition pieces shall be used. Should manufacturer not produce an adapter for a specific pipe of other material, the adapters or transition fittings as specified in this section of these Specifications shall be used.
  4. Joints - Interior Piping
    - a. Joints for PVC pipe and fittings for interior piping systems shall be the solvent weld type.
    - b. The solvent cement for use with PVC pipe and fittings shall be as specified in ASTM D 2564. The cement shall be provided with the pipe by the pipe manufacturer or be of a specific brand as recommended by the manufacturer of the pipe unless otherwise accepted by the ENGINEER.

## 2.03 SOURCE QUALITY CONTROL

### A. PVC Polyvinyl-Chloride Sewer Pipe

1. Pipe shall be tested and inspected at the factory and inspected at the job site. Testing shall be accomplished in conformance with the following ASTM specifications utilizing the test methods specified therein:

Dimensions	ASTM D 3034 or ASTM F 679 and D 2122
Extrusion Quality	ASTM D 2152
Pipe Stiffness (5%)	ASTM D 2412
Impact Resistance	ASTM D 2444

2. In addition, a typical joint assembly, both gasket type joint and solvent weld joint, shall be tested by a qualified independent laboratory per test requirements of ASTM D 3212. The manufacturer shall submit through the CONTRACTOR sufficient copies of certification and test results for each lot of material represented by shipment to the job site that will permit the ENGINEER to retain 3 copies.

### **PART 3 EXECUTION**

#### **3.01 TRENCH EXCAVATION - SEWER AND DRAIN PIPE**

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

1. All excavation shall be open trenches, except where the Drawings call for tunneling, boring or jacking under structures, railroads, sidewalks, roads or highways.

##### **B. Trees and Shrubs**

1. Trenching shall include all clearing and grubbing, including all weeds, briars, trees and stumps encountered in the trenching, regardless of size. The CONTRACTOR shall dispose of any such material by burning, burial or hauling away or as noted on the Drawings, at no extra cost to the OWNER. Ornamental shrubs, hedges and small trees (3 inches in diameter or less) shall be removed, protected and replanted, at no extra cost to the OWNER.
2. Where pipelines run through wooded terrain, cutting of trees within limits of maximum permissible trench widths, as set forth in this article, will be permitted. However, cutting of additional trees on sides of trench to accommodate operating of trenching machine will not be permitted. The CONTRACTOR shall obtain specific permission of the OWNER before cutting any tree larger than 4 inches in diameter.

##### **C. Existing Utilities**

1. The CONTRACTOR shall determine, as far as possible in advance, the location of all existing sewer, culvert, drain, water, electric, telephone conduits, gas pipes, and other subsurface structures and avoid disturbing same in opening his trenches. In case of sewer, water and gas services and other facilities easily damaged by machine trenching, same shall be uncovered without damage ahead of trenching machine and left intact or removed without permanent damage ahead of trenching and restored immediately after machine has passed, without extra cost to the OWNER. The CONTRACTOR shall protect such existing facilities, including power

and telephone poles and guy wires, against danger or damage while pipeline is being constructed and backfilled, or from damage due to settlement of his backfill. It shall be the responsibility of the CONTRACTOR to inform the customers of utilities of disruption of any utility service as soon as it is known that it has been or will be cut off.

2. Where there is the possibility of damage to existing utility lines by trenching machine, the CONTRACTOR shall make hand search excavation ahead of machine trenching, to uncover same, at no extra cost to the OWNER. Hand trenching is required, at no extra payment, where undue damage would be caused to existing structures and utilities by machine trenching.
3. The work of uncovering and backfilling required for locating existing sewers, water lines and other existing facilities for connection of improvements or avoidance in location of proposed pipeline, where such uncovering and backfilling is not within trench for improvements, shall be paid for at a price per cubic yard for such excavation actually removed and backfilled under item for "Search or Extra Depth Trench Excavation." Such payment does not include uncovering existing utility lines for their protection during or after trenching operations for the proposed pipeline.

#### D. Location of Proposed Pipelines

1. The location of pipelines and their appurtenances, as shown on the Drawings, are those intended for the final construction. However, conditions may present themselves before construction on any line is started that would indicate desirable changes in location. Also, development of property traversed may require location changes. In such cases, the OWNER reserves the right to make reasonable changes in line and structure locations without extra cost, except as may be determined by the application of the unit prices bid to the quantities actually involved. The OWNER is under no obligation to locate pipelines so they can be excavated by machine.

#### E. Trench Requirements

1. All trenches must be dug neatly to lines and grades as shown on the Drawings, as established in the field and/or as established on the cut sheets. Trenches shall be of sufficient width to properly assemble or bolt joints.
2. No additional compensation will be allowed for the extra depth trenching so required below invert.
3. Where bottoms of trench for 6-inch through 16-inch size pipe are in or on solid rock or where concrete cradle or arch is to be used, trenches or tunnels shall be dug to a depth of at least 6 inches below bottom of barrel of pipe. Where in earth, they shall be dug to at least 4 inches below bottoms of pipe barrels and bells.

F. Excavation Unclassified

1. Excavation for pipelines shall be unclassified and the cost of all excavation of whatever nature and state, including solid rock, shall be included in the CONTRACTOR'S unit price bid for furnishing, trenching, laying and backfilling the pipe.
2. Excavation for structures such as manholes, pump stations, and vaults is likewise unclassified and the cost of all excavation of whatever nature and state, including solid rock, shall be included in the CONTRACTOR'S lump sum or unit price bid, as the case may be.
3. Solid rock is defined as materials of one-third cubic yard or more in one location (in a native state or concrete) that rings under the hammer which cannot be removed economically without the use of explosives. Paving removal is excluded; also shale rock.
4. In the event the ENGINEER finds it necessary to specifically order mechanical removal of solid rock, it will be measured by the cubic yard for such materials actually removed limited in depth to required depths of bedding below outside of pipe barrel and in width to the following dimensions:

TABLE 3.01

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For 6" Pipe 2'-6"	For 15" Pipe 2'-10"	For 27" Pipe 4'-0"
For 8" Pipe 2'-9"	For 16" Pipe 2'-11"	For 30" Pipe 4'-4"
For 10" Pipe 2'-9"	For 18" Pipe 3'-2"	For 33" Pipe 4'-7"
For 12" Pipe 2'-9"	For 20" Pipe 3'-5"	For 36" Pipe 5'-6"
For 14" Pipe 2'-9"	For 21" Pipe 3'-6"	For 42" Pipe 6'-0"
	For 24" Pipe 3'-8"	For 48" Pipe 6'-6"
		For 54" Pipe 7'-0"

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5. Mechanical removal of solid rock is defined as solid rock in its native state which is ordered to be fractured and broken up for removal by hand tools and/or hand held power or pneumatic tools to provide protection of utilities, structures, etc. which might otherwise be subject to damage by conventional drilling and shooting or heavy excavating equipment.
6. Payment for mechanical removal will not be authorized for solid rock excavation which is accomplished by drilling and shooting or by crawler or wheel mounted excavators, trenching machine, and similar equipment.

### G. Dewatering of Trenches

1. Dewatering of trenches shall be considered a part of trenching, at no extra cost to the OWNER. Dewatering of trenches shall include ground-water and storm or sanitary sewage. Suitable pumping and other dewatering equipment is to be provided by the CONTRACTOR, to insure the installation of the pipeline structure in a dewatered trench and under the proper conditions. Dewatering shall include all practical means available for prevention of surface runoff into trenches and scouring against newly laid pipe.
2. Piles of excavated materials shall be trenched or temporarily piped to prevent, as far as practical, blockage of drainage ditches and gutters, and water carriage of excavated materials over street and highway surfaces.
3. Where subgrade of trench has insufficient stability to support the pipeline and hold it to its original grade, the ENGINEER may order stabilization by various means. Exclusive of dewatering normally required for construction and instability caused by neglect of the CONTRACTOR, it shall be paid for at unit prices set up in the Contract, such as extra excavation, crushed rock for pipe bedding, concrete cradle or piling.

## 3.02 LAYING SEWER PIPE

### A. General

1. Checking of Pipe
  - a. The selection of pipe strength class shall be based on earth weight of 130 pounds per cubic foot and a safety factory of 1.50.
  - b. All pipe and fittings must be tested for uniform diameter, straightness and defects by the CONTRACTOR before being lowered into trench, and rejected pipe marked in a way not to impair its value. Rejected pipe must be separated from accepted pipe and removed from the project. The ENGINEER will make periodic observations of pipe in storage and/or incorporated into the work. Pipe found defective, not meeting Specifications, or improperly installed shall be rejected and replaced.
2. Alignment and Grade
  - a. All pipe, after being inspected and accepted, shall be laid to correspond with lines and grades staked out by the CONTRACTOR. All sewer lines shall be laid to constant grades between invert elevations shown on the Drawings. Grades shown on the Drawings are invert of pipe and NOT trench subgrade. The pipe lengths shall be fitted together and matched, so that they will form a sewer with a smooth and uniform invert, visible as a full circle from manhole to manhole, except in special cases where curved sewer lines are planned.

3. Unstable Subgrade
  - a. In wet, yielding, and mucky locations where pipe is in danger of sinking below grade or floating out of grade or line, or where backfill materials are of such a fluid nature that such movements of pipe might take place during the placing of the backfill, the pipe must be weighted or secured permanently in place by such means as will prove effective. If crushed rock fill is necessary, it will be paid for per ton of such material used, except in cases where instability is caused by neglect of the CONTRACTOR.
4. Control of Quantities Laid
  - a. Laying of pipe may be held up by the ENGINEER until trench has progressed far enough ahead to remove the possibility of having to change grade or alignment on account of other structures, pipelines or conduits.
  - b. Unless permitted or directed, not less than 100 feet of pipe shall be laid at one operation except for the following reasons:
    - (1) Street and railroad crossings.
    - (2) Wet caving trenches.
    - (3) Business houses or institutions damaged by prolonged disconnection from street.
    - (4) Less than 100 feet distance between manholes or pipe control sections.
5. Bedding of Pipe
  - a. Six-inch through 16-inch pipe shall be laid with bottom quadrant of barrel and bells of pipe bedded in at least 4-inch depth of crushed stone when on earth subgrade and in at least 6-inch depth of crushed stone, below the bottom of the barrel of pipe when on solid rock subgrade. Stone for bedding of 6 inch through 16-inch pipe shall be Kentucky Department of Highways Size 9 crushed rock as specified in Section 02235 of these Specifications, spaded into place. It shall be included in price for furnishing and laying pipe. Payment for the extra stone required for bedding pipe in solid rock for 6-inch through 16-inch pipe shall be included in the price bid for solid rock excavation in the case of classified excavation and in the price bid for trenching and backfilling in the case of unclassified excavation.
  - b. For PVC or polyethylene pipe, alternate bedding materials will be allowed with permission of the ENGINEER. In order to qualify for use with sewer pipes of these compositions, the bedding material must be of the type of material delineated as Class IA embedment



materials per Table 1 of ASTM D 2321, namely, coral, slag, cinders, crushed stone or crushed shells. The alternate bedding materials must also be of the same gradation of the crushed stone previously specified, namely, Kentucky Department of Highways Size 9. The crushed stone previously specified shall be used for all other piping materials.

- c. No filling of trench with earth to bring pipe to grade will be permitted. If trenches are dug too deep, they must be brought to grade and supported by crushed rock for pipe bedding (No. 9) as specified in Section 02235 of these Specifications at the CONTRACTOR'S expense. No pipe shall be laid in the trench until the subgrade is inspected and found correct.

6. Laying of Pipe (Mains)

- a. Laying crew foreman shall direct subgrade preparation and plumbing and leveling invert of pipe to grade and line, the pipe layer following his directions in placing the pipe. The pipe layer will be responsible for pipe bedding, cleaning joint, proper placement of joint annular ring or gasket, tight jointing and homing pipe, securing pipe against settlement or other movement, and inspecting and swabbing out any jointing material from inside of pipe.
- b. No joints will be accepted that show leakage and, after backfilling and inspection, any joints are found that are allowing groundwater to enter the sewer must be excavated and repaired.
- c. Plugs in branch fittings to future building sewers shall be protected from excavators by the method as shown on the Drawings for protecting the ends of laterals and shall be so constructed and joined in bell of pipe that they will be watertight, yet removable without breaking the bell or coupling when removed.

7. Piping Connections at Structures

a. Plants

- (1) Nonpressure pipes entering structures underground, unsupported by original earth for a distance of more than 3 feet shall be supported by Class 2500 concrete, where depth of such support does not exceed 3 feet. All pipes entering buildings or basins below original ground, which are more than 3 feet above structure subgrade and/or have a 3-foot span between wall and original earth, and have cover of more than 24 inches of earth or under roadway, shall be supported by concrete beams under them as shown on the Drawings with columns each 6 feet between structural wall and edge of excavation for the structure in

order to prevent breakage from settlement of backfill about the structure. Concrete and reinforcing steel for such support are to be included in the lump sum portion of the Contract and not as extra concrete. Sewers entering structures shall have flexible joint within 16 inches of exterior of structure.

8. Protection of Pipe in Trench

- a. No walking upon the completed pipelines will be permitted until trench has been backfilled to a depth of at least 6 inches over the top of the pipe. The interior of the pipe shall, as the work progresses, be cleaned of all dirt, jointing materials, and superfluous materials of every description. When laying of pipe is stopped for any reason, the exposed end of such pipe shall be closed with a suitable plug fitted into the pipe bell, so as to exclude earth and other material, precautions being taken to prevent flotation of pipe by runoff into trench.

9. Observation of Pipeline

- a. No backfilling (except for securing pipe in place) over pipe will be allowed until the ENGINEER has had an opportunity to observe the joints, alignment and grade, in the section laid, but such observation shall not relieve the CONTRACTOR of further liability in case of defects occurring during or after placement of backfill.

3.03 FIELD QUALITY CONTROL - TESTING SEWERS FOR LEAKS, INFILTRATION, AND DEFLECTION

A. Drains and Storm Sewers

1. It is not the intent herein that drains and storm sewers shall be constructed watertight. If, however, groundwater flows are observed in the pipeline in fairly large quantities, the ENGINEER may require infiltration tests, as herein specified, to be completed in order to determine the amount of groundwater entering the completed pipeline. Should leakage result in a volume flow exceeding 500 gallons per inch diameter per mile of pipe per 24 hours, the CONTRACTOR shall be required to locate and repair leaks occurring in the system.
2. Culverts and cross drains shall be inspected visually for groundwater leakage.

3.04 BASIS OF PAYMENT

A. Excavation and Backfilling

1. Trenching and Backfilling

a. Lump Sum Contracts

(1) The CONTRACTOR'S lump sum bid shall include all costs for trenching and backfilling.

2. Solid Rock Excavation

a. Unclassified Excavation

(1) Excavation shall be unclassified and the cost of all excavation of whatever nature and state, including solid rock, shall be included in the CONTRACTOR'S unit price bid for each item of construction requiring excavation.

3. Search and Extra Depth Trench Excavation

a. "Search" trench excavation shall be the actual measured excavation within limits as acceptable to the ENGINEER.

b. "Extra Depth" trench excavation shall be the calculated yardage below the lowest point of excavation which would normally have been required for construction.

c. Trench width limitations for either condition shall be as listed in the following table:

For 6" Pipe 2'-6"	For 15" Pipe 2'-10"	For 27" Pipe 4'-0"
For 8" Pipe 2'-9"	For 16" Pipe 2'-11"	For 30" Pipe 4'-4"
For 10" Pipe 2'-9"	For 18" Pipe 3'-2"	For 33" Pipe 4'-9"
For 12" Pipe 2'-9"	For 20" Pipe 3'-5"	For 36" Pipe 5'-6"
For 14" Pipe 2'-9"	For 21" Pipe 3'-6"	For 42" Pipe 6'-0"
	For 24" Pipe 3'-8"	For 48" Pipe 6'-6"
		For 54" Pipe 7'-0"

d. Payment shall be by the cubic yard removed, including backfilling.

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B. Trench and Pipe Stabilization

1. Extra Excavation

- a. Extra excavation required for trench or pipe stabilization shall be paid by the cubic yard so excavated under the item "Search and/or Extra Depth Trench Excavation" based on the limitations for that item.

2. Crushed Stone for Trench Stabilization

- a. Crushed stone ordered by the ENGINEER for trench stabilization shall be paid by the ton so placed.

3. Crushed Stone for Pipe Bedding

- a. Additional crushed stone bedding ordered by the ENGINEER for pipe stabilization shall be paid by the ton so placed.

C. Sewer and Drain Pipe and Accessories

1. Lump Sum Contracts

- a. All work shall be included in the CONTRACTOR'S lump sum bid.

**END OF SECTION**

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## SECTION 02830

### FENCING

#### PART 1 GENERAL

##### 1.01 SCOPE OF WORK

- A. Provide all labor, materials, equipment and services required to install fencing as shown on the Contract Drawings and as specified herein.

##### 1.02 RELATED WORK

- A. Special sequence or schedule requirements (if any) are specified in Section 01010 - Summary of Work.
- B. Concrete is specified in Division 3.

##### 1.03 QUALIFICATIONS

- A. The fencing shall be furnished and installed by a manufacturer and supplier who are reputable and qualified in the design, fabrication, and installation of fencing in accordance with best practices and methods.

##### 1.04 SUBMITTALS

- A. Shop drawings and other items needed to establish compliance with the Drawings and these Specifications shall be submitted to the ENGINEER in accordance with Section 00700.

##### 1.05 SYSTEM WARRANTY

- A. Refer to Division 0 and 1 for warranty requirements.

#### PART 2 PRODUCTS

##### 2.01 SECURITY FENCING

###### A. General

- 1. Fencing shall be woven wire, chain link type, and shall be 8 feet high overall. Fabric shall be 7 feet high with 1 foot of height of 3-strand barbed wire overhanging outside at a 45 degree angle.

###### B. Fittings

- 1. All fittings necessary to make a complete installation shall be malleable iron, pressed steel, aluminum or forgings. All ferrous materials shall be thoroughly galvanized by the hot dip method as specified in ASTM A 525-81.

**TABLE 1**  
**CHAIN LINK FRAMEWORK TABLE**  
**(Schedule 40)**

Size Pipe	Weights Lbs. Per Ft.	Depth	Concrete Diameter
1 5/8" O.D.	2.27 lbs.		
2" O.D.	2.72 lbs.		
2 1/2" O.D.	3.65 lbs.	30"	10 Inches
3" O.D.	5.79 lbs.	3 Ft.	12 Inches
4" O.D.	9.11 lbs.	3 Ft.	12 Inches
6 5/8" O.D.	8.97 lbs.	4 Ft.	14 Inches
8 5/8" O.D.	5.00 lbs.	4 Ft.	16 Inches

#### C. Corner, Terminal and Pull Posts

1. Corner, terminal and pull posts shall be hot galvanized inside and outside at a rate of 2.0 oz per square foot of actual surface area. The 3-inch outside diameter seamless steel pipe shall weigh 5.79 pounds per foot and extend 3 feet below ground level. The posts shall extend high enough to allow attachment of barbed wire by 3 tension bands equally spaced to give a uniform appearance. All posts shall be capped with a heavy malleable iron top, of bullet type construction, to exclude moisture.
2. SS-40 pipe, as manufactured by Allied Tube and Conduit Corp. or equal, may be substituted for Schedule 40 pipe. The SS-40 pipe sizes may be less than the Schedule 40 sizes but shall have greater strength.

#### D. Line Posts

1. Line posts shall be 2-1/2 inch diameter high carbon seamless steel pipe, hot galvanized inside and outside at a rate of 2.0 oz per square foot of actual surface area. The 2-1/2 inch pipe shall weigh 3.65 lbs per foot and extend 30 inches below ground level. Line posts shall be capped with a barbed wire extension arm as specified herein.
2. SS-40 pipe, as manufactured by Allied Tube and Conduit Corp. or equal, may be substituted for Schedule 40 pipe. The SS-40 pipe sizes may be less than the Schedule 40 sizes but shall have greater strength.

#### E. Rails

1. Top rails and brace rails shall be 1-5/8 inch outside diameter seamless steel tubing, weighing 2.27 pounds per foot, hot galvanized at a rate of 2.0 oz. per square foot of actual surface area. Rails shall be not less than 20 feet in length jointed with extra long pressed steel sleeves as specified herein.

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2. SS-40 pipe, as manufactured by Allied Tube and Conduit Corp. or equal, may be substituted for Schedule 40 pipe. The SS-40 pipe sizes may be less than the Schedule 40 sizes but shall have greater strength.

F. Fabric

1. The fabric shall be aluminum coated steel to meet ASTM A 491-80 composed of individual wire pickets, helically wound and interwoven from No. 9 gauge steel wire to form a continuous chain link fabric having a 2-inch mesh. Both the top and bottom edges shall be twist construction. Basic steel wire shall conform to the following:

Carbon	.18 - .31
Manganese	.60 - .90
Phosphorous	.040 Max.
Sulphur	.050 Max.

2. The aluminum coating weight shall be a minimum of 0.40 ozs per square foot of wire surface. The breaking strength of the aluminum coated wire shall be a minimum of 1,290 ft-lbs

G. Chain Link Special Appurtenances (Per ASTM F 626-79)

1. Each line post shall be capped with a hot dipped galvanized barbed wire extension arm capable of passing top rail. The arm shall be of pressed steel riveted to a malleable iron base at a 45 degree angle for carrying three strands of barbed wire.
2. Brace and tension bands shall be beveled edge type fabricated from pressed steel or aluminum. Steel bands shall be hot dipped galvanized with a minimum of 1.2 oz of zinc coating per square foot of surface area. Brace bands shall be a minimum of 12 gauge in thickness and a minimum width of 3/4-inch or 19.05 mm. Tension bands shall be a minimum of 14 gauge with a minimum of 3/4-inch or 19.05 mm in width.
3. All post caps and rail ends shall be designed to fit snugly over post and prevent moisture from entering the inside of the tube. Post caps shall be fabricated from malleable iron, pressed steel or aluminum. Line post caps shall be designed to allow top rail to pass through. All ferrous materials shall be thoroughly galvanized by the hot dip method with a minimum of 1.2 oz of zinc coating per square foot of surface area.
4. Top rail sleeve shall be fabricated from pressed steel or round steel tubing. Sleeve shall be hot dip galvanized with a minimum of 1.2 oz. of zinc coating per square foot of surface area. The design of the sleeve shall be such that no movement along the rail can take place upon installation.
5. Tension bars for attaching fabric to terminal post shall be a minimum of 3/16-inch thickness by 3/4-inch in width. The length shall be a minimum of 2 inches less than the full height of the chain link fabric.

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6. Truss rods shall be a minimum of 5/16 inch in diameter fabricated from merchant quality steel rod and hot dip galvanized with a minimum of 1.2 oz of zinc coating per square foot of surface area. All rods shall be designed and equipped with a truss tightener.
7. Aluminum ties shall be used for attaching fabric to top rail, brace rails and line post. The aluminum ties shall be 9 gauge round wire of Alloy 1100-H 14 or equal.
8. Carriage bolts shall be hot dip galvanized or aluminum, 5/16-inch x 1-1/4 inch, with nut and shall be used in conjunction with brace and tension bands. Galvanized bolts and nuts shall be coated in accordance with ASTM A 153-80. Larger bolts as required at gates or latches shall be galvanized coated in accordance with ASTM A 153-80.

## 2.02 FARM WIRE FENCING

### A. General

1. Fencing shall be farm type fabric with 2 strands of galvanized barbed wire stretched between 9 inch diameter treated pine corner and/or pull posts set in concrete. Intermediate or line posts shall be 5-1/2 inch diameter treated pine post or standard painted steel tee section post spaced on 8-foot centers. Every third post shall be a 5-1/2 inch diameter treated pine post. The corner posts shall be braced from the center of corner posts to the center of a 6-inch diameter treated pine brace post located 8 feet from the corner post. Bracing shall be provided with a 4-inch diameter treated pine post keyed and doweled in place. Cross bracing shall be accomplished with 3 strands of No. 9 gauge galvanized brace wire wrapped from top of brace post to bottom of corner post. The tensioning adjustment shall be made with an extra heavy galvanized turnbuckle attached to a 3/4-inch eye bolt through the 9-inch corner post. The brace wire shall be tightened to a taut position and locked in place by a method acceptable to the ENGINEER.
2. Layouts of fencing and gate are as shown on the Drawings. Copies of shop drawings and descriptive literature of fencing materials shall be submitted to the ENGINEER for review and acceptance prior to the use of materials.

### B. Material

1. Fence fabric shall be farm type 1047-6-9, 10 wires horizontal, 47 inches high, 6-inch stays with No. 9 gauge wire throughout with Class 2 (0.60 oz/ft) galvanized coating per ASTM A 116-81.
2. Barbed wire shall be 2 strands each of two No. 12-1/2 gauge twisted copper bearing steel wires, hot galvanized after weaving, with No. 14 gauge aluminum 4 point barbs spaced not more than 4 inches apart. The zinc coated (galvanized) steel barbed wire shall be produced and tested in accordance with ASTM A 121-81 for Class 2 coating (0.50 oz per ft).



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3. Wood line posts shall be 5-1/2 inches diameter x 7 feet-6 inches long pressure treated pine in accordance with the American Wood Preserver's Association Standard C5-81.
4. Steel line post shall be the standard painted steel tee section, 7 feet-6 inches long, with hooks to clasp wire.
5. Corner posts shall be 9 inch diameter x 9 feet long pressure treated pine in accordance with the American Wood Preserver's Association Standard C5-81.
6. Farm gate shall be made of tubular construction from 1-1/2 inch O.D. pregalvanized pipe, 50 inches in height with 7 bars horizontally with spacing being closer toward the bottom.

## 2.03 FARM PLANK FENCING

### A. General

1. Fencing shall be farm type, 4 board treated rough oak planks, treated wood posts (40 penetration) set on 7.81-foot (7-foot-10-inch) centers with a treated wood batten at each post. The fence shall be 54 inches in height with a 7-inch gap between each board. The layout of the fence line and gates shall be as shown on the Drawings.

### B. Material

1. All posts shall be 5-1/2 inch diameter, 7 feet-6 inches long pressure treated to 0.40 penetration (min.) in accordance with the American Wood Preserver's Association Standard C5-81. All posts shall be uniform without bows or crooks. The ENGINEER reserves the right to reject any post not meeting the above stated requirements.
2. Planks shall be rough cut oak with the minimum dimensions of 6 inches wide, 1 inch thick and running 16 feet in length, pressure treated to 0.40 penetration per requirements established by the American Wood Preserver's Association C5-81.
3. Post bats shall be used at each post to cover joints. The bat shall be flush with the top of top plank and extend 2 inches below bottom plank of fence. Bats shall meet the same quality requirements for wood and preservatives as specified for planks.

## PART 3 EXECUTION

### 3.01 DELIVERY, STORAGE AND HANDLING

- A. Special provisions for material and equipment are given in Section 01600.

### 3.02 SITE PREPARATION

- A. The location of fence lines, gates and terminal posts shall be as shown on the Drawings. Prior to construction the CONTRACTOR shall locate and flag all underground utilities in or about the fence construction. Adequate clearing and grading shall be done prior to fence construction.

### 3.03 SECURITY FENCE INSTALLATION

#### A. Posts

- 1. All posts shall be set 10 feet or less on centers equally spaced between pull posts in a hole filled with concrete as required per Table 1. All concrete shall be left 2 inches below grade to allow for cover with sod, blacktop or other cover material. Posts shall be accurately lined and plumbed. Intermediate pull posts with bracing shall be equally spaced when a straight run becomes greater than 300 feet in length. If solid rock is encountered, excavation shall be at no extra cost to the OWNER.

#### B. Terminal, Gate, Pull and Corner Post Bracing

- 1. A center rail is required with horizontal braces and truss rod to adjacent line post, securely fastened with adequate adjustment.

#### C. Top Rail

- 1. The top rail shall run through the openings in the line post tops on a continuous grade uniformly parallel with the ground surface. Connection to the corner, gate, terminal and pull posts shall be with brace bands and rail ends. Offsets at corners will not be permitted.

#### D. Fabric Stretching

- 1. Two stretcher bars shall be threaded through the fabric from top to bottom at a location in the center of the fence section to be stretched. The bars shall be adequately spaced such that when stretched the installer has room to thread a loose picket link down through the meshing links of the 2 ends to make a perfect jointing. The stretching shall be done with 2 blocks and when released the fabric shall be taut along any point of the fence line. The top selvage shall be dressed above the top rail and the fabric secured with tie wires spaced not more than 24 inches apart and uniformly tied. The fabric shall be fastened to the line posts with specified tie wires spaced not more than 14 inches on center uniformly tied.

#### E. Barb Wire Stretching

- 1. Block and tackles and come along shall be used to string barbed wire. Wire shall be placed in the openings provided in the barb arms, and locked in place by sliding the locking wire down inside the V-channel and over the barbed wire.

F. Repair of Galvanized Surfaces

1. Galvanized surfaces damaged by welding or other reasons shall be repaired according to Federal Specification MIL-P-21035 (Galvanizing Repair Spec.) as follows:
  - a. Remove foreign matter from both damaged and contiguous undamaged area by wire brushing and cleaning with metal conditioner recommended by cold galvanizing coating manufacturer.
  - b. Apply 2 coats of cold galvanizing coating to damaged area, ensuring an overlap of the surrounding undamaged galvanizing for continuity of galvanic protection. Cold galvanizing coating shall be Z.R.C. Chemical Products Co., "Z.R.C. Cold Galvanizing" or Galvicon Corp., "Cold Galvanizing," or equal.

3.04 FARM WIRE FENCING INSTALLATION

A. Corner Posts

1. Corner posts shall be placed, true to line and plumb at least 36 inches in the ground in concrete according to the concrete requirements shown in Table 2 in this group of the Specifications. All corner posts shall be braced to the first line post or brace post. This post shall be a standard specified 6-inch diameter wood post set in concrete in accordance with Table 2 of this group of the Specifications. Bracing shall be with a 4-inch diameter post keyed and doweled from center of corner post to the center of brace post. Wire cross bracing shall be with 3 strands of No. 9 gauge galvanized brace wire wrapped from bottom of corner post to top of brace post. Adjustment on the brace wire shall be with an extra heavy galvanized turnbuckle attached to a 3/4-inch eye bolt through the 9-inch corner post. The brace wire shall be tightened to a taut position and locked in place.

B. Line Posts

1. All line posts shall be placed on 8 foot centers at least 30 inches in the ground true to line and plumb. Wood line posts shall be either driven into place or set in an augered hole. If augered, the hole shall be backfilled with dense graded aggregate (DGA), and hand tamped until post is tight. Mechanically tamped earth backfill will also be acceptable. Steel line posts shall be driven into place by an acceptable method which prevents damage to post.

C. Gate Posts

1. Gate posts shall be placed true to line and plumb at least 36 inches in the ground and set in concrete in accordance with concrete requirements per Table 2 of this group of the Specifications. All gate posts shall be braced back to first line post or brace post. This post shall be a 6-inch diameter

treated wood post set in concrete. Bracing shall be with a 4-inch diameter post keyed and doweled from bottom of gate post to top of brace post. Wire bracing shall be with 3 strands of No. 9 gauge galvanized wire wrapped from bottom of corner post to top of brace post. Adjustment on the brace wire shall be with an extra heavy galvanized turnbuckle attached to a 3/4-inch eye bolt which shall be bolted through the 9-inch corner post. The brace wire shall be tightened to a taut position and locked in place.

D. TABLE 2: Concrete Requirements for Corner, Brace and Gate Posts

Description	Depth	Concrete Dia.
9" Corner Post	3 Ft.	16 Inches
6" Brace Post	3 Ft.	12 Inches
9" Gate Post	3 Ft.	16 Inches
9" Pull Post	3 Ft.	16 Inches

E. Fabric

1. Fence fabric shall be stretched taut between corner posts, intermediate pull posts and/or gate posts. No splicing will be permitted. Fabric shall connect to corner posts, pull posts or gate posts by wrapping the horizontal wire strands twice around post before connecting to line fabric. Fabric shall be fastened to wood line post with 1-1/4 inch staples at a rate of 1 per horizontal strand. Wire hooks or ties shall be used to secure fabric to steel line posts.

F. Hanging Gates

1. Gates shall be swung plumb and level and high enough to prevent dragging. Latches shall be properly fitted and firmly secured to posts. Means shall be provided for latching as well as retaining gate in the open position.

G. Barbed Wire Stretching

1. The 2 strands of barbed wire shall be stretched to accepted tension with stretchers specifically manufactured for that purpose. All strands shall be double stapled to each wood line post and tied at each steel line post. OWNER may require at no extra cost, for strands of barbed wire to be alternated on each side of posts.

3.05 FARM PLANK FENCING INSTALLATION

A. Posts

1. All posts shall be placed at least 30 inches in the ground true to line and plumb on 7.81-foot (7-foot-10-inch) centers. Posts shall be either driven in place or set in augered hole. If augered, each hole shall be backfilled

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with dense graded aggregate (DGA) hand tamped until post is tight. Mechanically tamped earth backfill will also be acceptable.

**B. Planks**

1. Plank ends shall be trimmed where cracking exists. Top plank or top rail shall be installed first by temporarily tacking in order to check alignment. Adjustment shall be made if a smooth flowing fence is not attained. Once the top rail has been installed to the ENGINEER'S satisfaction the CONTRACTOR shall install the remaining 3 planks. Each board shall be nailed with three #10 screw type nails per post.
2. The battens shall be placed at each post to cover post and plank joints. They shall be flush with top rail and be nailed with #10 screw type nails, 2 at the top, 2 at the bottom and 2 in the middle.

**3.06 CLEANUP**

- A. CONTRACTOR is responsible for removal of all excess material, earth, etc. due to fence construction.
- B. Earth shall be slightly mounded around each post to enhance drainage.

**3.07 METHOD OF PAYMENT**

- A. Payment for all fencing work under this Contract shall be included in the CONTRACTOR's lump sum price, unless otherwise specified on the bid form and in the Contract Agreement.

**END OF SECTION**

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**SECTION 02930**  
**SODDING AND SEEDING**

**PART 1 GENERAL**

1.01 SCOPE OF WORK

- A. Provide all labor, materials, equipment and services required to perform seeding as shown on the Contract Drawings and as specified herein.
- B. All areas disturbed by construction operations shall receive a protective cover of vegetation. The work shall consist of preparing the area for treatment, furnishing and placing soil amendments, fertilizer, sod, seed, inoculants, mulch and plantings as specified in the designated areas.

1.02 RELATED WORK

- A. Special requirements for materials and equipment are given in Sections 00700 and 01600.
- B. Special sequence or schedule requirements (if any) are specified in Section 01010 - Summary of Work.

1.03 QUALIFICATIONS

- A. The work shall be done by a provider who is experienced, reputable, and qualified in the tasks required.

1.04 SUBMITTALS

- A. Shop Drawings and other items needed to establish compliance with the Drawings and these Specifications shall be submitted to the ENGINEER in accordance with Section 00700.
- B. Where fertilizer is furnished from bulk storage, the CONTRACTOR shall furnish a supplier's certification of analysis and weight. When required by the Contract, a representative sample of the fertilizer shall be furnished the OWNER for chemical analysis.

1.05 WARRANTY

- A. Refer to Division 0 and 1 for warranty requirements.

**PART 2 PRODUCTS**

2.01 SEED

- A. All seed shall conform to the current rules and regulations of the state where it is being used and from the latest crop available. It shall meet or exceed the standards for purity and germination listed herein.

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- B. Seed shall be labeled in accordance with the state laws and the U.S. Department of Agriculture Rules and Regulations under the Federal Seed Act in effect on the date of invitations for bids. Bag tag figures will be evidence of purity and germination. No seed will be accepted with a date of test of more than 9 months prior to the date of delivery to the site.
- C. The seed for use on this project shall be of the type as listed below with the listed germination and purity qualifications.

<u>Species</u>	<u>% Purity</u>	<u>% Germination</u>
Tall fescue (KY-31) ( <u>Festuca arundinacea</u> )	98.5	80
Ryegrass ( <u>Lolium multiflorum</u> )	98.0	90
Oats ( <u>Avena sativa</u> )	98.0	90
Rye, grain ( <u>Secale cereale</u> )	97.0	85
Redtop ( <u>Agrostis alba</u> )	90.0	80
Ky. Bluegrass ( <u>Poa pratensis</u> )	81.0	70

#### 2.02 FERTILIZER

- A. Unless otherwise specified the fertilizer shall be a commercial grade fertilizer or as specified herein. The fertilizer shall meet the standard for grade and quality specified by state law.

#### 2.03 INOCULANTS

- A. The inoculant for treating legume seeds shall be a pure culture of nitrogen-fixing bacteria prepared specifically for the species and shall not be used later than the date indicated on the container or as otherwise specified. A mixing medium, as recommended by the manufacturer, shall be used to bond the inoculant to the seed. Two times the amount of the inoculant recommended by the manufacturer shall be used, except when seed is applied by use of hydraulic seeder, in which case 4 times the amount of inoculant recommended by the manufacturer shall be used. Seed shall be sown within 24 hours of treatment and shall not remain in the hydraulic seeder longer than 4 hours.

#### 2.04 SOIL AMENDMENTS

- A. Lime shall consist of standard ground agricultural limestone, or equal. Standard ground agricultural limestone is defined as ground limestone meeting current requirements of the State Department of Agriculture. Agricultural lime or other needed soil amendments will be uniformly applied at the rate specified herein.

#### 2.05 ASPHALT EMULSION

- A. Asphalt emulsion shall conform to the requirements of ASTM D 977-80, "Emulsified Asphalt." The emulsified asphalt may be rapid, medium, or slow cure materials.

## 2.06 STRAW MULCH MATERIALS

- A. Straw mulch materials shall consist of wheat, oat, or rye straw, hay, grass clippings cut from any native grasses or other plants acceptable to the ENGINEER. The mulch material shall be air dry, reasonably light in color, and shall not be musty, moldy, caked, or otherwise of low quality. The use of mulch that contains noxious weeds will not be permitted. The CONTRACTOR shall provide a method satisfactory to the ENGINEER for determining weight of mulch furnished.

## 2.07 OTHER MULCH MATERIALS

- A. Mulching materials, such as wood cellulose fiber mulch, emulsion type, synthetic fiber mulch, netting, mesh, and other mulching materials that may be required for specialized locations and conditions, when specified, must be accompanied by the manufacturer's recommendations for methods of application.

## PART 3 EXECUTION

### 3.01 EXTENT

#### A. Lump Sum Contracts

##### 1. Seeding

- a. Except for areas occupied by structures, roadways, walkways, and sodded areas specified above, the entire area disturbed by construction operations shall be seeded.

#### B. Unit Price Contracts

##### 1. Seeding

- a. Where lawns, pastures, thin grass or cover crops are destroyed by trenching, laying, backfilling, or tunneling operations, surface shall be prepared by disking, fertilizing and seeding. Seeding, fertilizing, and mulching shall be included in the price for trenching and backfilling. The timing of this operation shall be controlled by the ENGINEER. Requirements of the Department of Highways for reseeding shall take precedence over these Specifications where they are involved.
- b. When the construction project is located on privately owned property on easements acquired by the OWNER and the individual landowner requires the cover grass to be the same as present at the beginning of construction, the CONTRACTOR shall supply the seed required by the landowner. Seeding and fertilizing in such instances, shall be at the rate as recommended by the seed producer with soil preparation and mulching as stated herein.



- c. When the construction project encroaches within the rights-of-way of the Department of Highways, the seed mixture, application rate and method of mulching shall be as required by the Department of Highways.

2. CONTRACTOR'S Options

- a. Where surface grasses and cover are similar in nature throughout the length of the project, the CONTRACTOR may provide seed of one type or mixture for the entire project provided there are no objections by individual landowners involved and with permission of the OWNER and ENGINEER. In such cases, the seed type and/or mixture shall be that specified for lawn areas. Pasture and/or cover crop mixtures shall not be used for lawn application for any reason.
- b. When construction facilities or construction operations are located on or encroach on privately owned properties, the CONTRACTOR may, at his election, negotiate with the individual landowners for restoration of the surface. This negotiation and settlement may be for materials or labor or both as agreeable to the individual property owner. In such cases, the CONTRACTOR shall obtain from the individual landowner a "Release of Claims" releasing the OWNER from any further liability for surface restoration, a copy of which shall be provided for the OWNER and ENGINEER. This option shall apply to surface restoration only. The CONTRACTOR shall be responsible for cleanup and regrading work and for any settlement of the trench or graded area within the one year guarantee period.

3.02 SOIL PREPARATION

- A. All areas to be seeded or sodded shall be thoroughly cleaned, removing all debris of whatever nature. After the area has been cleaned, the soil for seeding and sodding shall be prepared as follows:
  - 1. Loosen the soil to a depth of not less than 4 inches.
  - 2. Work the soil until it is in good condition, raking with hand rake to complete the soil preparation and make final finished grade.
  - 3. Broadcast 15 pounds of 8-8-8 or better fertilizer on each 1,000 square feet of area (for sodded areas only).
  - 4. Rake area to receive sod, to spread fertilizer and work into soil.
  - 5. On areas to be seeded, the raking in of fertilizer may be done concurrently with raking in of seed as hereinafter specified.

### 3.03 SEEDING

#### A. Temporary Cover (All Areas)

1. This item shall consist of seeding a temporary cover of grass, or grass and small grain, on areas disturbed on the construction site which will not be redisturbed within a 60 day period. The determination of the area to be temporarily seeded and the time of seeding shall be controlled by the ENGINEER.
2. The seed mixtures to be used for temporary cover will be governed by the time of year the seeding is accomplished. The mixtures and time of seeding shall be as follows:
  - a. Time of Seeding - 2/15 to 6/1
    - (1) Rye 1-1/2 bushels and ryegrass 25 pounds per acre; or tall fescue 30 pounds and ryegrass 20 pounds per acre.
  - b. Time of Seeding - 6/2 to 8/15
    - (1) Tall fescue 30 pounds and ryegrass 20 pounds per acre; or, spring oats 2 bushels and ryegrass 30 pounds per acre.
  - c. Time of Seeding - 8/16 to 2/14
    - (1) Rye 2 bushels and ryegrass 20 pounds per acre; or, tall fescue 30 pounds and ryegrass 20 pounds per acre.
  - d. Lime will not be required for temporary seeding.
  - e. Fertilize at the rate of 400 pounds per acre of 10-10-10 fertilizer, or equivalent, broadcast uniformly on the area to be seeded.
  - f. All seed shall be broadcast evenly over the area to be seeded and cultipacked or otherwise pressed into the soil. Seed and fertilizer may be mixed together and applied after the seed bed has been prepared.
  - g. Mulch for temporary seeding will not be required except on those areas, in the ENGINEER'S opinion, too steep to hold the seed without protective cover.

#### B. Seeding (Permanent Cover)

1. This item consists of seeding all areas disturbed during construction. All grading and/or filling of rills and gullies to a cross section acceptable to the ENGINEER shall be included in the seed bed preparation.

- a. Pastures and Cover Crops
  - (1) All areas to be seeded shall be seeded with 50 pounds of tall fescue (KY-31) per acre, subject to the provisions hereinbefore stated in this Specification group.
  - (2) Prepare seed bed as specified in Article 3.02 of this Specification Section unless instructed otherwise by the ENGINEER. Apply 2 tons of lime per acre.
  - (3) No mulch will be required except when seeding is done during the period October 16 through January 31, or May 2 through July 31, tall fescue straw shall be used at the rate of 2 tons per acre.
- b. Lawns and Yards
  - (1) This item consists of seeding all areas equivalent to residence lawns or yards disturbed during construction. All grading and filling shall be accomplished in a manner acceptable to the ENGINEER prior to the placement of seed and materials. Seed shall consist of a mixture of one part Red Top and 3 parts high grade Kentucky Bluegrass seed mixed together and broadcast at the rate of 2 lbs to each 1,000 square feet of surface, to be seeded. Apply 2 tons of lime per acre. Apply 1500 pounds of 10-20-20 fertilizer per acre. Apply mulch at the rate of 2 tons per acre. Mulch shall be applied to all lawn areas regardless of the time seeded.

### 3.04 MULCHING

- A. Mulch materials, meeting the requirements of Part 2 of this Specification Section, shall be applied at the rate of 2 tons per acre.
- B. The mulch shall be stabilized by running a "weighted" disk harrow with disks set straight, over the area on the contour, after the mulch has been applied, so as to imbed or press a part of the straw into the soil sufficiently to hold it in place. On earth embankments or areas too steep for use of mechanized equipment, the mulch shall be held in place by using small stakes and twine or other method acceptable to the ENGINEER. The blown-on bituminous-treated straw mulch method of placing the mulch, as specified in Section 212.06.03, Method 2 of the Standard Specifications for Road and Bridge Construction of the Kentucky Transportation Cabinet Department of Highways, will be an acceptable placing method.
- C. Mesh, netting or other special protective cover shall be at locations as shown on the Drawings and shall be installed according to the manufacturer's recommendations.

**END OF SECTION**

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**SECTION 03300**  
**CAST-IN-PLACE CONCRETE**

**PART 1 GENERAL**

**1.01 SCOPE OF WORK**

- A. Work Included: Provide all labor, material, equipment and services to complete all cast-in-place concrete work required by the Project, shown on the Drawings or herein specified, including generally the following:
1. All concrete work shown on Drawings.
  2. Exterior concrete pavements and walks; concrete curbs.
  3. Reinforcing steel and welded wire fabric.
  4. Concrete accessories.
  5. Built-in work furnished under other Sections, including setting and placing unless otherwise specified.
  6. Openings, chases, pockets, blockouts required for work of other Sections.
  7. Construction, contraction (control) and expansion joints.
  8. Forming, finishing, curing and patching.
  9. Granular base course under all exterior pavements and walks.
  10. Moisture barrier under interior slabs-on-grade as specified.
  11. Sealing of joints in exterior concrete pavements and walks.

**1.02 CODES AND STANDARDS**

- A. Conform to the following:
1. ACI 318-89, "Building Code Requirements for Reinforced Concrete."
  2. Governing Building Code. Comply with all requirements of the governing building code that are more stringent than the above-referenced codes, standards and Specifications.
  3. ACI SP-15 (89), Field Reference Manual. A copy of this publication must be kept in the field office at all times during concrete construction.
  4. ACI 304, Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.
  5. ACI 311, Recommended Practice for Concrete Inspection.

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6. ACI 211.1 Recommended Practice for Selecting Proportions for Normal and Heavyweight Concrete.
  7. ACI 214, Recommended Practice for Evaluation of Compression Test Results of Field Concrete.
  8. ACI 305, Recommended Practice for Hot Weather Concreting.
  9. ACI 306, Recommended Practice for Cold Weather Concreting.
  10. ACI 308, Recommended Practice for Curing Concrete.
  11. ACI 309, Recommended Practice for Consolidation of Concrete.
  12. AASHTO M 182, Burlap Cloth Made from Jute or Kenaf.
- B. All work shall be performed to secure for the entire job homogeneous concrete having required strength, durability and weathering resistance, without planes of weakness and other structural defects and free of pronounced honeycombs, air pockets, voids, projections, offsets of plane, and other defacements on exposed surfaces.
- C. Standard Specifications
1. The "Specifications for Structural Concrete for Buildings" ACI 301-89 including all modifications as hereinafter specified, are hereby incorporated as a part of these Specifications and are as much a part of the contract documents as if reproduced herein. Modifications shall take precedence over items specified in ACI 301 and as incorporated in Part III are preceded by the relative ACI 301 designation. All ACI 301 items unless so modified below are incorporated as written. When any part of any item is modified or voided by these modifications, the unaltered provisions of that part shall apply as written. Copy of ACI 301 shall be kept in the project field office at all times. No work shall proceed until persons directly responsible for the project representing the contractors, subcontractors, suppliers and testing agencies have a copy of this Specification and an understanding of the provisions therein.

### 1.03 SUBMITTALS

- A. Provide the following submittals in accordance with ACI-301:
1. Mill tests for cement.
  2. Admixture certification. Concrete admixtures product data shall include brand name and manufacturer and dosage rate.
  3. Aggregate certification.
  4. Concrete mix designs.
  5. Construction and control joints shown on Drawings.

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6. Method of developing bond at joints.
  7. Method of adding admixtures.
  8. Materials and methods for curing.
  9. Testing Agency to perform services required in ACI-301, Section 16.7.
  10. Laboratory tests on concrete.
- B. Shop drawings for reinforcing steel and accessories prepared in accordance with "Details and Detailing of Concrete Reinforcement," ACI 315-80.
1. The following information, if ready-mixed concrete is used.
    - a. Physical capacity of mixing plant.
    - b. Trucking facilities available.
    - c. Estimated average amount which can be produced and delivered to the site during a normal 8 hour day, excluding the output to other customers.
- C. Manufacturer's Data: For information only and as requested by the ENGINEER, submit 2 copies of manufacturer's data with application and installation instructions for all proprietary materials.
- D. Substitutions: Any request for product substitution must be submitted for review, with all necessary documentation, prior to time of bid. No requests for substitutions will be considered after bid has been received.
- E. Throughout the Specifications, types of materials may be specified by manufacturer's name in order to establish standards of quality and performance and not for the purpose of limiting competition. Unless specifically stated otherwise, the Bidder may assume the phrase "or approved equal," except that the burden is upon the Bidder to prove such equality. If the Bidder elects to prove such equality, it must request the ENGINEER's approval in writing to substitute such item for the specified item, with data and samples, if required, to permit a fair evaluation of the proposed substitute with respect to quality, serviceability, warranty and cost.
- F. Delivery Tickets: Furnish to ENGINEER copies of all delivery tickets for each load of concrete delivered to the site. Provide items of information as specified in ASTM C 94, Section 15.

#### 1.04 COORDINATION

- A. Review installation procedures under other Sections and coordinate the installation of items that must be installed in the concrete.

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- B. Notify other contractors in advance of the placing of concrete to provide the other contractors with sufficient time for furnishing of items included in their contracts that must be installed in the concrete.

#### 1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. All materials used for concrete must be kept clean and free from all foreign matter during transportation and handling and kept separate until measured and placed in the mixer. Bins or platforms having hard clean surfaces shall be provided for storage. Suitable means shall be taken during hauling, piling and handling to insure that segregation of the coarse and fine aggregate particles does not occur and the grading is not affected.

### PART 2 PRODUCTS

#### 2.01 MATERIALS

##### A. General

1. After award of the Contract, the CONTRACTOR shall submit in writing to the ENGINEER the name, address and qualifications of the ready-mix supplier who will furnish concrete for the project. The CONTRACTOR shall also submit the supplier and source of the sand, coarse aggregate, cement and admixtures. The ENGINEER shall then distribute copies of Form "REQUISITION FOR MATERIALS AND DESIGN MIX TESTS," which will indicate tests and design mixes required, to the testing laboratory, CONTRACTOR, CONTRACTOR's job office, and resident project representative. The testing laboratory shall also receive a copy of this Section 03300, this Division, of the Project Specifications. After receiving the form, the CONTRACTOR shall send the required materials to the approved testing laboratory.
2. Each material submitted for tests shall be from the same single source as material proposed for the concrete work unless otherwise required or permitted.
3. Also refer to ACI 301-89 and Supplemental Requirements under PART 3 - EXECUTION, this Section.

##### B. Cement

1. Portland cement for concrete and mortar shall conform to ASTM C 150-86, Type I or II.
2. The CONTRACTOR shall deliver cement as requested by the ENGINEER to the testing laboratory for initial and periodic tests. Cement shall be delivered in a minimum amount of 1 sack at a time.
3. The ENGINEER may require the CONTRACTOR to deliver cement to the testing laboratory for tests according to ASTM Specification C 150-86 for Type I or II. Should cement fail the tests, the CONTRACTOR shall pay for the tests and the ENGINEER shall have the right to reject the brand.

4. Cement for tests shall be delivered in 4-ply paper bags with supplier and source identified in writing. Cement shall be stored in a dry location for not longer than 90 days after delivery from the mill.

C. Admixtures

1. The air-entraining admixture for concrete shall conform to ASTM C 260-86, and shall be Master Builders' Micro-Air, W.R. Grace's Darex II or Daravair, Sika Chemical Corporation's Sika AER, or equal.
2. The water-reducing admixture for concrete shall conform to ASTM C 494-86 for Type A (water-reducing admixtures) and shall be W.R. Grace's Wrda with Hycol, or Wrda-79, the Euclid Chemical Company's Eucon WR-75, Sika Chemical Corporation's Plasticrete 160, Master Builders' Pozzolith 322N or 344N, as recommended by manufacturers for the brand of cement to be used, or equal.
3. The water-reducing, set-retarding admixture for concrete shall conform to ASTM C 494-86 for Type D (water-reducing and retarding admixtures) and shall be W.R. Grace's Daratard-17, Master Builders' Pozzolith 300R, the Euclid Chemical Company's Eucon Retarder-75, Sika Chemical Corporation's Plastiment, or equal.
4. High range water reducing admixture (superplasticizer) shall conform to ASTM C-494 for Type F or G and shall be the Euclid Chemical Company's Eucon 37, Sika Chemical Corporation's Sikament, W.R. Grace's Wrda-19, or Daracem-100, or equal.
5. Non-chloride and non-corrosive accelerator shall conform to ASTM C-494 for Type C and shall be W.R. Grace's Daraset, or equal.
6. The admixture manufacturer shall furnish a qualified concrete technician employed by the manufacturer, to assist in the proper field batching and use of specified admixtures. The technician shall visit the site at the beginning of concrete operations and as requested during construction. In addition, the manufacturer shall furnish the ready mix plant with accurate and dependable equipment for the proper dispensing of admixture.
7. Substitute admixtures will be acceptable provided they meet or exceed all properties of the specified materials and specified field service is provided.
8. The CONTRACTOR shall deliver, to the testing laboratory selected by the OWNER, 12 fluid ounces of each admixture required in the concrete design mix such as air entraining, water-reducing admixture and water-reducing, set-retarding admixtures. Admixture samples shall be labeled with printed identification indicating trade name, strength, dosage instructions and manufacturer.



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9. Pozzolanic admixtures according to "Specification for Fly Ash and Raw or Calcined Natural Pozzolans for Use in Portland Cement Concrete" (ASTM C 618-87) shall normally be prohibited.
10. Submit method of adding mixture.
11. All admixtures shall be approved by the cement manufacturer.

D. Water

1. Water shall be clean and free from injurious amounts of oils, acid, alkali, organic matter, or other deleterious substances.
2. When subjected to the mortar strength test described in ASTM C 87-83, the 28-day strength of mortar specimens made with the water under examination and normal portland cement shall be at least 100 percent of the strength of similar specimens made with distilled water.
3. Potable tap water will normally fulfill the above requirements.

E. Fine Aggregate

1. Fine aggregate shall consist of clean, well graded particles of hard, durable sand and shall contain limited amounts of deleterious substances. It shall be washed Ohio, Scioto, or Cumberland River sand. Most Tennessee River sand, bank sands, and limestone fines are not acceptable.
2. The CONTRACTOR shall deliver sand as requested by the ENGINEER to the testing laboratory for initial and periodic tests. Usually 150 pounds of sand for initial and periodic tests will be sufficient. All material delivered to the laboratory shall be accompanied by identification in writing as to supplier and source.
3. Sand shall be graded in accordance with Section 804 of the Kentucky Transportation Cabinet, Department of Highways Standard Specifications for Road and Bridge Construction.

**Percent**

Passing 3/8 Inch Sieve	100
Passing No. 4 Sieve	90-100
Passing No. 16 Sieve	45-80
Passing No. 50 Sieve	5-25
Passing No. 100 Sieve	0-8

4. Sand shall meet the requirements of these Specifications and the specifications and tests listed below:

Deleterious Substances	- Par. 5 - ASTM Designation C 33-86.
Soundness	- Par. 6 - ASTM Designation C 33-86.
Organic Impurities	- ASTM Designation C 40-88.

5. Form "REQUISITION FOR MATERIALS AND DESIGN MIX TESTS," shall indicate which of the above tests the testing laboratory shall perform.

**F. Coarse Aggregate**

1. Coarse aggregate shall be washed river gravel or crushed limestone of hard durable particles and shall contain limited amounts of deleterious substances. Crushed limestone shall come from ledges of a quarry approved by the Kentucky Transportation Cabinet, Department of Highways for use in reinforced concrete untreated bridge superstructures above the tops of the caps, excluding pedestals.
2. The CONTRACTOR shall deliver coarse aggregate as requested by the ENGINEER to the testing laboratory for initial tests and periodic tests. Usually 200 pounds of coarse aggregate for initial and periodic tests will be sufficient. All material delivered to the laboratory shall be accompanied by identification in writing as to supplier and source.
3. Coarse aggregate shall be graded in accordance with Section 805 of the Kentucky Transportation Cabinet, Department of Highways Standard Specifications for Road and Bridge Construction. Refer to Section 3.6 of ACI 301-89 for maximum size of coarse aggregate.

	<b>Percent by Weight</b>	
	<b>No. 57</b>	<b>No. 67</b>
Passing 1-1/2 Inch Square Sieve	100	
Passing 1-Inch Square Sieve	95-100	100
Passing 3/4-Inch Square Sieve	-	90-100
Passing 1/2-Inch Square Sieve	25-60	-
Passing 3/8-Inch Square Sieve	-	20-55
Passing No. 4 Square Sieve	0-10	0-10
Passing No. 8 Square Sieve	0-5	0-5

4. Coarse aggregate shall meet the requirements of these Specifications and the specifications and tests listed below:
  - Deleterious Substances - Par. 9 - ASTM Designation C 33-86.
  - Soundness - Par. 9 - ASTM Designation C 33-86.
  - Abrasion - Par. 9 - ASTM Designation C 33-86.
5. Form "REQUISITION FOR MATERIALS AND DESIGN MIX TESTS," shall indicate which of the above tests the testing laboratory shall perform.

**G. Reinforcing**

1. Unless otherwise required or permitted, concrete reinforcing bars shall conform to grade 60 deformed bars and shall meet requirements of Deformed and Plain Billet-Steel Bars for Concrete Reinforcement (ASTM A 615-87a), Rail-Steel Deformed and Plain Bars for Concrete and Plain Bars

for Concrete Reinforcement (ASTM A 617-87). All other reinforcement and details shall conform to ACI Standard Building Code Requirements for Reinforced Concrete (ACI 318-83).

2. Before steel is shipped to job, the reinforcing steel supplier shall submit to the ENGINEER, 2 certified copies of mill tests on all steel to be used in the work. The tests shall substantiate that chemical and physical properties of the steel comply with the requirements of the governing specification.
3. The ENGINEER may require the CONTRACTOR, at his expense, to deliver samples of reinforcing steel to the testing laboratory, to determine compliance with governing specifications. Should the reinforcing steel fail the tests, the CONTRACTOR shall pay for the tests and the ENGINEER shall have the right to reject the entire shipment of steel.
4. The CONTRACTOR shall carry in stock at beginning of concrete work the following amounts of extra reinforcing steel for replacement of lost steel or additional steel considered necessary by the ENGINEER:

5 - 3/8-Inch Rods	30 Feet - 0-Inches Long
5 - 1/2-Inch Rods	30 Feet - 0-Inches Long
5 - 5/8-Inch Rods	30 Feet - 0-Inches Long
5. Welded wire fabric shall be new steel wire fabric, conforming to ASTM A185, and welded in a rectangular pattern.
6. Tie wire for reinforcement shall be 16 gauge or heavier, black or galvanized steel wire, conforming to ASTM A82.

#### H. Non-shrink Grout

1. Unless otherwise required or permitted, the grout for non-shrink waterproof joints, waterproof mortar patches, filling under handrail floor flanges and anchoring bolts into existing concrete shall be Sonneborn-Contech SonogROUT, Master Builders' Masterflow 713 grout, or equal. The grout for use under baseplates of columns, pumps, compressors, generators and similar heavy equipment, and for rebar grouting shall be Sonneborn-Contech FerroLith GNC, Master Builders' Embeco 636 grout, or equal.

#### I. Waterstop for Construction and Control Joints

1. Unless otherwise shown, waterstops shall be 4 inches wide, 3/16-inch minimum thickness, ribbed with center bulb, virgin polyvinyl chloride, in accordance with Corps of Engineers Specifications CRD-C-572, latest revision, as manufactured by Greenstreak, Inc., Vinylex Corp., or equal.
2. Where metal waterstops are required, they shall be fabricated from nickel-copper roofing sheet conforming to the requirements of ASTM B 127-85 and shall be No. 24-gauge U.S. Standard (0 to .025-inch) thick

with widths as shown on the project Drawings. Waterstops shall be prefabricated to fit the contour of the joints and shall be folded, bent and/or crimped in accordance with details shown or accepted. Bends and crimps shall be made with a minimum radius of 1/2-inch. All joints shall be lapped and pre-tinned at least 1 inch, riveted and soldered, to make the stops continuous and watertight. Solder shall be a minimum of 50 percent tin and the remainder lead. Rivets shall be nickel-copper alloy conforming to the requirements of ASTM B 164-90, Class A.

3. Waterstops shall be furnished in maximum lengths available to reduce the number of joints to the minimum.
4. Provide factory fabrications for all intersections, transitions and changes of direction, leaving only straight butt joint splices for the field.

J. Premolded Joint Fillers

1. Joint fillers, where required, shall be Sonneborn-Contech Sonoflex F foam expansion joint filler (closed cell, ultraviolet stable, polyethylene foam), or equivalent W.R. Grace Co. products, or equal. Where the application requires cementing the joint filler into place, such as in a wall expansion joint, a pressure-sensitive adhesive recommended by the filler manufacturer shall be used.

K. Concrete Floor Curing and Sealing System

1. System shall be a pigmented, ready to use, non-yellowing, acrylic curing and sealing compound which seals by providing a tough scuff resistant film over freshly finished concrete and complies with ASTM C309-81 and AASHTO M-148. System shall be Sonneborn-Contech's Gray Kure-N-Seal, the Euclid Chemical Company's Super Aqua Cure VOX, W.R. Meadow's Sealtight 1100, or equal.

L. Self-leveling Floor, Deck and Sidewalk Joint Sealant

1. One-part self-leveling polyurethane sealant for concrete floors, decks, sidewalks and other horizontal contraction and expansion joints shall be Sonolastic SL1 as manufactured by Sonneborn-Contech or equivalent by W.R. Grace Company or equal.
2. Sealant shall comply with Federal Specification TT-S-00230C, Type 1 Class A and ASTM C 920-79, Type S, Grade P, Class 25, Use T, M. Joint primer shall be Sonolastic primer No. 733. When required in deep joints, backing material shall be Sonofoam Backer-Rod which should not be primed and/or punctured.
3. Sealant color shall be limestone or gray as selected by the ENGINEER unless otherwise required or permitted.

M. Waterstop for Expansion Joints

1. Waterstops, where indicated on the Drawings, shall be 9 inches wide, 3/8-inch minimum thickness, ribbed with center bulb, virgin polyvinyl chloride, in accordance with Corps of Engineers Specification CRD-C-572, latest revision, as manufactured by Greenstreak, Inc., Vinylex Corp., or equal.
2. Provide factory fabrications for all intersections, transitions and changes of direction, leaving only straight butt joint splices for the field.

N. Joint Sealants and Backing for Sealants

1. For sealing vertical exposed faces of joint fillers, use Sonneborn-Contech Sonolastic NP1 or NP2 (one or 2 component urethane) or equivalent W.R. Grace Co. products, or equal. For water immersion, prime with Sonneborn-Contech Primer No. 733 for concrete and masonry or Primer No. 758 for glass and metals or as required by manufacturers of equivalent acceptable sealants.
2. For sealing horizontal exposed faces of joint fillers, use Sonneborn-Contech Sonolastic SL1, one-part, self-leveling, polyurethane sealant with Primer No. 733 or equivalent W.R. Grace Co. products, or equal.
3. Where additional sealant backing is needed to control the depth of sealant in relation to joint width, use Sonneborn-Contech Sonoflex F foam expansion joint filler or Sonofoam Backer Rod (closed cell polyethylene foam) or equivalent W.R. Grace Co. products or equal.

O. Epoxy Bonding Agent

1. Provide an epoxy-resin bonding agent, 2 component, polysulfide type.
2. Product and Manufacturer: Provide 1 of the following:
  - a. Sikadur Hi-Mod LPL by Sika Chemical Corporation.
  - b. Eucopoly LPL by the Euclid Chemical Company, or equal.

P. Patching Mortar

1. Use free flowing, polymer modified cementitious mortar, "Euco Thin Coat, Concrete Coat" (horizontal repairs), "verticoat" (vertical and overhead repairs) by the Euclid Chemical Company or "Sikatop 121 or 122" (horizontal repairs), "Sikatop 123" (vertical and overhead repairs) by Sika Chemical Corp.

## PART 3 EXECUTION

### 3.01 SUPPLEMENTAL REQUIREMENTS AND MODIFICATIONS TO ACI 301-89

(Use "\*" before numbers indicating modifications and "\*\*" for supplements or additions to ACI 301 for clarification.)

#### A. Chapter 3 (ACI 301) Proportioning

- \*3.2 The specified compressive strength of the concrete  $f'_c$  for each portion of the structure shall be as designated in the contract documents. Strength requirements shall be based on 28-day compressive strength unless a different test age is specified. Specified strength of concrete,  $f'_c$  for each structure or portion of structures shall be as follows unless otherwise required or permitted:
  - \*\*3.2.1 Class 4,500 concrete ( $f'_c = 4,500$  psi) for special structures and components as indicated on the project Drawings.
  - \*\*3.2.2 Class 4,000 concrete ( $f'_c = 4,000$  psi) for all reinforced concrete structures, sidewalks and driveways, except as otherwise noted on the Drawings and surface courses of highway and street paving except as required for Class 4,500 concrete.
  - \*\*3.2.3 Class 3,500 concrete ( $f'_c = 3,500$  psi) for non-reinforced portions of manholes, control chambers, interceptor structures, grout for two-course slab toppings, grout to be screeded in place by process mechanical equipment, curbs, gutters, and base courses for highway and street paving.
  - \*\*3.2.4 Class 3,000 concrete ( $f'_c = 3,000$  psi) for structures and components as indicated on the project Drawings.
  - \*\*3.2.5 Class 2,500 concrete ( $f'_c = 2,500$  psi, minimum cement factor of 450 lb./cu. yd. and 3 to 6 inch slump) for encasement around sewers and branches.
  - \*\*3.2.6 Class 2,000 concrete ( $f'_c = 2,000$  psi, minimum cement factor of 360 lb./cu. yd. and 3 to 6 inch slump) for cradle or refill under conduits and fill under structures as specified or indicated on the project Drawings.
  - \*\*3.3.1 Lightweight concrete shall not be used unless otherwise required or permitted.
  - \*3.4.1 Classes 4,500, 4,000 and 3,500 concrete required to be watertight or subjected to potentially destructive exposure (other than wear and loading) such as freezing and thawing, severe weathering or deicer chemicals shall have an entrained air content of  $6 \pm 1$  percent for coarse aggregate size No. 57 or No. 67 and  $5-1/2 \pm 1$  percent for coarse aggregate size No. 467 by volume. Measurement of air content shall

meet the requirement of ASTM C 231-82, ASTM C 173-78 or ASTM C 138-81.

- \*3.4.2 Classes 4,500, 4,000 and 3,500 concrete which must be watertight shall have a maximum water-cement ratio of 0.45. Minimum cement content shall be 564 pounds per cubic yard for coarse aggregate size No. 57 and No. 67; and 517 pounds per cubic yard for coarse aggregate size No. 467.
- \*3.5 Slump test shall be determined in accordance with ASTM C 143-78. Minimum shall be 1 inch. Maximum shall be 3 inches for footings, caissons, and substructure walls, and 4 inches for slabs, beams, reinforced walls and columns. These slump numbers do not apply when an approved high-range water reducer is used.
- \*3.7.3 All admixtures shall be used in accordance with the manufacturer's instructions except as otherwise specified. The ENGINEER may require a set-retarding admixture if required by construction conditions. Otherwise, the CONTRACTOR shall have the option to use a retarding, a water reducing, or a water reducing, set-retarding admixture. However, once accepted by the ENGINEER, the CONTRACTOR shall be consistent in admixture use, for example in all well pours of a structure. Accelerating admixture shall not be used unless otherwise required or permitted. Fly ash shall not be used in the concrete.
- \*3.8.1.2 Concrete proportions shall be established on the basis of previous field experience or laboratory trial batches as specified in Section 3.9 with the materials to be employed in the work, or as specified in Section 3.10. The CONTRACTOR shall furnish design mix of Class 2000 concrete, if requested by the ENGINEER, in accordance with good practices of proportioning and the required cement factors and slumps.
- \*3.14.1 These criteria apply only when structural or durability requirements of Section 3.2 and 3.4 do not necessitate higher strength or cement content. All floors including those in liquid-holding basins shall be cast of Class 4000 concrete and shall meet the requirements for Class 4 floors unless otherwise required or permitted.
- \*\*3.15 Grout
- \*\*3.15.1 Cement grout for surfacing of false sloped floors over crushed stone aggregate fill media shall be proportioned by volume, 1 part portland cement and 2-1/2 parts concrete sand in a damp, loose condition (80 pcf dry basis) with sufficient water to produce a stiff workable mix.

#### B. Chapter 4 (ACI 301) Formwork

- \*4.1.3 Earth cuts may be used as forms for footing vertical surfaces, if sides are sharp and true, and not exposed in finished structure. ENGINEER's approval is required on all earth cuts used as forms.

\*4.1.4 Formwork is the CONTRACTOR's responsibility and shop drawings will not be required.

\*4.2.8 Form accessories to be partially or wholly embedded in the concrete, such as ties and hangers, shall be of a commercially manufactured type. Nonfabricated wire shall not be used.

Form ties shall be constructed so that the ends or end fasteners can be removed without causing appreciable spalling at the surface of the concrete.

After the ends or end fasteners of form ties have been removed, the embedded portion of the ties shall terminate not less than 1-1/2 inch from the formed faces of concrete. Refer to ACI 347-78 for additional recommendations.

Form ties shall have waterstops in all water- and sewage-holding basins and in all dry rooms below ground or below high water levels and in additional places noted on the project Drawings unless otherwise required or permitted.

\*4.3.1 Table 4.3.1 shall be followed for forming tolerance limits. When panel-type forms are used in circular tanks, formed surfaces shall be within 3/8-inch of planned curvature.

\*4.4.2.1 Before placing the reinforcing steel or the concrete, the surfaces of the forms shall be covered with an acceptable coating material that will effectively prevent absorption of moisture, prevent bond with the concrete, and not stain the concrete surfaces. A field applied form release agent or sealer of acceptable type or factory applied nonabsorptive liner may be used. For potable water treatment facilities, the form coating shall be non-toxic after a specified period, usually 30 days.

\*4.5.4 Formwork for columns, walls, sides of beams, and other parts not supporting the weight of the concrete may be removed as soon as the concrete has hardened sufficiently to resist damage from removal operations, but not less than 24 hours.

\*4.5.5 Forms and shoring in the form work used to support the weight of concrete in beams, slabs and other structural members shall remain in place until the concrete has reached 75 percent of the specified strength, if, after stripping the forms, the structural system is reshored the same day of stripping and shores remain in place until the specified concrete strength is reached. Deviations from these requirements shall not occur unless otherwise required or permitted.

\*4.5.6 When shores and other vertical supports are so arranged that the nonload-carrying forms facing material may be removed without



loosening or disturbing the shores and supports, the facing material may be removed when the concrete has reached 50 percent of the specified strength unless otherwise required or permitted.

- \*4.6.1 When reshoring is permitted or required, the operations shall be planned in advance and shall be subject to approval. While reshoring is under way, no live load shall be permitted on the new construction. Reshoring shall be permitted in accordance with ACI Section 4.5.5 unless otherwise required or permitted.

#### C. Chapter 6 (ACI 301) Joints and Embedded Items

- \*\*6.1.4.4 Construction joints shall be bonded in accordance with ACI Section 6.1.4.3 unless otherwise required or permitted. Also refer to ACI Section 8.5 Bonding.
- \*\*6.5.1 Pipes shall not be poured or solidly grouted in concrete walls or floors unless fixations are indicated on the project Drawings, for example as anchorage to resist pipe thrusts, unless otherwise required or permitted.
- \*\*6.5.2 At wall and slab penetrations, openings shall be formed approximately 1 inch greater than the OD of the pipe. For openings 10 inches and less in diameter, openings may be cored if permitted by the ENGINEER before pouring wall or slab so that extra reinforcing steel can be accurately located and referenced to avoid the subsequent core hole, unless otherwise required or permitted. After pipe placement and alignment adjustment, the annular space between opening and outside of pipe shall be packed with dry braided hemp (or unbraided where pipe does not center in openings) to within 2 inches of the wall or slab surface. The 2-inch deep annular spaces shall be packed with non-shrink grout or caulked as required or permitted with materials specified in Division 7 of these Specifications, and in strict accordance with the material manufacturers' instructions.
- \*\*6.5.3 Sleeves shall be cast in floors and walls for penetrations of small pipe, cut and fitted on the job, such as steel, wrought iron, copper, plastic and rubber pipe and hoses. Unless otherwise required or permitted, sleeves shall be steel, cast iron or plastic of about 1 inch greater ID than the OD of the pipe and shall be packed and grouted or caulked as previously described, except the joint depth shall be 1 inch and, if required or permitted, hemp packing may be replaced with backer rod and joint sealant according to Division 7 of these Specifications. Penetrations may be made by coring according to previously described requirements if permitted by the ENGINEER.
- \*\*6.5.4 Where openings larger than 10 inches in diameter are required for pipe penetrations in existing walls and slabs, the opening shall be made approximately 2 inches to 4 inches larger in diameter than the pipe OD.

\*\*6.5.5 All joints around pipe shall be watertight unless otherwise required or permitted.

D. Chapter 7 (ACI 301) Production of Concrete

\*\*7.1.3 All concrete to be ready-mixed.

Furnish 2 delivery tickets with each load containing the following information:

1. Date
2. Product and plant
3. Job name and location
4. Truck number and time dispatched
5. Concrete designation and cement type
6. Admixtures description and content.
7. Time discharge started and completed
8. Amount of concrete in load
9. Where a ready-mix concrete supplier has more than one batch plant, make all deliveries from the same plant.

\*7.6.3 The concrete must be discharged from the ready-mix trucks within 1-1/2 hours after the introduction of mixing water to the cement and aggregates. Arrange the delivery so that intervals between batches are kept to a minimum, and in any event not more than 30 minutes.

During hot weather or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C94 may be required. When air temperature is above 85 degrees Fahrenheit, reduce mixing and delivery time to 60 minutes.

E. Chapter 8 (ACI 301) Placing

\*8.1.3 All subgrades shall be covered with a 6 mil minimum thickness polyethylene sheet with joints lapped a minimum of 12 inches unless otherwise required or permitted.

\*8.3.2 Placing of concrete in supported elements shall not be started until the concrete previously placed in columns and walls is no longer plastic and has been in place at least 2 hours. At least 72 hours shall elapse between casting adjoining units separated by construction joints unless otherwise required or permitted.

\*8.4.1 Unless adequate protection is provided and acceptance is obtained, concrete shall not be placed during rain, sleet, or snow. Adequate protection against rain, sleet, or snow shall be defined as protection which prevents any and all adverse affects of the rain, sleet, or snow on the appearance, strength and durability of the concrete.

- \*8.5.3 The hardened concrete of horizontal construction joints in exposed work; horizontal construction joints in the middle of beams, girders, joists, and slabs; and horizontal construction joints in work designed to contain liquids shall be dampened (but not saturated) and then thoroughly covered with a coat of cement grout of similar proportions to the mortar in the concrete. The cement grout shall be between 1 and 2 inches thick at the bottom of wall pours unless otherwise required or permitted. The fresh concrete shall be placed before the grout has attained its initial set.
- \*8.6 When required or permitted, concrete shall be deposited under water by an acceptable method in a way that the fresh concrete enters the mass of previously placed concrete from within, causing water to be displaced with minimum disturbance at the surface of the concrete. Placement of concrete under water shall be allowed only by permission of the ENGINEER unless otherwise required or permitted.

#### F. Chapter 9 (ACI 301) Repair of Surface Defects

- \*9.2 Repair of defective areas with prior approval of the ENGINEER, as to method and procedure, all repairs of defective areas shall conform to ACI 301, Chapter 9, except that the specified bonding compound must be used.

The specified patching mortar may be used in lieu of the bonding compound with prior approval of the ENGINEER, when color match of the adjacent concrete is not required.

All structural repairs shall be made with prior approval for the ENGINEER, as to method and procedure, using the specified epoxy adhesive and/or epoxy mortar. Where epoxy injection procedures must be used, an approved low viscosity epoxy made by the manufacturers previously specified shall be used.

- \*\*9.5 All patching material shall be proportioned to match color of surrounding material. Prior to starting patching operation, test different techniques, grout mixes, and curing procedures on concealed areas to best match cast concrete.

#### G. Chapter 10 (ACI 301) Finishing of Formed Surfaces

- \*10.1.1 After removal of forms, the surfaces of concrete shall be given the finishes specified below unless otherwise required or permitted.
- \*10.2.1 Rough form finish - No selected form facing materials shall be specified for rough form finish surfaces. Tie holes and defects shall be patched. Fins exceeding 1/4-inch in height shall be chipped off or rubbed off. Otherwise, surfaces shall be left with the texture imparted by the forms. Rough form finish shall be

used on all concrete surfaces which are not normally exposed to the view of the public or to the view of personnel responsible for operation or maintenance of the facilities. Covered under this category shall be surfaces similar to and inclusive of inside surfaces of covered vaults, covered intake structures, covered clear wells and covered basins; surfaces 2 feet and greater below operating liquid level in open basins; surfaces in contact with fills and 1 foot or greater below the top of fills; and any additional surfaces required or permitted.

\*10.2.2 Smooth form finish - The form facing material shall produce a smooth, hard, uniform texture on the concrete. It may be plywood, tempered concrete-form-grade hardboard, metal, plastic, paper, or other acceptable material capable of producing the desired finish. The arrangement of the facing material shall be orderly and symmetrical, with the number of seams kept to the practical minimum. It shall be supported by studs or other backing capable of preventing excessive deflection (see Table 4.3.1 for tolerances). Material with raised grain, torn surfaces, worn edges, patches, dents, or other defects which will impair the texture of the concrete surface shall not be used. Tie holes and defects shall be patched. All fins shall be completely removed. Smooth form finish shall be used on all surfaces not included in ACI Section 10.2.1 above unless otherwise required or permitted.

\*10.3.2 Grout cleaned finish - No cleaning operations shall be undertaken until all contiguous surfaces to be cleaned are completed and accessible. Cleaning as the work progresses shall not be permitted. Mix 1 part Portland cement and 1-1/2 parts fine sand with sufficient water to produce a grout having the consistency of thick paint. White Portland cement shall be substituted for a part of the gray Portland cement in order to produce a color matching the color of the surrounding concrete, as determined by a trial patch. Wet the surface of the concrete sufficiently to prevent absorption of water from the grout and apply the grout uniformly with brushes or a spray gun. Immediately after applying the grout, scrub the surface vigorously with a cork float or stone to coat the surface and fill all air bubbles and holes. While the grout is still plastic, remove all excess grout by working the surface with a rubber float, burlap, or other means. After the surface whitens from drying (about thirty minutes at normal temperature), rub vigorously with clean burlap. The finish shall be kept damp for at least 36 hours after final rubbing. Grout-cleaned finish shall be applied to all smooth form finish surfaces unless otherwise required or permitted.

Grout-cleaned finish shall be undertaken as soon as forms can be removed without jeopardizing the structure and after

necessary patching has been completed. In order to insure continuity of color and texture, grout cleaned finish shall be applied at one time to continuous, plane, surfaces such as from corner-to-corner of a wall.

#### H. Chapter 11 (ACI 301) Slabs

- \*11.2.3 The subgrade shall be moist at the time of concreting. If necessary, it shall be dampened with water in advance of concreting, but there shall be no standing water on the subgrade nor any muddy or soft spots when the concrete is placed. All subgrades shall be covered with a 6-mil minimum thickness polyethylene sheet with joints lapped a minimum of 12 inches unless otherwise required or permitted.
- \*\*11.10 Slab finishes shall be as follows unless otherwise required or permitted.
  - a. Troweled finish shall be applied to concrete on which process water and sewage flow and to all surfaces normally intended as walking surfaces including surfaces to receive covering such as tile, and in working and operating areas except as required below for non-slip surfaces.
  - b. Broom or belted finish shall be applied to all exterior sidewalks, steps, platforms, ramps, and concrete walking surfaces and to interior sloped walking surfaces frequently cleaned by hosing such as garage floors. Brooming shall be in the direction of slab drainage maintaining the required surface tolerance to provide non-slip finish.
  - c. Floated finish shall be applied to all surfaces intended to receive roofing, waterproofing membranes or sand bed terrazzo.
  - d. Refer to project Drawings for any special requirements.

#### I. Chapter 12 (ACI 301) Curing and Protection

- \*12.2.1.7 Application of a curing compound conforming to ASTM C 309. The compound shall be applied in accordance with the recommendations of the manufacturer immediately after any water sheen which may develop after finishing has disappeared from the concrete surface. It shall not be used on any surface against which additional concrete or other material is to be bonded unless it is proven that the curing compound will not prevent bond, or unless positive measures are taken to remove it completely from areas to receive bonded applications. When concrete floors are shown on the Drawings to be sealed, 2 coats of Gray Kure-N-Seal, or equal, specified under PART 2 - Products, shall be applied at the rate of 200-400 S.F./gal depending on

surface texture and porosity. The first coat shall be applied after completion of the work to be thoroughly cleaned floors. All work shall be done strictly according to the manufacturer's instructions.

- \*\*12.2.4 Masonry shall not be placed on or supported off of structural floors until the concrete has achieved full specified strength and all shoring has been removed.

J. Chapter 16 (ACI 301) Testing

- \*16.2.1 The required testing services of Sections 16.3, 16.4, and 16.5 shall be performed by a testing agency designated by the OWNER. The services of Section 16.3 and 16.4 will be performed at no cost to the CONTRACTOR with the exceptions of Sections 16.3.4.1, 16.3.4.2, 16.3.4.4, 16.3.5, 16.3.6, 16.3.7, and 16.3.8 which the CONTRACTOR shall pay or may perform with his personnel under the observation of the ENGINEER. The CONTRACTOR shall pay for any required services of Section 16.5 including such additional testing required because of changing ready mix suppliers. The CONTRACTOR is required to furnish all necessary labor, material, and equipment, and all other incidentals required for all testing.
- \*16.3.4.4 Make at least one strength test for each 50 cubic yards, or fraction thereof, of each mixture design of concrete placed in any one day. When the total quantity of concrete with a given mixture design is less than 50 cubic yards, the strength tests may be waived by the ENGINEER if, in his judgment, adequate evidence of satisfactory strength is provided, such as strength test results for the same kind of concrete supplied on the same day and under comparable conditions to other work or other projects. The ENGINEER may request cylinder specimens to be taken at any time.
- \*16.3.5 Determine slump of the concrete sample for each strength test and each load of concrete delivered to project.
- \*16.3.6 Determine air content of normal weight concrete sample for each strength test in accordance with either ASTM C 231, ASTM C 173, or ASTM C 138. The CONTRACTOR may use an air indicator to measure entrained air. For this purpose, one C-157 Concrete Air Indicator Kit, two T-158 Concrete Air Indicators, and 2 quarts of isopropyl alcohol (rubbing alcohol) shall be available on the job at all times. The kit and indicators can be obtained from Soiltest, Inc., 2205 Lee Street, Evanston, Illinois. The ENGINEER reserves the right to request that air tests be made by the ASTM methods required under Sections 16.3.6 and 16.3.7 if the air indicator is not operated properly, air content measurements are

questionable, or such ASTM methods appear necessary in the opinion of the ENGINEER.

Air content tests shall be taken from every truck. Do not allow concrete to be placed that does not satisfy air entrainment requirements. The second or third truck every day shall have air content checked at both the end of truck discharge and at end of hose for pumped concrete.

- \*16.3.8 Determine temperature of concrete sample for each strength test and load of concrete delivered to project.

#### K. Chapter 18 (ACI 301) Acceptance of Structure

- \*\*18.1.4 CONTRACTOR shall bear all costs of correcting rejected work, including the cost of the ENGINEER's additional services thereby made necessary.

### 3.02 CONCRETE PLACEMENT

#### A. General

1. Place concrete continuously so that no concrete will be placed on concrete that has hardened sufficiently to cause the formation of seams or planes of weakness within the section. Deposit concrete as nearly as practical in its final location to avoid segregation due to rehandling or flowing. Do not subject concrete to any procedure which will cause segregation.
  - a. Screed concrete which is to receive other construction to the proper level to avoid excessive skimming or grouting.
  - b. Do not use concrete which becomes non-plastic and unworkable, or does not meet the required quality control limits, or which has been contaminated by foreign materials. Do not use retempered concrete. Remove rejected concrete from the job site and dispose of it in an acceptable location.
  - c. Do not place concrete until all forms, bracing, reinforcement, and embedded items are in final and secure position.
  - d. Do not place footings in freezing weather unless adequate precautions are taken against frost action.
  - e. Do not place footings, piers or pile caps on frozen soil.
  - f. Allow a minimum of 3 days before placing concrete against a slab or wall already in place.

## B. Concrete Conveying

1. Handle concrete from the point of delivery and transfer to the concrete conveying equipment and to the locations of final deposit as rapidly as practical by methods which will prevent segregation and loss of concrete mix materials.
2. Provide mechanical equipment for conveying concrete to ensure a continuous flow of concrete at the delivery end. Provide runways for wheeled concrete conveying equipment from the concrete delivery point to the locations of final deposit. Keep interior surfaces of conveying equipment, including chutes, free of hardened concrete, debris, water, snow, ice and other deleterious materials.
3. Do not use chutes for distributing concrete unless approved in writing by ENGINEER.
  - a. Provide sketches showing methods by which chutes will be employed when requesting such approval.
  - b. Design chutes, if permitted, with proper slopes and supports to permit efficient handling of the concrete.
4. Pumping concrete is permitted, however, do not use aluminum pipe for conveying.

## C. Placing Concrete into Forms

1. Deposit concrete in forms in horizontal layers not deeper than 18 inches and in a manner to avoid inclined construction joints. Where placement consists of several layers, place concrete at such a rate that concrete which is being integrated with fresh concrete is still plastic.
2. Do not permit concrete to free fall within the form a distance exceeding 4 feet. Use "elephant trunks" to prevent free fall and excessive splashing on forms and reinforcement.
3. Remove temporary spreaders in forms when concrete placing has reached the elevation of such spreaders.
4. Consolidate concrete placed in forms by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures for consolidation of concrete in accordance with the applicable recommended practices of ACI 309. Vibration of forms and reinforcing will not be permitted, unless otherwise accepted by ENGINEER.
5. Do not use vibrators to transport concrete inside of forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than the visible effectiveness of the machine. Place vibrators to rapidly penetrate the layer of concrete and at least 6 inches into the preceding layer. Do not insert vibrators into lower layers of concrete that have



begun to set. At each insertion, limit the duration of vibration to the time necessary to consolidate the concrete and complete embedment of reinforcement and other embedded items without causing segregation of the mix.

6. Do not place concrete in beam and slab forms until the concrete previously placed in columns and walls is no longer plastic.
7. Force concrete under pipes, sleeves, openings, and inserts from one side until visible from the other side to prevent voids.

#### D. Placing Concrete Slabs

1. Deposit and consolidate concrete slabs in a continuous operation, within the limits of construction joints, until the placing of a panel or section is completed.
2. Consolidate concrete during placing operations using mechanical vibrating equipment, so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.
3. Consolidate concrete placed in beams and girders of supported slabs, and against bulkheads of slabs on ground, as specified for formed concrete structures.
4. Bring slab surfaces to the correct level. Smooth the surface, leaving it free of humps or hollows. Do not sprinkle water on the plastic surface. Do not disturb the slab surfaces prior to beginning finishing operations.

#### E. Bonding for Next Concrete Pour

1. Roughen surfaces of set concrete at all joints, except where bonding is obtained by use of a concrete bonding agent. Clean surfaces of laitance, coatings, loose particles, and foreign matter. Roughen surfaces in a manner to expose bonded aggregate uniformly and to not leave laitance, loose particles of aggregate, or damaged concrete at the surface.
  - a. Prepare for bonding of fresh concrete to new concrete that has set but is not fully cured, as follows:
    - (1) Thoroughly wet the surface but allow no free standing water.
    - (2) For horizontal surfaces place a 1 to 2 inch layer of mortar, 1 part sand and 1 part cement with water, over the hardened concrete surface.
    - (3) Place fresh concrete before the mortar has attained its initial set.

2. Bonding of fresh concrete to fully-cured hardened concrete or existing concrete shall be accomplished by using an epoxy-resin bonding agent as specified.

F. Quality of Concrete Work

1. Make all concrete solid, compact and smooth, and free of laitance, cracks, and cold joints.
2. All concrete for liquid retaining structures, and all concrete in contact with earth, water, or exposed directly to the elements shall be watertight.
3. Cut out and properly replace to the extent ordered by the ENGINEER, or repair to the satisfaction of the ENGINEER, surfaces which contain cracks or voids, are unduly rough, or are in any way defective. Thin patches or plastering will not be acceptable.
4. All leaks through concrete, and cracks, holes or other defective concrete in areas of potential leakage, shall be repaired and made watertight by CONTRACTOR.
5. Repair, removal, and replacement of defective concrete as ordered by ENGINEER shall be at not additional cost to OWNER.

G. Cold Weather Concreting

1. The provisions of ACI 306 shall be followed for all concrete placed or cured when the average daily temperature is below 40 degrees Fahrenheit. The methods of protection used for cold weather concreting shall be submitted in writing to the ENGINEER for review at least one week prior to cold weather placement.
2. Plan construction schedule and obtain needed materials and equipment on the project site in advance of cold weather.
3. All reinforcement, form work and subgrades shall be clear of ice and snow and be above 40 degrees Fahrenheit at time of placement of concrete.
4. Concrete temperature as discharged shall not be less than 50 degrees Fahrenheit nor greater than 70 degrees Fahrenheit. The temperature of the concrete being discharged shall be tested by the testing agency whenever cylinders are cast by the CONTRACTOR.
5. The CONTRACTOR shall install and read maximum/minimum thermometers during the construction and curing of all structural slabs in cold weather. Provide one thermometer for each 3000 square feet of a slab. Place the thermometer near slab perimeter. The CONTRACTOR shall submit those temperature readings to the ENGINEER weekly.

#### H. Hot Weather Concrete

1. The provisions of ACI 305 shall be followed for all concrete placed when the air and/or form temperature is greater than 90 degrees Fahrenheit. Note: Concrete protection during windy conditions combined with hot and/or low humidity shall also conform to ACI 305. The methods of protection used for hot weather concreting shall be submitted in writing to the ENGINEER for review at least one week prior to hot weather placement.
2. Plan construction schedule and obtain needed materials and equipment on the project site in advance of hot weather.
3. CONTRACTOR and ready mix producer shall review concrete mixes for use in hot weather with respect to placing requirements, strength and durability.
4. Concrete temperatures as discharged from the truck shall not exceed 85 degrees Fahrenheit. Ice, if used, shall be considered part of the total mix water (50 lbs ice = 6 gallons of water). Retarders in low slump superplasticized mixes may be required to comply with this requirement. The temperature of the concrete being discharged shall be tested by the testing agency whenever cylinders are cast.
5. Cool and moisten form work and subgrade by sprinkling with water prior to placing concrete.
6. Placement and Finishing
  - a. Concrete shall be discharged from the truck a maximum of one hour after the introduction of mix water to cement and aggregates.
  - b. Strike off and screen slabs immediately. Protect slab's surface against moisture loss prior to final finishing.
  - c. Cure as specified in Chapter 12 above.

#### 3.03 TESTING CONCRETE STRUCTURE FOR STRENGTH

- A. When there is evidence that the strength of the in-place concrete does not meet specification requirements, CONTRACTOR shall employ at his expense the services of a concrete testing service to take cores drilled from hardened concrete for compressive strength determination. Test shall comply with ASTM C 42 and the following:
  1. Take at least 3 representative cores from each member or suspect area at locations directed by ENGINEER.

2. Strength of concrete for each series of cores will be considered satisfactory if their average compressive strength is at least 85 percent and no single core is less than 75 percent of the 28 day required compressive strength.
  3. Report test results in writing to ENGINEER on the same day that tests are made. Include in test reports the Project identification name and number, date, name of CONTRACTOR, name of concrete testing service, location of test core in the structure, type of class of concrete represented by core sample, nominal maximum size aggregate, design compressive strength, compression breaking strength and type of break (corrected for length-diameter ratio), direction of applied load to core with respect to horizontal plane of the concrete as placed, and the moisture condition of the core at time of testing.
- B. Fill core holes solid with patching mortar, and finish to match adjacent concrete surface.
- C. Conduct static load test and evaluations complying with ACI 318 if the results of the core tests are unsatisfactory, or if core tests are impractical to obtain, as directed by ENGINEER.

### 3.04 MISCELLANEOUS CONCRETE ITEMS

#### A. Filling-In

1. Fill in holes and openings left in concrete structures for the passage of work by other contractors, unless otherwise shown or directed, after the work of other contractors is in place. Mix, place and cure concrete as herein specified, to blend with in-place construction. Provide all other miscellaneous concrete filling shown or required to complete the Work.

#### B. Equipment Bases

1. Unless specifically shown otherwise, provide concrete bases for all pumps and other equipment. Construct bases as required to meet manufacturers' requirements and Drawing elevations. Where no specific elevations are shown, bases shall be 6 inches thick and extend 3 inches outside the metal equipment base or supports. Bases shall have smooth trowel finish, unless a special finish such as terrazzo, ceramic tile or heavy duty concrete topping is required. In those cases, provide appropriate concrete finish.
2. Include all concrete equipment base work not specifically included under other Sections or other contracts.
3. In general, place bases up to 1 inch below the metal base. Properly shim equipment to grade and fill 1 inch void with non-shrink grout as specified in Section 31.

### 3.05 CONCRETE REPAIRS

#### A. Repair of Formed Surfaces

1. Repair exposed-to-view formed concrete surfaces that contain defects which adversely affect the appearance of the finish. Surface defects that require repair include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets, fins and other projections on the surface; and stains and other discolorations that cannot be removed by cleaning.
2. Repair concealed formed concrete surfaces that may contain defects that adversely affect the durability of the concrete. Surface defects that require repair include cracks in excess of 0.01 inch wide, cracks of any width and other surface deficiencies which penetrate to the reinforcement or completely through non-reinforced sections, honeycomb, rock pockets, holes left by tie rods and bolts, and spalls except minor breakage at corner.

#### B. Method of Repair of Formed Surfaces

1. Repair and patch defective areas with cement mortar immediately after removal of forms and as directed by ENGINEER.
2. Cut out honeycomb, rock pockets, voids over 1/2-inch diameter, and holes left by tie rods and bolts, down to solid concrete but, in no case, to a depth of less than 1 inch. Make edges of cuts perpendicular to the concrete surface. Before placing the cement mortar, thoroughly clean, dampen with water, and brush-coat the area to be patched with the specified bonding agent.
  - a. For exposed-to-view surfaces, blend white Portland cement and standard Portland cement so that, when dry, the patching mortar color will match the color of the surrounding concrete. CONTRACTOR shall impart texture to repaired surfaces to match texture of existing adjacent surfaces. Provide test areas at inconspicuous locations to verify mixture, texture and color match before proceeding with the patching. Compact mortar in place and strike off slightly higher than the surrounding surface.
3. Cracks which require repair shall be pressure grouted using one of the following. Apply in accordance with the manufacturer's directions and recommendations.
  - a. Sikadue Hi-Mod L.V. and Gel by Sika Chemical Company.
  - b. Euco Epoxy #460 and #461 by the Euclid Chemical Company.
  - c. Or equal.

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4. Fill holes extending through concrete by means of a plunger-type gun or other suitable device from the least exposed face, using a flush stop held at the exposed face to ensure completely filling.
5. Sandblast exposed-to-view surfaces that require removal of stains, grout accumulations, sealing compounds, and other substances marring the surfaces. Use sand finer than No. 30 and air pressure from 15 to 25 psi.

#### C. Repair of Unformed Surfaces

1. Repair finish of unformed surfaces that contain defects which adversely affect the durability of the concrete. Surface defects, as such, include crazing, cracks in excess of 0.01-inch wide or which penetrate to the reinforcement or completely through non-reinforced sections regardless of width, spalling, popouts, honeycomb, rock pockets, and other objectionable conditions.

#### D. Methods of Repair of Unformed Surfaces

1. Repair defective areas, except random cracks and single holes not exceeding 1-inch diameter, 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 all concrete surfaces in contact with patching concrete and brush with the specified bonding agent. Place patching concrete before grout takes its initial set. Mix patching concrete of the same materials and proportions to provide concrete of the same type or class as the original adjacent concrete. Place, compact and finish as required to blend with adjacent finished concrete. Cure in the same manner as adjacent concrete.
2. Repair isolated random cracks, and single holes not over 1-inch diameter, by the dry-pack method. Groove the top of cracks, and cut out holes to sound concrete and clean of dust, dirt and loose particles. Dampen all cleaned concrete surfaces and brush with the specified bonding agent. Place dry-pack before the cement grout takes its initial set. Mix dry-pack, consisting of 1 part portland cement to 1-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched areas continuously moist for not less than 72 hours.
3. Cracks which require repair shall be pressure grouted using one of the following. Apply in accordance with the manufacturer's directions and recommendations.
  - a. Sikadur Hi-Mod L.V. and Gel by Sika Chemical Company.
  - b. Euco Epoxy #460 and #461 by the Euclid Chemical Company.
  - c. Or equal.

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4. Assure that surface is acceptable for flooring material to be installed in accordance with manufacture's recommendations.

**END OF SECTION**

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**SECTION 03301**  
**CAST-IN PLACE CONCRETE**  
**(MINOR STRUCTURES)**

**PART 1 GENERAL**

1.01 SUMMARY

- A. This specification delineates the requirements for cast-in place concrete for minor structures including concrete kickers for pipe blocking, sidewalks, collars, manholes, manhole bottoms, pipe cradles, piers and other areas where small quantities of concrete are required. It shall not be used for major structures such as floor slabs, structure or basin walls, roof slabs, or other structural components.

1.02 SCOPE OF WORK

- A. Provide all labor, material, equipment and services to complete all cast-in-place concrete work required by the Project as shown on the Drawings or specified herein.

1.03 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 185	Specification for Steel, Welded Wire, Fabric, Plain, for Concrete Reinforcement
ASTM A 497	Specification for Welded Deformed Steel Wire Fabric for Concrete Reinforcement
ASTM A 615/A615M	Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM A 616/A616M	Specification for Rail-Steel Deformed and Plain Bars for Concrete Reinforcement
ASTM A 617/A617M	Specification for Axle-Steel Deformed and Plain End Bars for Concrete Reinforcement
ASTM A 706/A706M	Specification for Low-Alloy Steel Deformed Bars for Concrete Reinforcement
ASTM C 33	Specification for Concrete Aggregates
ASTM C 150	Specification for Portland Cement



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ASTM C 260      Specification for Air-Entraining Admixtures for Concrete

ASTM C 494      Specification for Chemical Admixtures for Concrete

#### 1.04 SUBMITTALS

- A. Copies of all materials required to establish compliance with these Specifications shall be submitted in accordance with the provisions of the General Conditions.

#### 1.05 QUALITY ASSURANCE

- A. All work shall be performed to secure for the entire job homogeneous concrete having required strength, durability and weathering resistance, without planes of weakness and other structural defects and free of pronounced honeycombs, air pockets, voids, projections, offsets of plane and other defacements on exposed surfaces.

#### 1.06 DELIVERY, STORAGE AND HANDLING

- A. Do not deliver ready-mixed concrete to job site until ready for placement.
- B. All materials used for on-site mixed concrete shall be kept clean and free from all foreign matter during transportation and handling and kept separate until measured and placed in the mixer.
- C. Store concrete aggregates to prevent contamination or segregation. Store reinforcement of different sizes and shapes in separate piles or racks raised above the ground to avoid excessive rusting.
- D. Protect from contaminants such as grease, oil and dirt. Provide for accurate identification after bundles have been broken and tags removed.

#### 1.07 PROJECT/SITE CONDITIONS

##### A. Cold Weather

- 1. Provide and maintain 50 degrees Fahrenheit minimum concrete temperature. Do not place concrete when ambient temperature is below 40 degrees Fahrenheit. Cover concrete and provide with a source of heat sufficient to maintain 50 degrees Fahrenheit minimum while curing.

##### B. Hot Weather

- 1. Concrete temperature from initial mixing through final cure shall not exceed 90 degrees Fahrenheit. Cool ingredients before mixing, or substitute chip ice for part of required mixing water or use other suitable means to control concrete temperature to prevent rapid drying of newly placed concrete. Shade the fresh concrete and start curing as soon as the surface is sufficiently hard to permit curing without damage.

**PART 2 PRODUCTS**

**2.01 CONCRETE**

**A. Mix Design**

1. The concrete mix shall conform to the requirements of the following table according to the class of concrete required. The number in the "Class" column refers to the 28-day compressive strength of the concrete in pounds per square inch (psi).

Class	Minimum Cement Content (Lbs./Cu. Yd.)	*Maximum Slump (Inches)
3000	470	3 to 4
3500	520	3 to 4
4000	550	3 to 4

\* Maximum slump unless high range water reducing admixture is used.

**B. Area of Application**

1. Unless otherwise noted on the Drawings, concrete mixes shall be used as follows:
  - Class 3000 - kickers for pipe, fittings
  - Class 3500 - non-reinforced portions of manholes, pipe cradles
  - Class 4000 - reinforced portions of manholes, sidewalks, piers

**2.02 MATERIALS**

**A. Cement**

1. Portland cement for concrete and mortar shall conform to ASTM C 150, Type I or II.

**B. Water**

1. Water shall be potable.

**C. Aggregates**

1. Aggregates shall conform to ASTM C 33. Obtain aggregates from one source. Aggregates shall not contain any substance which may be deleteriously reactive with the alkalis in the cement.

**D. Admixtures**

1. Admixtures for air-entrained concrete shall conform to ASTM C 260, for water reducing (Type A, D or E) accelerating (Type C) and retarding (Type B or D) ASTM C 494. Calcium chloride shall not be used as an admixture.

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Admixtures shall not be used without prior written approval of the ENGINEER.

E. Reinforcement

1. Reinforcing Bars

- a. Reinforcing bars shall conform to ASTM A 615/A615M Grade 60, ASTM A 616/A616M Grade 60, ASTM A 617/A617M Grade 60 or ASTM A 706/A706M Grade 60 as applicable.

2. Welded Wire Fabric

- a. Welded wire fabric shall conform to ASTM A 497 or ASTM A 185.

**PART 3 EXECUTION**

3.01 FORMS

- A. Forms shall be used to confine concrete and shape it to the required dimensions. Set forms true to line and grade and make mortar tight. Chamfer above grade exposed joints, edges and external corners 3/4-inch, unless otherwise indicated. Earth cuts may be used as forms for footing vertical surfaces, if sides are sharp and true, and not exposed in finished structure.

3.02 PLACING REINFORCEMENT AND MISCELLANEOUS MATERIALS

- A. Provide bars, wire fabric and other reinforcing materials, including wire ties, supports and other devices necessary to install and secure the reinforcement.

3.03 CONTROL AND CONSTRUCTION JOINTS

- A. For sidewalks, provide control joints spaced at an interval equal to the width of the sidewalk, the minimum spacing of 5 feet. Cut joints 1 inch deep with a jointing tool after the surface has been finished. Provide 0.5-inch thick transverse expansion joints at changes in direction, where sidewalk abuts curb, steps, rigid pavement or other similar structures; space joints not more than 40 feet apart. Limit variation in cross section to 1/4-inch in 5 feet.

3.04 CURING AND PROTECTION

- A. Protect concrete from injurious action by sun, wind, rain, flowing water or mechanical injury. Do not allow concrete to dry out from time of placement until the expiration of the curing period. Forms may be removed 48 hours after concrete placement.

**END OF SECTION**

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**SECTION 03480**

**PRECAST CONCRETE SPECIALTIES**

**PART 1 GENERAL**

1.01 SUMMARY

- A. All items supplied for use on this project shall be as specified herein.

1.02 RELATED WORK

- A. Concrete specifications are included in Section 03300.
- B. Castings are specified in Section 05540.
- C. Connecting piping is specified in Section 02610 and Section 02700.

1.03 REFERENCES

- A. Where referenced specifications (ASTM, ACI, PCI, etc.), are mentioned, these standards are deemed to be the minimum standard of quality of materials or methods to apply to this project.

1.04 SUBMITTALS

- A. Shop drawings shall be submitted in accordance with Section 00700.

1.05 QUALITY ASSURANCE

- A. The precast fabricator shall be qualified in accordance with PCI MNL-116 - Manual for Quality Control for plants and production of precast concrete products.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Handle precast members in position consistent with their shape and design. Lift and support members only at such designated points.
- B. Provide temporary lateral support during storage as necessary to prevent bowing and warping. Temporary lateral devices shall be clean, non-staining and shall not inhibit uniform curing of exposed surfaces.
- C. Protect edges of members from chipping or spalling.
- D. Mark units with date of production and final position in structure.

**PART 2 PRODUCTS**

2.01 MATERIALS

- A. Concrete materials including cement, water, sand and coarse aggregate shall conform to ACI 301-84 (Revised 1988).

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- B. Reinforcing steel and prestressing wire and strand shall conform to ACI 301-84 (Revised 1988).
- C. Initial Drawings shall be sent through the general CONTRACTOR to the ENGINEER in 3 copies for checking and return to the general CONTRACTOR in 2 copies.
- D. Final Drawings shall be sent to the ENGINEER through the general CONTRACTOR in 5 copies for conformance and return in 3 copies.

**PART 3 EXECUTION**

Not used.

**END OF SECTION**

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## SECTION 04200

### UNIT MASONRY

#### PART 1 GENERAL

##### 1.01 SCOPE OF WORK

- A. Furnish all labor, materials, and equipment required to construct and install unit masonry for structures as shown on the Drawings and specified herein.

##### 1.02 RELATED WORK NOT INCLUDED

- A. Caulking compound for caulking joints in masonry is included in Section 07900.
- B. Doors and windows are included in Division 8.
- C. Painting is included in Section 09900.

##### 1.03 QUALITY ASSURANCE FOR FIRE RESISTANCE

- A. Where fire resistance ratings are indicated for unit masonry work, provide materials and construction which are identical to those of assemblies whose fire endurance has been determined by testing in compliance with ASTM E119 by a recognized testing and inspecting organization or by another means, as acceptable to the authority having jurisdiction.

##### 1.04 SUBMITTALS

###### A. Product Data

- 1. The CONTRACTOR shall submit to the ENGINEER manufacturer's product data for each type of masonry unit, accessory, and other manufactured products, including certifications that each type complies with specified requirements, in accordance with the specific requirements of Division 1, Section 00700.

###### B. Samples

- 1. The CONTRACTOR shall submit to the ENGINEER for verification purposes, samples of each exposed masonry unit. Include in each set of samples the full range of exposed textures to be expected in the completed work. For initial selection of exposed masonry units submit samples showing full range of textures available.

#### PART 2 PRODUCTS

##### 2.01 CONCRETE BLOCK

###### A. Size and Shapes

- 1. Blocks shall be of nominal dimensions and shapes as shown on the Drawings. They shall have actual dimensions 3/8-inch less than nominal

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dimensions to allow for width of joints. Interior blocks shall be regular units, with smooth faces on both sides. Exterior blocks shall be split-face blocks if facing bricks do not exist.

2. Special blocks shall be used at bond beams, corners and junctions, and about windows and doors.

#### B. Composition

1. Blocks shall be made of Portland Cement, Ohio River Sand or clean crushed limestone fine aggregate and crushed limestone.
2. Blocks shall meet the requirements of the Standard Specifications for Hollow-Load-Bearing Concrete Masonry Units, ASTM Designation C 90, Grade N, Type 1, normal-weight.
3. All exterior split-face blocks shall be ASTM C-90, Grade N, Type 1, with water absorption rate not to exceed 9 lbs./cu. ft. of material or 7.2 percent of dry weight of unit. Field samples shall be tested in accordance with ASTM C-140.

#### C. Expense of Tests

1. Except as specified under Article 9, "Rejection," of ASTM Designation C 90, the expense of inspection and testing shall be borne by the OWNER.

### 2.02 BRICK

- A. Standard facing brick shall conform to Standard Specification for Facing Brick (Solid Masonry Units Made From Clay or Shale), ASTM C 216, Type FBS, Grade SW, minimum compressive strength 2500 PSI, and shall be sized 2-1/4 inches high, 7-5/8 inches long, and 3-5/8 inches wide.
- B. Brick used for filler in masonry walls shall be unglazed and shall conform to ASTM C 216, Grade SW.

### 2.03 MORTAR MATERIALS

- A. Portland Cement: Any standard brand conforming to ASTM Specification C 150, same as specified for concrete.
- B. Masonry Cement: Any standard brand conforming to ASTM C 91.
- C. Lime: Hydrated lime must be at least 92 percent hydrated, conforming to ASTM Standard C 207.
- D. Sand: First quality clean natural Kentucky or Ohio River Sand. When dry 100 percent shall pass a No. 8 sieve and not more than 35 percent shall pass a No. 50 sieve, and conforming to ASTM Standard Specification C 144.

2.04 METAL TIES AND ANCHORS

- A. Masonry wall steel wire reinforcement shall consist of truss type horizontal joint reinforcement, Rectangular Ties and "Z" Bars as manufactured by Dur-O-Wal, Inc., Masonry Reinforcing Corporation of America, or equal.
- B. Truss type reinforcement shall have 2 galvanized (ASTM A641, Class 3) side rods for single wythe block walls, 4 galvanized side rods for cavity walls, and galvanized (ASTM A153, Class B-2), flush welded, cross ties spaced not greater than 16 inches on centers as follows:

	<b>Heavy Duty</b>	<b>Standard</b>	<b>Spec. Standard</b>	<b>Extra Heavy Duty</b>
Knurled Side Rods	3/16" Dia.	8 Ga. Galv	3/16" Dia.	
Cross Ties	9 Ga.	9 Ga.	9 Ga. Galv.	3/16" Dia.

- C. Rectangular ties shall be hot dipped galvanized (ASTM A153, Class B-2) after fabrication, 3/16-inch diameter by 4 inches wide, without moisture drip.
- D. Dovetail anchor slots shall be 24-gauge galvanized (ASTM A153, Class B-2) steel with 1-inch wide by 1-inch deep by 5/8-inch throat equal to Dur-O-Wal, Inc. D/A 100. Dovetail anchors shall be 1-inch wide, 12-gauge galvanized (ASTM A153, Class B-2) steel and corrugated. Length shall be sufficient to extend from face of concrete, through joint, to within 5/8-inch of masonry face except for partition walls where length shall be 5-1/2 inches from face of concrete to end of anchor.

**PART 3 EXECUTION**

3.01 MORTAR

A. Mortar Proportion

1. Mortar shall be in accordance with the Property Specifications, ASTM Designation C 270. Unless otherwise indicated on the Drawings, mortar shall be Type M, which shall be proportioned by volume, 1 part Portland Cement, 1 part masonry cement and not less than 4-1/2 parts nor more than 6 parts sand measured in a damp loose condition (80 pounds per cubic foot, dry basis), or 1 part Portland Cement, 1/4 part hydrated lime, and not less than 2-3/4 parts nor more than 3-3/4 parts sand measured in a damp loose condition. Sand shall be adjusted to obtain specified strength. All mortar shall be used within 2 hours after mixing.
2. The CONTRACTOR shall have on the job and use adequate and accurate equipment for obtaining required proportions by volume of cement, sand, and lime in the mortar.
3. Mortar shall not be used after initial set.



## B. Mortar Mixing

1. The mortar shall be thoroughly mixed, and only in such quantity as is needed for immediate use. Mortar shall be mixed with a maximum amount of water consistent with satisfactory workability for the mason. Overwetting of mixes shall not be permitted. Only machine mixing shall be used, except for small jobs when hand mixing is specifically authorized by the ENGINEER.
2. For machine mixing, while the mixer is in operation, the mortar materials shall be batched in the following order. Add approximately 3/4 of the required water, 1/2 the sand, all of the cement, then the remainder of the sand. Allow the batch to mix briefly and then add water in small quantities until satisfactory workability for the mason is attained. Caution is urged to avoid overwetting of the mix. The mortar shall then be mixed a minimum time of 5 minutes after all materials have been added. The mixer drum shall be completely empty before recharging next batch.
3. For hand mixing, the cement and sand shall be thoroughly mixed in the following manner, before water is added: Spread the sand in the box, spread the cement on top of the sand and mix well with hoe from both ends of the box. Add about 3/4 of the required water and mix until all materials are uniformly damp. Add water in small amounts and continue mixing until satisfactory workability for the mason is attained. Allow the batch to stand approximately 5 minutes and remix thoroughly with the hoe, without additional water.

## C. Mortar Consistency

1. The mortar shall contain as much water as it can possibly carry and still provide satisfactory workability for the mason at the time the masonry unit is laid in the wall. It shall be retempered on the board as necessary to maintain this consistency. Retempering of the mortar in the mortar box shall not be permitted. Overwetting mixes to reduce retempering time, or excessive retempering with continual additions of water, tend to weaken paste. The size of batches should be limited to avoid this requirement.

## D. Cold Weather Mortar

1. In cold weather, sand and water shall be heated sufficiently to maintain the temperature of mortar when used to above 50 degrees Fahrenheit.

## E. Admixtures

1. Antifreeze compounds to lower the freezing point of mortar shall not be used. Accelerators or other admixtures shall not be permitted without acceptance of the ENGINEER.

### 3.02 BRICK AND CONCRETE BLOCK CONSTRUCTION

#### A. General

1. Walls shall be laid up of wythes of brick and/or block and of thickness as shown on the Drawings. Concrete block shall be laid in a running bond pattern. Grouted construction, reinforced construction, control joints, expansion joints, roof anchors, and other special construction shall be as shown on the Drawings.
2. Cavity shall be of width shown on the Drawings and shall be kept clean of mortar droppings and other debris by pulling a clean-out board up through the space between wythes as the wall is laid up. Brick vents shall be installed in strict accordance with the vent manufacturer's printed instructions in the vertical joints at the bottom of the exterior cavity walls on 4 foot centers and at other locations shown on the Drawings.
3. Metal wall ties shall be as hereinafter specified.

#### B. Handling, Protection and Storage of Materials

1. Brick and block shall be delivered hand stacked or in original packages. In unloading, they must be carefully handled in the same manner, hand stacked or "ricked" on boards. Throwing or dumping of block or any handling as to cause chipping or otherwise marring of corners or edges will not be permitted.
2. Handle and store materials off the ground in such manner as to prevent damage or intrusion of foreign matter. All masonry units shall be covered. Store concrete units under a cover that permits circulation of air without excessive moisture absorption. Store cement, lime, gypsum and air setting mortars in tight sheds with elevated floors.

#### C. Wetting Brick

1. Except in freezing weather, all brick shall be thoroughly wetted as necessary to reduce their rate of absorption of water at the time of laying to not more than 7/10 of an ounce (20 grams per minute) per brick when placed on its flat side (30 square inches) in 1/4-inch of water for one minute. For a field check, deposit a quantity of water to the flat side of the brick to wet an area approximately the size of a \$0.25 coin. If the water disappears in less than 1-1/2 minutes, they shall be wetted. Absorptive brick shall be thoroughly soaked in the pile each afternoon prior to the day they are to be used and covered with tarpaulin or heavy paper to prevent evaporation. They shall be rewetted as necessary during the day to maintain the specified rate of absorption. In wetting brick, water should be played on the pile in a heavy coarse sprinkle with a hose for a period long enough for water to run from all sides of the pile. In cold weather, absorptive brick shall be wetted with warm water just before laying.

2. Concrete units shall not be wetted.

#### D. Workmanship

1. All masonry units shall be laid plumb, level and true to line in full bed of mortar. Lay out all face coursing in advance vertically and horizontally for placing doors, windows, and structural steel to minimize cutting closures or jumping bond. All head joints and bed joints in face brick and backup work shall be completely full of mortar. Mortar for the bed joints shall be spread thick, and the furrow in the mortar shall be shallow, not deep. Mortar spread on the wall shall be limited to that which can be covered before the surface of the mortar has begun to dry. Ample mortar for the head joint shall be placed on the end of each unit to insure a full joint when the unit is shoved into place. Enough mortar shall be used to cause mortar to ooze out on both sides of the head joint and bed joint. Slushing is not permitted. Units shall be adjusted to the line immediately when first set into the wall, and they shall not be moved thereafter unless relaid in fresh mortar.

#### E. Joints

1. All joints shall be of uniform thickness, approximately 3/8-inch for brick and block. All exterior joints shall be cut flush. As the mortar takes its initial set (when the mortar requires pressure to make a print with the thumb), they shall be tooled to provide a concave surface. A tool approximately twice the diameter of the joint shall be used. All masons must use jointing tools of the same size. Head joints shall be tooled first. Sufficient pressure shall be applied during the tooling of the joints to compact the mortar firmly against the units and provide a neat smooth weathertight joint. Exposed interior masonry work shall have neatly tooled concave joints made with same size tool used on exterior joints.

#### F. Cutting

1. Where cutting brick and concrete block is necessary, use motor-driven carborundum or diamond saw or other method to produce clean cut edges. Do all necessary cutting to accommodate installation of electric outlets, conduits, plumbing fixtures, pipes, brackets, and bathroom accessories. Block with chipped or irregular cut surfaces will not be accepted.

#### G. Protection

1. Protect brick and concrete block facing against staining. When work is not in progress, all unfinished masonry shall be covered with a weighted down, nonstaining, waterproofed material or canvas to overhang the wall at least 2 feet. When work is resumed, top surface of work shall be cleaned of all loose mortar and, in drying weather, thoroughly wetted. Concrete units shall be cleaned but not wetted.

2. No masonry shall be laid when the temperature is below 32 degrees Fahrenheit on a rising thermometer or below 40 degrees Fahrenheit on a falling thermometer, unless adequate precaution against freezing is provided. No masonry shall be constructed on or with frozen materials. All masonry units stored in the open or stacked near the mortar boards shall be covered with canvas or waterproofed material to prevent excessive wetting when freezing is expected. In cold weather, masonry shall be protected against freezing for at least 48 hours after being laid with the temperature on both sides of the wall maintained above 40 degrees Fahrenheit.

#### H. Pointing and Cleaning

1. Point and fill all holes and cracks in exposed joints with additional fresh mortar. If the mortar has hardened, defects shall be chiseled out, wetted and refilled solidly with fresh mortar and tooled as specified.
2. Clean exposed masonry surfaces thoroughly from top down, to remove stains and mortar deposited during construction. Cleaning with soap powder or other mild solutions shall not be attempted in less than 48 hours after the construction of the wall.
3. Brick masonry walls shall be cleaned in strict accordance with Brick Institute of America (BIA) Technical Notes publication No. 20 Revised Sept./Oct. 1977, "Cleaning Brick Masonry."
4. Concrete block masonry walls shall be cleaned in strict accordance with the recommendations of the National Concrete Masonry Association.

#### 3.03 METAL WALL TIES AND REINFORCEMENT

- A. Masonry wall ties shall be of the material specified herein and/or as shown on the Drawings. Ties shall be placed as shown on the Drawings and specified herein. Place additional rectangular ties around all door and window openings at jambs, heads, and sills with ties not over 8 inches O. C. and within 8 inches of the opening.
- B. Use reinforcement at control joints as shown on the Drawings.
- C. Anchor brick and block to adjacent columns and beams with dovetail anchors 24 inches O.C. horizontally and 16 inches O.C. vertically unless otherwise required or shown.

#### 3.04 INSTALLING WINDOW SILLS AND COPINGS

- A. Units shall be set by experienced masons to produce a first class job. Thoroughly clean units, then sponge with clean water just before setting; when setting in cold weather, clean by brushing instead of sponging.
- B. Set each stone plumb, level, and true to line in a full bed of mortar and tap to even bearing. Sawing through mortar joints to correct bearing or adjust joint will not be permitted.

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- C. Soft wood wedges, soaked in water, may be used where necessary to prevent crushing of mortar; wedges must be removed when dry and before pointing. Keep face of units free from mortar.
- D. Brush joints clean, carefully remove any wedges so that pointing will be continuous; after thorough wetting, point all joints (except those specified to be left open or caulked) flush with pointing mortar. Leave building expansion joints open except where shown on the Drawings to be filled. No pointing shall be done when temperature is below 35 degrees Fahrenheit.
- E. After completion of setting, all units shall be thoroughly cleaned by scrubbing with brushes and soap powder or other suitable cleaning compound or by the application of steam. Cleaning compounds shall not contain acid or other ingredients that will injure units. Cleaning shall begin at top and continue down face of building. Upon completion, leave units clean and free from mortar, stain and traces of cleaning compound and with all joints pointed.
- F. Protect offsets and sills with covering until completion of masonry work. Use galvanized nails to prevent rust stains. Protect other work as necessary to prevent damage. Replace damaged or defective units.
- G. Prepare and submit fabrication and setting drawings to the ENGINEER; do not fabricate units until drawings have been accepted. Drawings shall show jointing, bonding, connection with other work, typical and special anchoring dimensions and setting number of each unit. Each piece, when delivered, shall have corresponding setting number marked on back or unexposed edge.

**END OF SECTION**

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**SECTION 05520**  
**METAL FABRICATIONS**

**PART 1 GENERAL**

1.01 SCOPE OF WORK

- A. Provide all labor, materials, and equipment required to construct and install metal fabrications as shown on the Drawings and specified herein. Included in this section are handrails, grating, nuts, bolts, anchors, hatches, ladders, and stairs.

1.02 RELATED WORK NOT INCLUDED

- A. Concrete work is included in Division 3.
- B. Castings are included in Division 5, Section 05540.
- C. Painting is included in Division 9, Section 09900.

1.03 QUALITY ASSURANCE

- A. All fabricated materials shall be of the highest quality, free of structural, handling, and workmanship defects.
- B. Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

1.04 SUBMITTALS

A. Shop Drawings

1. The CONTRACTOR shall submit to the ENGINEER in accordance with Division 1, Section 00700 detailed shop drawings of all materials to be fabricated, and shall receive the ENGINEER's certification of review before fabrication. Include plans, elevations and details of sections and connections. Show anchorage and accessory items. Provide templates for anchor bolt installation by others. Include any requirements for surface preparation, paint products, or grout.
2. Where materials or fabrications are indicated to comply with certain requirements for design loadings, include structural computations, material properties and other information needed for structural analysis. This shall not relieve the CONTRACTOR of responsibility for all errors, omissions, and deviations of his shop drawings from the Drawings and Specifications and from requirements of final results called for in the Drawings and Specifications.

B. Samples

1. The CONTRACTOR shall submit 2 sets of representative samples of materials and finished products as may be requested by the ENGINEER, or as specified herein.

**PART 2 PRODUCTS**

2.01 MATERIALS

A. Steel

1. Steel fabrication shall be done in conformity with the "AISC Load and Resistance Factor Design Specification for Structural Steel Buildings," Second Edition dated December 1, 1993, latest revision.
2. Prime and paint in accordance with Division 9, unless otherwise required or permitted.
3. Unless otherwise noted on the Drawings or in the Specifications, galvanizing shall be by hotdip process in accordance with ASTM A 525-93, Coating Designation G90 (previous Coating Class Commercial 1.25 oz per sq ft).
4. Damaged zinc coating shall be repaired according to Federal Specification DOD-21035A (Galvanizing Repair Spec.) and ASTM A 780-93a as follows:
  - a. Remove foreign matter from both damaged and contiguous undamaged area by wire brushing and cleaning with metal conditioner recommended by cold galvanizing coating manufacturer.
  - b. Apply 2 coats of cold galvanizing coating to damaged area, ensuring an overlap of the surrounding undamaged galvanizing for continuity of galvanic protection. Cold galvanizing coating shall be Z.R.C. Chemical Products Co., "Z.R.C. Cold Galvanizing" or Galvicon Corp., "Cold Galvanizing," or equal.

B. Aluminum

1. Aluminum shall have a high resistance to corrosion and shall be Alloys 6061-T6, 6062-T6, 6063-T5, 6063-T6, or 6105-T5 for wrought products such as rods, bars, standard structural shapes, extrusions, and forgings; and Alloy 214 for castings, or equal.
2. Aluminum fabrication shall be in accordance with ASCE the Aluminum Association "Specifications for Aluminum Structures," latest revision. Welding shall be done by the argon-shielded tungsten-arc method or the automatic or semi-automatic argon-shielded consumable-electrode method, or equal. Welding rods and electrodes shall be in strict accordance with above specifications.

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3. Where anodic coating is required and type is not specified or shown on the Drawings, coating shall be Class II Clear (204-R1). Anodic coatings shall conform to the following requirements:
  - a. Clear Anodic Coatings
    - (1) Class II Clear (204-R1) (0.4 Mil Coating)
      - (a) The exposed surfaces of aluminum shall be cleaned of all fabricating oils and foreign matter, given a medium caustic etch pretreatment.
    - (2) Class I Clear (215-R1) (0.7 Mil Coating)
  - b. Color Anodic Coatings
    - (1) All aluminum parts (both extrusion and sheet stock) shall be of a controlled aluminum alloy and temper suitable for receiving an electrochemically produced hard anodic oxide coating. All aluminum parts (both extrusion and sheet stock) shall receive a caustic etch pretreatment to remove all surface foreign matter followed by an electrochemically produced anodic oxide coating having a minimum coating thickness of 0.7 mil. Color shall be specified by the OWNER and range samples shall be submitted to establish the upper and lower limits of color variations.

### **PART 3 EXECUTION**

#### **3.01 GENERAL**

- A. The CONTRACTOR shall be responsible for all errors, omissions, and deviations of the shop drawings from the Drawings and Specifications. Any errors or omissions shall be brought to the attention of the ENGINEER whose interpretation and instructions shall be received before proceeding with the fabrication of that portion of the work.
- B. Manufacturers' printed installation instructions shall be strictly followed and any conflicts with the shop drawings and/or Contract Drawings shall be directed to the ENGINEER for resolution before proceeding with installation.
- C. All base plates, inserts and anchorages shown embedded in concrete shall be accurately located and secured before placing concrete as per a manufacturer supplied template. All structural members and components shall be accurately leveled, plumbed and secured at locations shown on the Drawings.
- D. Painting
  1. Cleaning and painting of all fabricated materials shall be in strict accordance with Division 9, Section 09900, of these Specifications.



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E. Steel

1. All fabrication and erection shall be done in conformity with the "AISC Load and Resistance Factor Design Specification for Structural Steel Buildings," Second Edition dated December 1, 1993, latest revision.
2. Refer to Article 2.01.A of this Specification Section for repair of galvanized surfaces.

F. Aluminum

1. The contact surfaces of aluminum with steel, dissimilar materials, concrete and/or masonry shall be protected from corrosion by a coating of coal tar, Kop-Coat Bitumastic Super Service Black, or equal.
2. Aluminum surfaces embedded in concrete shall be protected from corrosion by a tightly adherent coating of 2 applications of zinc chromate primer.

3.02 NUTS AND BOLTS

- A. Bolts embedded in concrete shall be secured with templates at the time of pouring concrete. Bolts shall be suitably protected from damage throughout the construction period.
- B. Damaged galvanized surfaces on nuts and bolts shall be repaired according to Article 2.04, this Section.

3.03 CONCRETE ANCHORS

- A. Concrete anchors shall be installed strictly in accordance with manufacturer's printed instructions which shall be available on the job site.
- B. Refer to Division 15 for supporting small pipe.

3.04 GUARD POSTS

- A. Set in concrete as indicated. Fill cores solidly with air-entrained concrete having a 28-day minimum compressive strength at 3,000 psi.

**END OF SECTION**

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**SECTION 08100**  
**METAL DOORS AND FRAMES**

**PART 1 GENERAL**

1.01 SUMMARY OF WORK

- A. Furnish all labor, materials, and equipment required to construct and install doors and frames as shown on the Drawings and specified herein.
- B. Steel door assemblies are to be used at locations shown on the Door Schedule on the Drawings.
- C. Sizes, basic designs and special requirements for the doors are shown on the Drawings.

1.02 RELATED WORK

- A. Concrete work including grouting of frames is included in Division 3.
- B. Unit masonry is included in Division 4, Section 04200.
- C. Door Accessories are included in Division 8, Section 08730.
- D. Finish hardware for doors is included in this Division, Section 08700.
- E. Painting is included in Division 9, Section 09900.

1.03 QUALITY ASSURANCE

- A. Doors and frames shall be furnished by the same manufacturer.
- B. Resistance to high impact, high frequency use, corrosion and heat transmission are the governing factors requiring the doors to meet durability standards of the Steel Door Institute (SDI) Standard Data Series 100-76 Classification Type III, Extra Heavy Duty or NAAMM Standard CHM-1-74. A typical door shall have passed and all doors furnished shall meet the requirements of ANSI Standard A151.1-80, twist test and 1 million cycle swing test.
- C. Doors, which do not require a fire rating, shall be Ceko 1-3/4 inch Imperial Maxim or equal.

1.04 SUBMITTALS

- A. The CONTRACTOR shall submit to the ENGINEER in accordance with Division 1, Section 00700, copies of manufacturer's specifications for fabrication and installation of steel doors and frames. They shall include details of each frame type, elevations of door design types, conditions at opening, details of construction, location and installation requirements of finish hardware and reinforcements, and details of joints and connections. Show anchorage and accessory items.

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- B. The CONTRACTOR shall also provide schedule of doors and frames using same reference numbers for details and openings as those on the Drawings.
- C. Label Construction Certification: Submit manufacturer's certification for oversize fire-rated doors and frames that each assembly has been constructed with materials and methods equivalent to requirements for labeled construction.

#### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow metal work cartoned or crated to provide protection during transit and job storage. Provide additional sealed plastic wrapping for factory finished doors.
- B. Inspect hollow metal work upon delivery for damage. Minor damages may be repaired provided finish items are equal in all respects to new work and acceptable to ENGINEER; otherwise, remove and replace damaged items as directed.
- C. Store doors and frames at building site under cover. Place units on wood sills at least 4 inches high, or otherwise store on floors in manner that will prevent rust and damage. Avoid use of non-vented plastic or canvas shelters which could create humidity chamber. If cardboard wrapper on door becomes wet, remove carton immediately. Provide 1/4-inch spaces between stacked doors to promote air circulation.

## PART 2 PRODUCTS

### 2.01 DOORS

#### A. Typical Basic Construction

1. Doors shall be 1-3/4 inches thick, constructed of 14 gauge, galvanized, hot-dipped, heat-treated, zinc-coated steel. Doors shall have vertical mechanical interlocking seams on hinge and lock edges. Top and bottom 14 gage stainless steel channels laminated within the door shall be provided. Doors shall be reinforced, stiffened and sound deadened with impregnated honeycomb core filling the inside of the door and laminated to the inside faces of panels. Doors shall be mortised and adequately reinforced for all hardware. Doors shall be reinforced internally with 16 gage steel reinforcement for surface closers.
2. Clearance between bottom of exterior doors and floor shall be 3/4-inch to allow for 1/2-inch high threshold. Clearance at bottom of interior doors shall be 3/4-inch over uncovered floors and approximately 1/2-inch over quarry tile floors. Standard clearances shall be provided at heads and jambs.

#### B. Hardware Reinforcement

1. Standard hardware mortising shall be for full mortise heavy weight 4-1/2 inch x 4-1/2 inch template butt hinges (3 per door up to maximum door size 3'-4" wide by 7'-6" height) and government 86 series locksets. At the

factory, doors shall be mortised, drilled and tapped for other mortised hardware as required and reinforced for surface applied hardware, for which drilling and tapping shall be done by the CONTRACTOR.

C. Accessories

1. Channel Fillers

- a. The recessed top channel of all interior and exterior doors shall be closed with a snap-in vinyl filler.

2. Astragals

- a. Heavy gauge stainless steel astragals shall be provided on the inside of pairs of doors where indicated on the Drawings. Astragals shall be on the inactive leaf on outswing doors and on the active leaf of inswing doors. Refer to Section 08730 for additional requirements.

2.02 FRAMES

A. General

1. Frames shall be furnished by the door manufacturer in size and with special requirements shown on the Drawings and/or specified herein.

B. Basic Construction

1. Frames shall be of 16 gauge steel and depths shown on the Drawings for 1-3/4 inch doors. Frames shall have 8 gauge minimum hinge reinforcements with a minimum of 4 projection welds for reinforcement, 14 gauge minimum strike reinforcements with tubulated screw holes and 14 gauge minimum surface mounted hardware reinforcements.
2. Frames shall be mitered, setup, face welded and ground smooth. Three-sided frames shall have removable spreader braces securely fastened to bottom jambs for rigidity during shipping and handling. Knock-down frames may be used when called for on the Drawings or otherwise required.
3. Frames shall be furnished with factory installed rubber mutes or equivalent, 3 per strike jamb and 2 per hand on double swing frames.

C. Hardware Reinforcement

1. At the factory, frames shall be mortised, drilled and tapped for all mortise type hardware and reinforced for surface applied hardware, for which drilling and tapping shall be done by the CONTRACTOR. Steel plaster guards shall be provided at all hinge and strike locations and other locations of tapped holes.

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2. Special reinforcement and hinges shall be provided to transfer forces to frame anchors and prevent door sag.

#### D. Anchors

1. Appropriate anchors shall be provided at the jambs for securing to walls as shown on the Drawings. Anchors shall provide tight holding power inside of jambs to prevent door sag. Adjustable floor anchors shall be provided to permit setting frame above subfloor when required by floor toppings, etc.
2. Provision shall be made for anchoring into existing openings where indicated on the Drawings.

### PART 3 EXECUTION

#### 3.01 INSPECTION

- A. Installer must examine substrate and conditions under which steel doors and frames are to be installed and must notify CONTRACTOR in writing of any conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to installer.

#### 3.02 INSTALLATION

- A. General: Install standard steel doors, frames, accessories strictly in accordance with final shop drawings and manufacturer's data and as herein specified by personnel trained and experienced in the specific type of installation when damage from subsequent construction operations is unlikely.
- B. Placing Frames: Comply with provisions of SDI-105 "Recommended Erection Instructions for Steel Frames," unless otherwise indicated. Except for frames located at in-place concrete and masonry installations, place frames prior to construction of enclosing walls and ceilings. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After completion of wall construction, remove temporary braces and spreaders leaving surfaces smooth and undamaged.
  1. In masonry construction, locate 3 wall anchors per jamb at hinge and strike levels. Grout frames solid with cement containing no expanding or antifreeze agents.
  2. Use extreme care to attach frames securely to existing cement and masonry construction with machine screws and masonry anchorage devices using shims behind frames to prevent warping.
- C. Door Installation
  1. Fit hollow metal doors accurately in frames, within clearances specified in SDI-100.

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3.03 ADJUST AND CLEAN

- A. Final Adjustments: Check and readjust operating finish hardware items, leaving steel doors and frames undamaged and in complete and proper operating condition.
- B. Joints between frames and openings shall be caulked using appropriate color.

**END OF SECTION**

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**SECTION 08700**  
**BUILDERS' HARDWARE**

**PART 1 GENERAL**

**1.01 SUMMARY OF WORK**

- A. Furnish all labor, materials, and equipment required to install and integrate finish hardware, weatherstripping and thresholds with the doors and frames as specified herein and as shown on the Drawings.
- B. Definition: "Builders' Hardware" includes items known commercially as builders' hardware which are required for swing doors. Types of items in this Section may include (but are not necessarily limited to):
  - 1. Hinges
  - 2. Lock cylinders and keys
  - 3. Lock and latch sets
  - 4. Bolts
  - 5. Exit devices
  - 6. Closers
- C. The schedule included herein designates the type and quality of the hardware to be furnished for this project.

**1.02 QUALITY ASSURANCE**

- A. Manufacturer: Obtain each kind of hardware (latch and lock sets, hinges, closers, etc.), from only 1 manufacturer, although several may be indicated as offering products complying with requirements.

**1.03 SUBMITTALS**

- A. All submittals shall conform to Section 00700 requirements.
- B. Product Data: Submit manufacturer's technical information for each item of hardware. Include whatever information may be necessary to show compliance with requirements, and include instructions for installation and for maintenance of operating parts and finish.
- C. Hardware Schedule: Submit final hardware schedule in manner indicated below. Hardware schedules are intended for coordination of work.
- D. Final Hardware Schedule Content: Based on builders' hardware indicated, organize hardware schedule into "hardware sets" indicating complete designations of every item required for each door of opening. Include the following information:

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1. Type, style, function, size, and finish of each hardware item.
  2. Name and manufacturer of each item.
  3. Fasteners and other pertinent information.
  4. Location of hardware set cross-referenced to indications on Drawings both on floor plans and in door and frame schedule.
  5. Explanation of all abbreviations, symbols, codes, etc., contained in schedule.
  6. Mounting locations for hardware.
  7. Door and frame sizes and materials.
  8. Keying information.
  9. Keying Schedule: The supplier shall coordinate specific keying requirements through the OWNER prior to submittals to the ENGINEER for review.
- E. Samples: Submit one sample of each type of exposed hardware unit, finished as required, and tagged with full description for coordination with schedule.
- F. Samples will be returned to the supplier. Units which are acceptable and remain undamaged through submittal, review and field comparison procedures may, after final check of operation, be used in the work, within limitations of keying coordination requirements.

1.04 PRODUCT HANDLING

- A. Packaging of hardware is the responsibility of the supplier. As material is received by the hardware supplier from the various manufacturers, sort and repackage in containers marked with the hardware set number. Two or more identical sets may be packed in the same container.
- B. Inventory hardware jointly with representatives of the hardware supplier and the hardware installer until each is satisfied that the count is correct.

1.05 JOB CONDITIONS

- A. Coordination: Coordinate hardware with other work. Tag each item or package separately, with identification related to the final hardware schedule, and include basic installation instructions in the package. Furnish hardware items of proper design for use on doors and frames of the thicknesses, profile, swing, security, and similar requirements indicated, as necessary for proper installation and function. Deliver individually packaged hardware items at the proper times to the proper locations (shop or project site) for installation.



- B. Templates: Furnish hardware templates to each fabricator of doors, frames, and other work to be factory-prepared for the installation of hardware. Upon request, check the shop drawings of such other work to confirm that adequate provisions are made for the proper installation of hardware.

## **PART 2 PRODUCTS**

### **2.01 SCHEDULED HARDWARE**

- A. Requirements for design, grade, function, finish, size and other distinctive qualities of each type of builders' hardware is indicated in the Builders' Hardware Data Sheet and Hardware Schedule at the end of this section. Products are identified by using hardware designation numbers of the following:
  - 1. Manufacturer's product designations: Manufacturer's product designation is used in the Hardware Schedule for purposes of establishing minimum requirements. Provide either the product designated or the comparable product of other manufacturers that comply with requirements, except for door locks.
  - 2. Manufacturer's numbers used in Hardware Schedule are for purposes of setting a standard of quality and are not intended to imply that products of named manufacturers are required to the exclusion of equivalent products of other manufacturers.
- B. BHMA numbers are taken from the following BHMA standards. Provide products complying with these standards and requirements specified elsewhere in this section.
  - 1. Butts and Hinges: ANSI A156.1 (BHMA 101).
  - 2. Locks and Lock Trim: ANSI A156.2 (BHMA 601).
  - 3. Exit Devices: ANSI A156.3 (BHMA 701).
  - 4. Door Controls - Closers: ANSI A156.4 (BHMA 301)
  - 5. Auxiliary Locks: ANSI A156.5 (BHMA 501).
  - 6. Architectural Door Trim: ANSI A156.6 (BHMA 1001).
  - 7. Template Hinge Dimensions: ANSI A156.7.
  - 8. Door Controls - Overhead Holders: ANSI A156.8 (BHMA 311).
  - 9. Mortise Locks and Latches: ANSI A156.13 (BHMA 621).
  - 10. Auxiliary Hardware: BHMA 1201.
  - 11. Materials and Finishes: BHMA 1301.

### **2.02 MATERIALS AND FABRICATION**

- A. General: Hand of door: The Drawings show the direction of swing or hand of each door leaf. Furnish each item of hardware for proper installation and operation of the door movement as shown.
- B. Manufacturer's Nameplate: Do not use manufacturer's products which have manufacturer's name or trade displayed in a visible location (omit removable nameplates), except in conjunction with required UL labels and as otherwise acceptable to the ENGINEER.

- C. Manufacturer's identification will be permitted on rim of lock cylinders only.
- D. Base Metals: Produce hardware units of the basic metal and forming method indicated, using the manufacturer's standard metal alloy, composition, temper and hardness, but in no case of lesser (commercially recognized) quality than specified for the applicable hardware units.
- E. Fasteners: Manufacture hardware shall be attached with stainless steel screws to conform to published templates, generally prepared for machine screw installation. Do not provide hardware which has been prepared for self-tapping sheet metal screws, except as specifically indicated.
- F. Provide concealed fasteners for hardware units which are exposed when the door is closed, except to the extent no standard units of the type specified are available with concealed fasteners. Do not use through bolts for installation where the bolt head or the nut on the opposite face is exposed in other work, except where it is not feasible to adequately reinforce the work.
- G. Codes: Doors leading to hazardous areas such as boiler rooms, mechanical spaces, shafts, etc., shall be equipped with knurled levers.

#### 2.03 HINGES

- A. Hollow metal doors: Standard hinge shall be stainless steel, full mortise heavy weight 4-1/2 inch by 4-1/2 inch template butt hinges (3 per door-up to maximum door size 3 feet 4 inches wide by 7 feet 6 inches height). Finish shall be US32 D. Hinge size and quantity for larger doors will be shown on the Drawings.

#### 2.04 LOCK CYLINDERS AND KEYING

- A. General: Supplier will meet with OWNER at the job site to finalize keying requirements and obtain final instructions in writing, prior to shop drawing submittal for review.
- B. Review the keying system with the OWNER and provide the type system required.
- C. Keying system employed shall provide a high level of security. Each cylinder shall contain at least 7 key pins.
- D. All cylinders shall be furnished with removable cores, which will be keyed alike and furnished with 2 keys.
- E. Hardware distributor shall:
  - 1. Deliver hardware to the job site.
  - 2. Deliver to the OWNER all keys.
  - 3. Assist OWNER in set-up of key cabinet system.

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- F. All subsequent orders for cylinder and/or cut keys shall only be available from the factory upon receipt of the proper authorization from the building owner.
- G. Equip all locks with high security cylinders which comply with performance requirements for Grade 1 cylinders as listed in ANSI A156.5 and which have been tested for pick and drill resistance requirements of UL 437 and UL listed.
- H. Metals: Construct lock cylinder parts from brass/bronze, stainless steel or nickel silver.
- I. Comply with OWNER'S instructions for keying and, except as otherwise indicated, provide individual change key for each lock which is not designated to be keyed alike with a group of related locks.
- J. Key Material: Provide keys of nickel silver only.
- K. Key Quantity: Furnish 2 change keys for each lock.

#### 2.05 LOCKS, LATCHES AND BOLTS

- A. Strikes: Provide manufacturer's standard wrought box strike for each latch or lock bolt, with curved lip extended to protect frame, finished to match hardware set.
- B. Lockset: Provide locksets, mortised and have 5/8-inch throw.
  - 1. Lock Throw: Provide 3/4-inch minimum throw of latch and deadbolt used on pairs of doors. Comply with UL requirements for throw of bolts and latch bolts on rated fire openings.
- C. Flush Bolts, Bottom Inactive Leaf on Pair of Doors: Minimum of 1/2-inch diameter rods of brass, bronze or stainless steel, with minimum 12-inch long rod.
- D. Surface Bolts, Top of Inactive Leaf on Pair of Doors: Minimum of 3/4-inch wide steel rod by 1/4-inch thick. Finish shall be dull chromium plated.
- E. Cane Bolt: Provide 5/8-inch diameter rod, 18 inches long, steel with zinc plating, surface mount to pair of doors with stainless steel screws.
- F. Crash Stop: Polished cast brass brackets with solid, welded steel chain in tear resistant vinyl cover. Heavy duty compression spring assembled to both ends of chain and end brackets. Thru door fastening required.
- G. Door stops: Polished cast brass or aluminum, resilient, non-marring rubber tip. Expansion shield and lead shield. Base diameter 2-1/2 inches, height and/or projection 3-5/8 inches.
- H. Padlocks: Provide 3 padlocks of the same manufacturer as the door locks. Solid brass case and brass shackle. Shackle shall have minimum vertical clearance of 2-1/2 inches. Key all padlocks alike and provide 2 keys for each lock. Padlocks

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are for the use on motor control centers, security gates, rolling service doors, and as designated by the OWNER.

## 2.06 CLOSERS

- A. Size of Units: Except as otherwise specifically indicated, comply with the manufacturer's recommendations for size of closer, depending upon size of door, exposure to weather, and anticipated frequency of use, or treated for corrosive environment conditions.
- B. Body of closer shall be of corrosion resistant aluminum alloy with a prime coat and a finish coat of polyurethane enamel. The main arm, foot, threaded rod and adjusting arm assembly shall be stainless steel, or treated with a marine type paint suitable for corrosive environment conditions.

## 2.07 HARDWARE FINISHES

- A. Provide matching finishes for hardware units at each door or opening to the greatest extent possible, and except as otherwise indicated. Reduce differences in color and texture as much as commercially possible where the base metal or metal-forming process is different for individual units of hardware exposed at the same door or opening. In general, match items to the manufacturer's standard finish for the latch and lock set for color and texture.
- B. Provide finishes which match those established by BHMA or, if none established, match the Architect's sample.
- C. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified for the applicable units of hardware by referenced standards.
- D. Provide protective lacquer coating on all exposed hardware finishes of brass, bronze and aluminum, except as otherwise indicated.
- E. The designations used in schedules and elsewhere to indicate hardware finishes are the industry-recognized standard commercial finishes, except as otherwise noted.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. Mount hardware units at heights indicated in "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute, except as specifically indicated or required to comply with governing regulations, and except as may be otherwise directed by ENGINEER.
- B. Mount hardware units at heights indicated in "Recommended Locations for Builders Hardware for Custom Steel Doors and Frames" by the Door and Hardware Institute, except as specifically indicated or required to comply with governing regulations and except as otherwise directed by ENGINEER.

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- C. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Wherever cutting and fitting is required to install hardware onto or into surfaces which are later to be painted or finished in another way, coordinate removal, storage and reinstallation or application of surface protections with finishing work specified in the Division 9 sections. Do not install surface-mounted items until finishes have been completed on the substrate.
- D. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
- E. Drill and countersink units which are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

### 3.02 ADJUST AND CLEAN

- A. Adjust and check each operating item of hardware and each door to ensure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly as intended for the application made.
- B. Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy of a space or area, return to the work during the week prior to acceptance or occupancy and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.
- C. Instruct OWNER's personnel in proper adjustment and maintenance of hardware and hardware finishes during the final adjustment of hardware.

**END OF SECTION**

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**SECTION 08730**  
**DOOR WEATHERSTRIPPING**

**PART 1 GENERAL**

1.01 SUMMARY OF WORK

- A. Provide weatherstripping for all doors on this project. Unless noted on the Drawings, weatherstripping shall apply to exterior doors only.
- B. Certain products have been specified because of characteristics which appear to be most suited to the application such as type and thickness of materials, physical configurations, methods of attachment and probability of obtaining satisfactory performance.

1.02 RELATED WORK

- A. Doors are specified elsewhere in Division 8.
- B. For extent of door accessories, see this Division, Section 08700.

1.03 QUALITY ASSURANCE

- A. Manufacturer of Stripping and Seals: To greatest extent possible (where available), provide stripping and seals produced by only one manufacturer.

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's standard details, specifications and installation instructions for each type of product required, in accordance with Section 00700. Furnish templates to other fabricators when required for proper preparation of work to receive stripping and seals.

**PART 2 PRODUCTS**

2.01 ACCEPTABLE MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include the following:
  - 1. National Guard Products, Inc. (NGP)
  - 2. Pemko Manufacturing Co.
  - 3. Reese Enterprises, Inc.

## 2.02 WEATHERSTRIPPING AT JAMBS AND HEADS (WRSTP)

### A. Doors

1. Head and Jambs
  - a. Seal heads and jambs with compression weatherstrip attached to stop, NGP No. 110NSA, 3/4-inch by 3/16-inch, anodized natural aluminum and neoprene material.
2. Sill
  - a. Seal sill on exterior side of outswing door with Rain Drip and Vinyl Sweep unit NGP No. 101AV, aluminum and vinyl material.
  - b. Seal sill on interior side of inswing door with Sweep NGP No. 600, aluminum and nylon, and exterior side of door with Rain Drip NGP No. 17D, aluminum.

### B. Frames

1. Head and Jambs
  - a. Attach to the door frame at the head and jambs, weatherstripping NGP 132NS closed cell sponge neoprene flexible to -35 degrees Fahrenheit in aluminum clasp.
  - b. Supplemental weatherstripping in the space between door and frame may be required to effect proper seal without binding as directed by the ENGINEER.
  - c. Supplemental weatherstripping shall be press-on closed cell sponge neoprene flexible to -35 degrees Fahrenheit, rectangular in cross-section and in size of 3/8-inch by 3/16-inch and 1/2-inch by 1/4-inch, as required for the installation. Where required, weatherstripping shall be installed at the intersections of the door frame jambs and stops with the long dimension applied to the stop at the lock and head jambs and applied to the jamb at the hinge side, NGP 361 and 362.

### C. Pairs of Doors

1. Steel Z-Type astragals for hollow metal doors shall be factory installed on doors to close the space between pairs of doors.

### D. Threshold

1. Thermal Barrier Threshold, NGP 8424, aluminum and PVC vinyl frost barrier, 4 inches wide and 1/2-inch high.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Weatherstripping and Seals: Comply with manufacturer's instructions and recommendations, to extent installation requirements are not otherwise indicated.
  - 1. Provide stainless steel fasteners of type which will not work loose as a result of normal door use, and which are compatible with metal of stripping and door (if metal). Provide only smooth exposed fastener heads which do not constitute a snagging hazard to clothing of building occupants.
  - 2. Set units plumb and level, accurately centered at optimum location for maintaining a permanent seal.
  - 3. Adjust doors, frames and hardware, if necessary, to achieve proper operation of seals and stripping.
- B. When required to fill out 1-9/16 inch rabbit for thinner combination doors or effect proper seal in exterior doors, press-on type sponge weatherstripping shall be used as directed by the ENGINEER.
- C. Continuity of Stripping: Except as otherwise indicated, provide continuous stripping at each opening, without unnecessary interruptions at door corners and hardware. Where possible, provide units which will not become ineffective as seals because of misalignment at corners, minor out-of-adjustments on doors and frames, temperature variations and normal wear and aging of materials.

**END OF SECTION**

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## SECTION 09900

### PAINTING

#### PART 1 GENERAL

##### 1.01 GENERAL REQUIREMENTS

###### A. Scope

1. CONTRACTOR shall furnish all labor, materials, equipment and incidentals required to provide painting as shown and specified.
2. The extent of painting Work is shown on the Drawings and Schedules, and as herein specified.
3. The Work includes the painting and finishing of all new and existing interior and exterior exposed items and surfaces throughout the Project included in this Contract, except as otherwise indicated.
4. Surface preparation, priming and coats of paint specified herein are in addition to shop priming and surface treatment specified under other sections of the Work.
5. The term "paint" as used herein means all protective coating systems materials, which includes pretreatments, primers, emulsions, enamels, stains, sealers, fillers and thinners, and other applied materials whether used as primer, intermediate, or finish coats.
6. Paint all exposed surfaces whether or not colors are designated in schedules, except where the natural finish of the material is specifically noted as a surface not to be painted. The term "exposed" as used herein means all items not covered with concrete or finish materials. Ducts, conduits and other materials with corrosion resistant surfaces which are in chases, above finished ceilings, or other inaccessible areas shall not require field painting. Where items or surfaces are not specifically mentioned, paint these the same as adjacent similar materials or areas. Where color or finish is not designated, the ENGINEER will select these from standard or special colors or finishes available from manufacturer for the materials system specified.
7. Prepare existing substrates as specified to receive the Work of this Section.
8. Structural and miscellaneous metals covered with concrete shall only receive a primer compatible with the covering material.
9. Pipe markers shall be as specified.

B. Coordination

1. Review installation and restoration procedures under other Sections and coordinate the installation and restoration of items that must be field painted this Section.
2. Notify other contractors in advance of the field painting to provide the other contractors with sufficient time for installation, demolition and restoration of items included in their contracts that must be field painted in this Section.
3. Coordinate the painting of areas that are inaccessible once equipment has been installed.
4. Provide finish coats which are compatible with and made by the same manufacturer as the prime paints used. Review other Sections of these Specifications in which prime paints are to be provided to ensure compatibility of the total coatings system for the various substrates. CONTRACTOR shall be responsible for the compatibility of all protective coating systems in this Contract. The CONTRACTOR shall be responsible for obtaining and providing information on the characteristics of the finish materials proposed for use, to ensure that compatible prime coats are used. No barrier coats will be used. Notify the ENGINEER in writing of anticipated problems using the coating systems as specified with substrates primed by others.

C. Related Work Specified Elsewhere

1. Division 11, Equipment
2. Division 15, HVAC
3. Division 16, Electrical

D. Painting Not Included: The following categories of Work are not included as part of the field-applied finish Work, but are included in other Sections of these Specifications or in other contracts.

1. Priming: Unless otherwise specified, shop-priming of structural metal, miscellaneous metal fabrications, other metal items and such fabricated components as shop-fabricated or factory-built heating and ventilating, instrumentation and electrical equipment or accessories shall conform to applicable requirements of Section 09900 but is included under the appropriate Sections of this Specification.
2. Pre-Finished Items: Unless otherwise shown or specified, do not include painting when factory-finishing or installer finishing is specified for such items as (but not limited to), baked-on enamel, porcelain, polyvinylfluoride or other similar finish, finished mechanical and electrical equipment such as light fixtures and distribution cabinets, elevator frames, doors and equipment. CONTRACTOR shall be required to touch

up factory finished items with paint supplied by the item manufacturer. CONTRACTOR shall field paint damaged prefinished items as directed by the ENGINEER.

3. Concealed Surfaces
  - a. Unless otherwise indicated, painting is not required on nonmetallic wall or ceiling surfaces in areas concealed from view and generally inaccessible areas such as furred areas, foundation spaces, utility tunnels, pipe spaces, duct shafts, and elevator shafts, as applicable to this project.
  - b. Paint all piping, equipment, and other items within these areas that do not have a galvanized or other corrosion resistant finish as specified.
4. Cast-in-place concrete, unless specifically scheduled on the Room Finish Schedule or in other Section.
5. Metal surfaces of anodized aluminum, stainless steel, chromium plate, bronze, copper, and similar finished materials will not require finish painting.
6. Operating Parts and Labels
  - a. Moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sensing devices, motor and fan shafts do not require finish painting, unless otherwise specified.
  - b. Do not paint over any code-required labels, such as UL and Factory Mutual, or any equipment identification performance ratings, or nomenclature plates.
  - c. Remove all paint, coating or splatter inadvertently placed on these surfaces.
7. All concrete inside of liquid holding basins unless otherwise specified or noted on Drawings to be painted.
8. All aluminum except electrical conduits specified to be painted and except surfaces in contact with concrete, wood, masonry, dissimilar metals, or in the ground.
9. Copper, aluminum, and stainless steel flashing.
10. Stair treads and risers unless otherwise specified or noted on the Drawings to be painted.

## 1.02 QUALITY ASSURANCE

### A. Manufacturer: Provide products manufactured by the following:

1. Rustoleum Corporation
2. Tnemec
3. Carboline
4. Sherwin-Williams
5. ProSoCo, Inc.

NOTE: Painting systems are listed for 4 manufacturers. Systems of other manufacturers listed above may be allowed providing they are the premium generic coatings available. See Article 2.02, Substitutions. All coatings for potable water contact shall be NSF61 and Kentucky Division of Water approved.

### B. Applicator Qualifications

1. Submit the names and experience records of the painting applicator and the painting applicator's superintendent and field foreman. Include a list of utility or industrial installations painted, responsible officials, architects, or engineers concerned with the Project and the approximate contract price.
2. Painting applicators whose submissions indicate that they have not had the experience required to perform the Work will not be approved.

### C. Single Source Responsibility: Obtain all materials from the same manufacturer unless otherwise approved. Obtain materials only from manufacturers who will:

1. Provide the services of a qualified manufacturer's representative at the Project site at the commencement of Work and on a weekly basis during painting Work to advise on materials, installation and finishing techniques.
2. Certify long term compatibility of all coatings with all substrates, both new and existing.

### D. Reference Standards: Comply with applicable provisions and recommendations of the following, except where otherwise shown or specified:

1. ANSI/ASME A13.1, Scheme for the Identification of Piping Systems
2. Great Lakes-Upper Mississippi River Board of State Sanitary Engineers (Ten States Standards), Recommended Standards for Waste Treatment Works-Latest Edition, Recommended Color Scheme for Piping

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3. Great Lakes-Upper Mississippi River Board of State Sanitary Engineers (Ten States Standards), Recommended Standards for Water Works-Latest Edition, Addendum No. 6, Painting of Water Works Piping for Public Water Supplies.
4. 29 CFR OSHA 1910.144, Safety Color Code for Marking Physical Hazards
5. SSPC Volumes 1 and 2, Latest Edition, Good Painting Practices, Systems and Specifications.

#### 1.03 SUBMITTALS

A. Samples: Submit for approval the following:

1. Paint samples for ENGINEER'S review of color and texture only. Compliance with all other requirements is the exclusive responsibility of the CONTRACTOR. Provide a listing of the material and application for each coat of each finish sample.

B. Shop Drawings: Submit for approval the following:

1. Copies of manufacturer's technical information, including paint label analysis, detailed surface preparation guides and application instructions for each material proposed for use.
2. Painting schedule for all areas to be coated.
3. Copies of CONTRACTOR'S proposed protection procedures in each area of the Work.
4. List each material and cross-reference to the specific paint and finish system and application. Identify by manufacturer's catalog number and general classification.
5. Copies of manufacturer's complete color charts for each coating system.
6. Pipe Markers: Copies of manufacturer's technical brochure, including color chart and list of standard markers.
7. Maintenance Manual: Upon completion of the Work, furnish copies of a detailed maintenance manual including the following information:
  - a. Product name and number.
  - b. Name, address and telephone number of manufacturer, manufacturer's representative, regional office and representative, and local distributor.
  - c. Detailed procedures for routine maintenance and cleaning for each system.

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- d. Detailed procedures for light repairs such as dents, scratches and staining.

C. Certificates: Submit for approval the following:

1. Certificates stating that materials meet or exceed Specification requirements.
2. Certificate stating that all coatings are compatible with substrate specified, and factory or field applied prime coats.

D. Test Reports: Submit for approval certified laboratory test reports for required performance tests and minimum solids content of products used.

#### 1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery of Material: Deliver all materials to the job site in original, new and unopened packages and containers bearing manufacturer's name and label, and the following information:

1. Name or title of material.
2. Manufacturer's batch number and date of manufacture.
3. Manufacturer's name.
4. Contents by volume, for major pigment and vehicle constituents.
5. Thinning instructions where recommended.
6. Application instructions.
7. Color name and number.

B. Storage of Materials

1. Store only acceptable project materials on project site.
2. Store in a suitable location approved by the ENGINEER. Keep storage area clean and accessible.
3. Store in an area where the minimum temperature is 50 degrees Fahrenheit.
4. Restrict storage to paint materials and related equipment.
5. Comply with health and fire hazards regulations including the Occupational Safety and Health Act.

#### 1.05 JOB CONDITIONS

A. Existing Conditions

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1. Before painting is started in any area, it shall be thoroughly cleaned by vacuuming with commercial vacuum cleaning equipment or flushing with clean water.
2. After painting operations begin in a given area, cleaning shall then be done only with commercial vacuum cleaning equipment.

B. Environmental Requirements

1. Apply water-base or epoxy paints only when temperature of surfaces to be painted and surrounding air temperatures are between 55 degrees Fahrenheit and 90 degrees Fahrenheit unless otherwise permitted by the paint manufacturer's printed instructions.
2. Apply other paints only when the temperature of surfaces to be painted and the surrounding air temperatures are between 65 degrees Fahrenheit and 95 degrees Fahrenheit, unless otherwise permitted by the paint manufacturer's printed instructions.
3. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85 percent; or when the surface temperature is less than 5 degrees Fahrenheit above dew point; or to damp or wet surfaces.
4. Painting may be continued during inclement weather only if the areas and surfaces to be painted are enclosed and heated within temperature limits specified by paint manufacturer during application and drying periods.
5. Adequate illumination and ventilation shall be provided by the CONTRACTOR in all areas where painting operations are in progress. Adequate ventilation and temperature shall be maintained during the required drying time.
6. Install piping markers only after all painting and finish Work has been completed and cured.

C. Protection

1. Cover or otherwise protect finished work of other trades and surfaces not being painted concurrently or not to be painted.
2. During the painting Work, the treatment plant shall remain in operation. Employ procedures to prevent contamination of the water or wastewater process, or cause plant shutdown due to the Work of this Section. Submit proposals for protection Work to the ENGINEER.
3. Painting shall not begin in any area until ENGINEER approves protection technique proposed by the CONTRACTOR.

## **PART 2 PRODUCTS**

### **2.01 MATERIAL QUALITY**

- A. Provide the best grade of the various types of coatings suitable for use in wastewater and water treatment plants as regularly manufactured by listed acceptable paint materials manufacturers. Materials not displaying the manufacturer's identification as a standard, premium best-grade product will not be acceptable.
- B. Provide primers produced by the same manufacturer as the finish coats. Thinning shall be avoided if possible. Where thinning is necessary to ensure an acceptable finish, use only thinners recommended and manufactured, and use only to recommended limits.
- C. Provide paints, and pipe markers of durable and washable quality. Use materials which will withstand normal washing as required to remove grease, oil, chemicals, etc., without showing discoloration, loss of gloss, staining, or other damage.

### **2.02 SUBSTITUTIONS**

- A. No substitutions shall be considered that decrease the film thickness, the number of coats, the surface preparation or the generic type of coating specified. Approved manufacturers must furnish the same color selection as the manufacturers specified, including accent colors in all coating systems.
- B. A substitute paint system other than as specified in Part 2 of this section may be used if:
  - 1. The CONTRACTOR satisfactorily proves and documents that they are equivalent to the specified items in (1) quality and (2) durability, (3) suitability for the intended services, (4) resistance to abrasion and physical damage, (5) efficiency in protecting the substrate from corrosion for extended periods, (6) life expectancy, (7) recoating cycles, (8) solids content by volume, (9) dry film thickness per coat, (10) mil square feet per gallon, (11) compatibility with other coatings, (12) resistance to chemical attack, (13) submersion limitations, (14) temperature limitations in service and during application, (15) recommended surface preparation for maximum coating life, (16) type and quality of recommended undercoats and topcoats, (17) generic type, and (18) other pertinent criteria.
  - 2. The CONTRACTOR shall submit to the ENGINEER notarized certificates on the letterhead of the firm manufacturing the proposed substitution certifying (1) that the proposed substitution is the equivalent of the specified material in the qualities specified above, (2) that the list of compared equivalency qualities attached, as required below, is accurate, and (3) that the proposed substitution is suitable for the intended use. The CONTRACTOR shall also submit to the ENGINEER on the letterhead of the firm manufacturing the proposed substitution a list of at least 10



installations similar to the installation for which the products are being proposed, at which installations the proposed products have performed reliably in similar service for at least 5 years; this list shall include the name, address, and telephone number of the owner of each installation, and the name of that owner's employee who is responsible for maintenance and construction.

3. If the proposed coatings have not been used at the number of installations and for the number of years specified above, the CONTRACTOR shall submit to the ENGINEER on the letterhead of the firm manufacturing the proposed substitution, a statement that the manufacturer will guarantee to furnish a bond from an acceptable surety guaranteeing that the manufacturer of the proposed substitution shall, in case of failure by the proposed substitution within a 5-year period, promptly pay all costs for material and labor for (1) removal of unsuitable coatings, (2) proper reparation of the substrate, (3) recoating with all the coats of the originally specified products in the complete specified coating system in place on the equipment whether the coatings were applied in the shop or in the field, (4) OWNER'S administration and supervision for the corrective action, and (5) bypass and alternate treatment processes while the equipment is unoperative due to coating failure and replacement.
4. If the proposed substitution requires alteration to the contract work, the CONTRACTOR shall bear all such costs involved and the costs of allied trades affected by the substitution.
5. The CONTRACTOR shall submit to the ENGINEER, the paint manufacturer's current printed information and recommendations and product data sheets both for the proposed substitutions and specified products, and shall submit a list comparing the difference between the proposed substitution and the specified products for the equivalency qualities specified hereinbefore and between the 2 paint manufacturer's printed information, recommendations, and product data sheets.
6. No proposed substitution shall be incorporated in the work until all the above submission requirements have been reviewed and accepted by the ENGINEER.

## 2.03 COLORS AND FINISHES

- A. Surface treatments and finishes, are shown under "Painting Systems" below. All substrates scheduled under "Painting Systems," both new and existing, shall be painted whether or not shown on the Drawings, or in Schedules, unless an item is specifically scheduled as not requiring the painting system scheduled below.
- B. Color Selection: The OWNER may select colors from the standard or custom colors available, in addition to color coding on all piping and ducts.

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- C. Color Coding: In general, and unless otherwise specified, all color coding of piping, ducts, and equipment shall comply with applicable standards of ANSI A13.1 and OSHA 1910.144.
- D. Pipe Labeling and Color Code: Refer to Schedule A at end of Section.
- E. Signs: See Schedule B at the end of Section.
- F. Use representative colors when preparing samples for ENGINEER'S review.
- G. Color Pigments: Pure, nonfading, leadfree applicable types to suit substrates and service indicated.

## 2.04 PAINTING OR COATING SYSTEMS

### A. Ferrous Metals and all Ferrous Piping; Interior Non-submerged

- 1. Product and Manufacturer: Provide one of the following:
  - a. Rustoleum
    - (1) Surface Preparation: SSPC-SP6 Commercial Blast Cleaning.
    - (2) Shop Primer: No.9380 Epoxy Primer-1 coat, 3.0 to 5.0 dry mils per coat, 9360
    - (3) Intermediate and Field Touch-up: Series HS9381 Epoxy, Primer 1 coat 3.0 to 5.0 dry mils
    - (4) Finish: Series 9100 High Performance Epoxy-1 coat, 5.0 to 9.0 dry mils per coat.
  - b. Tnemec
    - (1) Surface Preparation: SSPC-SP6 Commercial Blast Cleaning
    - (2) Primer: Series 66 Hi Build Epoxoline -1 coat, 4.0 to 6.0 dry mils.
    - (3) Finish: Series 66 Epoxoline -1 coat, 4.0 to 6.0 dry mils.
  - c. Carboline
    - (1) Primer: Carboline Carboguard 60 at 2.0 to 3.0 dft.
    - (2) Intermediate: Carboline Carboguard 893 SG at 4.0 to 6.0 DFT.
    - (3) Finish: Carboline Carboguard 893 SG at 4.0 to 6.0 dft.
  - d. Sherwin-Williams
    - (1) Primer: Macropoxy 646 - 1 coat at 3.0 to 5.0 dry mils.

- (2) Finish: Macropoxy 646 – 2 coats at 3.0 to 5.0 dry mils.

**B. Ferrous, Non-ferrous Metals and Galvanized Metals; Exterior Non-submerged**

1. Surface Preparation

- a. Ferrous Metals: SSPC-SP-10 with 2.0 mil profile.
- b. SSPC SP 16 Brush-off Blast Cleaning of Coated and Uncoated Galvanized Steel, and Non-Ferrous Metals.

2. Product and Manufacturer: Provide the following:

a. Rustoleum

- (1) Primer: No. 9100 H.P. Epoxy-1 coat, 5.0 to 8.0 dry mils.
- (2) Finish: Series 9400 Polyurethane-1 coat, 2.0 to 3.0 dry mils per coat.

b. Tnemec

- (1) Primer: Series 66 Hi Build Epoxoline – 1 coat, 4.0 to 6.0 dry mils.
- (2) Finish: Series 1074/1075 – 1 coat, 2.0 to 3.0 dry mils.

c. Carboline

- (1) Primer: Carboline Carboguard 60 at 2.0 to 3.0 dft.
- (2) Intermediate: Carboline Carboguard 60 at 4.0 to 6.0 dft.
- (3) Finish: Carboline Carbothane 134 HG at 2.0 to 3.0 dft.

d. Sherwin-Williams

- (4) Primer: Macropoxy 646 – 2 coats at 3.0 to 4.0 dry mils per coat.
- (5) Finish: Acrolon 218HS, B65 Series – 1 coat at 3.0 to 4.0 dry mils.

**C. Galvanized Metal and Non-Ferrous Metal; Interior, Non-submerged**

1. Surface Preparation

- a. Ferrous Metals- SSPC-SP-10 with 2.0 mil profile.
- b. SSPC SP Brush-off Blast Cleaning of Coated and Uncoated Galvanized Steel, and Non-Ferrous Metals.

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2. Product and Manufacturer: Provide the following:
  - a. Rustoleum
    - (1) Primer: No. 9100 Epoxy-1 coat, 5.0 to 8.0 dry mils.
    - (2) Finish: Series 9100 Epoxy-1 coat, 5.0 to 8.0 dry mils, 100 to 200 square feet per gallon
  - b. Tnemec
    - (1) (1) Primer: Series 66 Hi Build Epoxoline - 1 coat, 3.0 to 5.0 dry mils.
    - (2) (2) Finish: Series 66 Epoxoline - 1 coat, 4.0 to 6.0 dry mils.
  - c. Carboline
    - (1) (1) Primer: Carboline Galoseal at 2.0 to 4.0 dft.
    - (2) (2) Finish: Carboline Carbocrylic 3359 at 2.0 to 3.0 dft.
  - d. Sherwin-Williams
    - (1) (1) Primer: Macropoxy 646 - 1 coat at 4.0 to 6.0 dry mils.
    - (2) (2) Finish: Macropoxy 646 - 1 coat at 4.0 to 6.0 dry mils.

**D. PVC Piping, Fiberglass, Fiberglass Insulation Covering; Interior**

1. Surface Preparation: Sand as specified in 3.02.G.
2. Product and Manufacturer: Provide the following:
  - a. Rustoleum
    - (1) Primer: No. 9100 Epoxy-1 coat, 2.0 to 3.0 dry mils
    - (2) Finish: Series 9100 Epoxy-1 coat, 5.0 to 8.0 dry mils per coat
  - b. Tnemec
    - (1) Primer: Series 66 Hi Build Epoxoline - 1 coat, 2.0 to 3.0 dry mils.
    - (2) Finish: Series 66 Epoxoline - 1 coat, 2.0 to 3.0 dry mils.
  - c. Carboline
    - (1) Primer: Carboline Carboguard 60 at 2.0 to 3.0 dft.

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(2) Finish: Carboline Carboguard 60 at 2.0 to 3.0 dft.

d. Sherwin-Williams

(1) Primer: Macropoxy 646 - 1 coat at 2.0 to 3.0 dry mils.

(2) Finish: Macropoxy 646 - 1 coat at 2.0 to 3.0 dry mils.

#### E. Gypsum Wallboard, Interior

1. Surface Preparation: Sand and seal as specified in 3.2.H.

2. Product and Manufacturer: Provide the following:

a. Rustoleum

(1) Primer: No. 5290 Low Gloss Acrylic-1 coat, 2.0 to 3.0 dry mils, 225 to 320 square feet per gallon.

(2) Finish: No. 5290 Low Gloss Acrylic -2 coats, 3.5 to 6.0 wet mils, 2.0 to 3.0 dry mils per coat, 225 to 400 square feet per gallon.

b. Tnemec

(1) Primer: No. 51-792 PVA sealer-1 coat, 1.0 to 2.0 dry mils.

(2) Intermediate: No. 113/114, Color Tneme, Tufcoat-1 coat, 2.0 to 2.5 dry mils

(3) Finish: No. 113/114, Color Tneme, Tufcoat-1 coat, 2.0 to 2.5 dry mils

c. Carboline

(1) Primer: Carboline Sanitile 120 at 1.0 to 2.0 dft.

(2) Intermediate: Carboline Carbocrylic 3359 at 2.0 to 3.0 dft.

(3) Finish: Carboline Carbocrylic 3359 at 2.0 to 3.0 dft.

d. Sherwin-Williams

(1) Finish: 2 coats Fromar 200 Eggshell at 1.5 to 2.0 dft per coat.

### PART 3 EXECUTION

#### 3.01 INSPECTION

A. CONTRACTOR and his applicator shall examine areas and conditions under which painting work is to be performed and notify the ENGINEER in writing of conditions detrimental to the proper and timely completion of work. Do not

proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to the ENGINEER.

- B. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to formation of a durable paint film.

### 3.02 SURFACE PREPARATION

#### A. General

1. Perform all preparation and cleaning procedures as specified herein and in strict accordance with the paint manufacturer's instructions for each particular substrate and atmospheric condition.
2. Prepare existing substrates required to be painted under this Section as specified for new substrates. Where other methods of preparing existing substrates are proposed by the CONTRACTOR, they shall be submitted to the ENGINEER for approval. ENGINEER's approval of alternate substrate preparation shall not relieve the CONTRACTOR of this required performance under this Section.
3. Remove all hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items in place and not to be finish-painted, or provide surface-applied protection, prior to surface preparation and painting operations. Remove, if necessary, for complete painting of the items and adjacent surfaces. Following completion of painting of each space or area, reinstall the removed items by workmen skilled in the trades involved.
4. Clean surfaces to be painted before applying paint or surface treatments. Remove oil and grease with clean cloths and trisodium phosphate and water or cleaning solvents prior to mechanical cleaning. Program cleaning and painting so that dust and other contaminants from cleaning process will not fall onto wet, newly-painted surfaces.
5. All surfaces which were not shop painted or which were improperly shop painted, and all abraded or rusted shop painted surfaces, which are to be painted, as determined by the ENGINEER, shall be prepared as specified below.
6. All submerged metals shall be field prepared and field coated in lieu of shop preparation.

#### B. Concrete, Precast Concrete, and Masonry Surfaces

1. Surface preparation shall be in accordance with SSPC-SP 13/NACE No. 6. Surface Preparation of Concrete and the following requirements.
2. Prepare surfaces of concrete, precast concrete, and concrete block to be painted by removing all efflorescence, chalk, dust, dirt, grease, oils, with soap and water. All cracks, nails, nail holes, and fins shall be removed and/or filled before painting.

- a. Concrete shall have been allowed a minimum curing time of 30 days prior to painting.
  - b. Any measurable protrusions in concrete block shall be ground smooth prior to painting.
  - c. All spilled concrete or excess concrete from mortar joints shall be ground smooth prior to painting.
3. Determine alkalinity and moisture content of surfaces to be painted by performing appropriate tests. If surfaces are found to be sufficiently alkaline to cause blistering and burning of the finish paint, correct this condition before application of paint. Provide the ENGINEER with suitable testing materials in order to carry out alkalinity and moisture tests.
  4. Determine, by testing surfaces, that no chlorides are present.
  5. Do not paint over surfaces where moisture content exceeds that permitted in the manufacturer's printed directions.
  6. Remove loose or incompatible existing finish coats as recommended by the paint manufacturer for full product responsibility. Brush blast or power tool clean all residue and create uniform rough texture.
  7. Acid etch submerged concrete and concrete floor surfaces with Rustoleum Surfa-Etch, or equal, or a commercial solution of muriatic acid, 15 percent concentration. Other surfaces that cannot be adequately cleaned by soap and water in the opinion of the ENGINEER shall also be acid etched. Exceedingly dense concrete may require a second etching. Flush floor with clean water to neutralize acid, and allow to dry before painting.

#### C. Ferrous Metals

1. Clean non-submerged ferrous surfaces including structural steel and miscellaneous metal to be shop primed, of all oil, grease, dirt, mill scale, and other foreign matter by commercial blast cleaning complying with SSPC-SP 6, minimum.
2. Clean submerged ferrous surfaces including structural steel and miscellaneous metal to be primed, of all oil, grease, dirt, chloride, mill scale, and other foreign matter by near-white blasting complying with SSPC-SP 10.
3. Clean non-submerged ferrous surfaces that have not been shop-coated of all oil, grease, dirt, chloride, loose mill scale, and other foreign substances by commercial blasting, complying with SSPC-SP 6, minimum.
4. Clean submerged ferrous surfaces that have not been shop-coated or that, in the opinion of the ENGINEER, have been improperly shop coated, of all oil, grease, dirt, chloride, mill scale, and other foreign matter by near white blasting complying with SSPC-SP 10.

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5. Touch up shop-applied prime coats which have been damaged or bare areas, with primer recommended by the coating manufacturer after commercial blasting complying with SSPC-SP 6, or by SSPC-SP-3 power tool cleaning.
  6. Remove all rust and contamination on existing ferrous metals to sound substrate with abrasive wheels, SSPC-SP 3.
- D. Non-Ferrous Metal Surfaces: Clean non-ferrous metal surfaces in accordance with the coating system manufacturer's instructions for the type of service, metal substrate, and application required.
- E. Galvanized Surfaces: Clean free of oil and surface contaminants with solvent wipe and water cleaning, recommended by the coating manufacturer, complying with SSPC-SP 16.
- F. PVC Piping and Fiberglass: Lightly sand and clean all surfaces to be painted.
- G. Insulation Covering: Clean free of oil and surface contaminants as recommended by the coating manufacturer for substrate and application required. Do not cut or damage the insulation in any way.
- H. Plaster and Gypsum Wallboard
1. Patch, sand, and seal all rough spots before prime coat.
  2. Touch up all suction spots and hot spots with primer before application of finish coats.
- I. Wood
1. Clean wood surfaces to be painted of dirt, oil, or other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sandpaper smooth those finished surfaces exposed to view and dust off. Scrape and clean small, dry, seasoned knots and apply a thin coat of white shellac or other recommended knot sealer, before application of priming coat. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood-filler. Sandpaper smooth when dried.
  2. Seal wood required to be job painted immediately upon delivery to job. Seal edges, ends, faces, undersides, and backsides of such wood including chair rails, moldings and trim, cabinets, counters, cases, and paneling.

### 3.03 MATERIALS PREPARATION

#### A. General

1. Mix and prepare painting materials in strict accordance with manufacturer's directions.
2. Do not mix coating materials produced by different manufacturers.



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3. Store materials not in actual use in tightly covered containers. Maintain containers used in storage, mixing, and application of paint in a clean condition, free of foreign materials and residue.
4. Stir all materials before application to produce a mixture of uniform density, and stir as required during the application of the materials. Do not stir any film which may form on the surface into the material. Remove the film and, if necessary, strain the material before using.

### 3.04 APPLICATION

#### A. General

1. Apply paint by brush, roller, air spray, or airless spray in strict accordance with manufacturer's detailed instructions and recommendations of Paint Application Specifications No. 1 in SSPC Vol. 2, where applicable. Use brushes best suited for the type of material being applied. Use rollers of carpet, velvet back, or high pile sheep's wool as recommended by the paint manufacturer for material and texture required. Use airless spray equipment that is capable of providing 1500 to 3000 psi at the nozzle.
  2. The number of coats and paint film thickness required is the same regardless of the application method. Do not apply succeeding coats until the previous coat has completely dried/cured.
  3. Apply additional coats when undercoats, stains, or other conditions show through final coat of paint, until paint film is of uniform finish, color, and appearance. This is of particular importance regarding intense primary accent colors. Ensure that all surfaces, including edges, corners, crevices, welds, and exposed fasteners receive a film thickness equivalent to that of flat surfaces.
  4. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, non-specular black paint as specified, before final installation of equipment.
  5. Finish exterior doors on tops, bottoms, and side edges same as exterior faces, unless otherwise specified.
  6. Paint metal or wood parts in contact with dissimilar materials as specified with appropriate primer.
  7. Omit field primer on metal surfaces that have been primed with an open approved primer at the point of manufacturer. Touch-up paint prime coats only when approved by ENGINEER.
- B. Minimum Coating Thickness: Apply each material at not less than manufacturer's recommended spreading rate, and provide total dry film thickness as specified. Apply extra coat if required to obtain specified total dry film thickness or to provide a uniform finished appearance.

C. Scheduling Painting

1. Apply the first-coat material to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practical after preparation and before subsequent surface deterioration.
2. Allow sufficient time between successive coatings in accordance with manufacturer's instructions to permit proper drying. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate pressure, and application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.

D. Prime Coats: Recoat primed and sealed walls and ceilings where there is evidence of suction spots or unsealed areas in first coat, to ensure a finish with no burn-through or other defects caused by insufficient sealing.

E. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance, and coverage.

F. Transparent (Clear) Finishes

1. On exposed-to-view portions, use multiple coats to produce glass-smooth surface film of even luster. Provide a finish free of laps, cloudiness, color irregularity, runs, brush marks, orange peel, nail holes, or other surface imperfections.
2. Provide satin finish for final coats, unless otherwise indicated.

G. Brush Application

1. Brush-out and work all brush coats onto the surface in an even film. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable. Neatly draw all glass and color break lines.
2. Brush apply all primer or first coats, unless otherwise permitted to use mechanical applicators.

H. Mechanical Applicators

1. Use mechanical methods for paint application when permitted by governing ordinances, paint manufacturer, and approved by ENGINEER. If permitted, limit to only those surfaces impractical for brush applications.
2. Limit roller applications, if approved by the ENGINEER, to interior wall finishes for second and third coats. Apply each roller coat to provide the equivalent hiding as brush-applied coats.
3. Confine spray application to metal framework, siding, decking, wire mesh, and similar surfaces where hand brush work would be inferior and to other surfaces specifically recommended by paint manufacturer.

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4. Wherever spray application is used, apply each coat to provide the equivalent hiding of brush-applied coats. Do not double back with spray equipment for the purpose of building up film thickness of 2 coats in one pass.

I. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not in compliance with specified requirements as required by the ENGINEER.

J. Stenciling of Pipe, Valves, and Appurtenances: Stencil all pipe, valves, and appurtenances as specified in 2.05.A. The CONTRACTOR shall provide and install under glass 4 framed color legends to be mounted as instructed by the ENGINEER.

### 3.05 PROTECTION

A. Protect work of other trades, whether to be painted or not, from the work of this Section. Leave all such work undamaged. Correct all damages by cleaning, repairing, or replacing, and repainting, as acceptable by the ENGINEER.

B. Provide "Wet Paint" signs as required to protect newly-painted finishes. Remove all temporary protective wrappings provided for protection of this Contract and other contracts after completion of painting operations.

### 3.06 CLEANUP

A. During progress of work, remove from site all discarded paint materials, rubbish, cans, and rags, at the end of each work day.

B. Upon completion of painting work, clean all paint-spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.

C. At the completion of work of other trades, touchup and restore all damaged or defaced painted surfaces as determined by the ENGINEER.

**END OF SECTION**

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## SECTION 13400

### FACTORY-BUILT BOOSTER PUMP SYSTEM

#### PART 1 GENERAL

##### 1.01 SCOPE OF WORK

- A. The CONTRACTOR shall furnish and install 1 prefabricated, above-ground water booster pump system with all necessary internal piping, valves, fittings, supports, pumps, motors, controls, and other necessary appurtenances as shown on the plans and specified herein.
- B. The station shall be complete when delivered and will not require internal contractor construction except to install the power service through the service conduit provided for that purpose and to connect the main water service to the required points and other work as may be listed in this Section, or as shown on the Drawings.
- C. The station shall be designed such that all electrical components are a minimum 1 size larger than what is initially installed to allow for larger pumps to be installed in the future. For instance if the large pumps initially need 19.4 hp at the design point but need 21.2 hp to cover the entire pump curve without overloading, then a minimum 25 hp pump/motor will initially be installed but the VFDs, starters, wiring, etc., shall be designed to handle 30 hp pumps as 30 hp is 1 size above the minimum motor size initially installed.

##### 1.02 SYSTEM-OPERATIONAL DESCRIPTION

- A. The prefabricated booster pump system will be providing water to 3 different pressure zones in the distribution system. Demand in the 3 different pressure zones consist of a storage tank, another high level booster pump station and a distribution system. Any one or all three of the pressure zones may demand water from the prefabricated booster pump system at a time.
- B. The prefabricated booster pump system shall consist of at least 3 large pumps and at least one small pump, all with VFDs. A small recirculation line or another small pump or a hydro pneumatic tank may be supplied if the one specified small pump cannot provide the full specified flow range. Each of the large pumps shall produce a minimum flow of 250 gpm while boosting the pressure 230 feet, and when 2 of the pumps are operating in parallel the combined output shall be at least 480 gpm. The small pump shall produce between 10 gpm and 100 gpm and shall have a design condition of 105 gpm while boosting the pressure 51 ft. The suction pressure will vary depending on what the system demand is but can be generally expected to range between 70 ft (30.3 psi) for the large pumps and 300 ft (130 psi) for the small pump(s) at 10 gpm. Operation will consist of either 1 or 2 of the large pumps operating or the small pump operating. The small pump will not operate when either of the large pumps are operating. See Section 17200 for detailed pump operational sequence.

### 1.03 CONTRACTOR'S INSTALLATION REQUIREMENTS

- A. The CONTRACTOR shall be required to set the system in the building on the foundation shown in the drawings. The foundation shall be constructed by the CONTRACTOR as shown in the drawings. Following setting of the station, the CONTRACTOR will be required to anchor the station to the foundation. The CONTRACTOR shall supply the anchor bolts.

### 1.04 MANUFACTURER'S RESPONSIBILITY FOR PERFORMANCE

- A. The Specifications and Drawings for the factory-built equipment do not necessarily include all the details for the design and fabrication for the factory-built equipment. The Drawings are generally schematic but the specifications do call out strict requirements to known methods, components and assemblies that must be in a full, complete and functional pumping system. As such, the Manufacturer shall accept and hold complete responsibility for the functionality of the pump system and its workings.

### 1.05 MANUFACTURER

- A. The basis of design station equipment is Grundfos Hydro MPC-E BoosterpaQ having been deemed to represent the minimum level of quality, performance and service acceptable for this equipment.

#### B. Alternate Manufacturers

- 1. Alternate manufacturers may propose on the equipment set forth in these documents.

#### C. Shop Drawing Submittal Documents

- 1. As a minimum the below-listed SHOP DRAWING SUBMITTAL documents for the pump system shall be provided.
  - a. "11-Inch x 17-Inch minimum, 24-Inch x 36-Inch maximum" sized system mechanical drawing sheets fully to scale and fully annotated showing:
    - (1) A plan view of all mechanical equipment, piping and devices necessary to system operation and with NEC Electrical Clearances;
    - (2) A lengthwise section view;
    - (3) A sidewise section view;
    - (4) A complete structural plan view of the steel base for the pump system.

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- b. "11-Inch x 17-Inch minimum, 24-Inch x 36-Inch maximum" sized sheets showing:
  - (1) A power one line diagram annotated and showing all power components;
  - (2) A process and instrumentation diagram (P&ID) showing all components, devices and circuit for the controls and instrumentation for the control and monitoring equipment.
- 2. The shop drawing submittal shall be provided in the number of copies noted in Section 00700 (00710) bound in a 3-ring binder with a Table of Contents and tabs for each individual pump system and with 1 electronic copy on CD placed inside the 3-ring binder in a suitable pocket.

#### D. Post-Bid Submittal

- 1. Equipment submittals shall be bound and in the number of copies as noted in section 01600. The submittals shall contain a minimum of 2 full size drawings, size 24" x 36"; 1 each covering the booster pump system and the electrical control schematic. The booster pump system drawing shall be specific to this project, in at least 3 different views, be to scale and illustrate the National Electrical Code (NEC) clearances per Section 110-26 of the Code. The submittal booklets will be complete with data sheets covering all major components that make up the booster pump system and the ETL file number under which the manufacturer is listed, service department personnel statement as detailed in the specifications and be complete with the manufacturer's formal warranty policy.

#### 1.06 QUALITY ASSURANCE

- A. The equipment furnished shall be designed, constructed, and installed in accordance with the best practices and methods and shall operate satisfactorily when installed as shown on the contract drawings and operated per manufacturer's recommendations.

#### 1.07 SHIPPING AND DELIVERY

- A. The specified equipment shall be delivered by the manufacturer FOB DESTINATION and thereby the pump system manufacturer shall hold the full responsibility for the condition and completeness of the equipment upon its delivery.
- B. The ENGINEER shall hold the right to inspect the equipment prior to unloading and setting so as to assure the quality and condition of the equipment is in no way deficient.
- C. If in the view of the ENGINEER or ENGINEER's resident project representative, the equipment is deficient when delivered, delivery shall be refused.

#### 1.08 FACTORY START-UP AND TRAINING SERVICE

- A. Without exception, the pump system manufacturer is directly responsible for pump system start-up and operator training. Third party contractors, agents or representatives are not to be allowed to start up the pump system. As such;
  - 1. One start-up factory service technician shall be a regular employee of the pump station manufacturer.
  - 2. The manufacturer shall provide the number of copies of the type noted in Section 01600 of the complete Operation and Maintenance Manual.

#### 1.09 MANUFACTURER'S WARRANTY

- A. The warranty is the sole responsibility of the pump system manufacturer and that manufacturer's warranty shall be provided in written form, being placed in both the Submittal documents covering the specified equipment and the O&M manuals provided with that equipment.
- B. It is required the pump system warranty provide the OWNER with a single source responsibility for all components specified herein and the system as a whole. That single source shall be none other than the pump system manufacturer. Third party suppliers, service contractors, "Pass-through" warranties and service by the representative are not acceptable.
- C. Said manufacturer's warranty shall at a minimum cover:
  - 1. A period of 2 years commencing upon **successful start-up**, after authorized manufacturer's start-up, not to exceed 30 months from the date of shipment.
  - 2. The warranty period shall be inviolate regardless of any component manufacturer's warranty for equipment and components within the station.
  - 3. The manufacturer's warranty shall cover all equipment, components and systems provided in or with the pump system by the manufacturer of the pump system, exclusive of those components supplied by and/or installed by others independent of the manufacturer of record for this system.
  - 4. The warranty shall provide for the station manufacturer to bear the full cost of labor and materials for replacement and/or repair of faulty or defective components so there shall be **no cost** incurred by the OWNER for this work during the warranty period.
  - 5. The manufacturer's warranty policy is amended only by the items considered consumable, i.e., light bulbs, pump seals, pump packing, lubricants and other maintenance items consumed by usage.
  - 6. No assumption of contingent liabilities for any component failure during manufacturer's warranty is made.

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7. The warranty pertains only where the equipment has been operated in strict accordance with the manufacturer's instructions and requirements. Evidence of misuse or modification to the equipment voids the warranty.

D. If the submitted written manufacturer's warranty **does not** meet the minimum requirements set forth above, that submittal will forthrightly be rejected.

## PART 2 PRODUCTS

### 2.01 PREFABRICATED VARIABLE SPEED PACKAGED PUMP SYSTEM

- A. Furnish and install a pre-fabricated and tested variable speed packaged pumping system to maintain constant water delivery pressure.
- B. The packaged pump system shall be a standard product of a single pump manufacturer. The entire pump system including pumps and pump logic controller, shall be designed, built, and tested by the same manufacturer.
- C. The complete packaged water booster pump system shall be certified and listed by UL (Category QCZJ - Packaged Pumping Systems) for conformance to U.S. and Canadian Standards.
- D. The complete packaged pumping system shall be NSF61 Annex G listed for drinking water and low lead requirements.

### 2.02 PUMPS

- A. All pumps shall be ANSI/NSF 61 Annex G listed for drinking water and low lead requirements.
- B. The pumps shall be of the in-line vertical multi-stage design.
- C. The head-capacity curve shall have a steady rise in head from maximum to minimum flow within the preferred operating region. The shut-off head shall be a minimum of 20% higher than the head at the best efficiency point.
- D. Pump Acceptance Test
  1. All pumps shall meet the pump acceptance grade and corresponding tolerance bond of IU with regard to flow rate, head, power and efficiency as stated in the Hydraulic Institute 14.6 (ANSI/HI 14.6). Values outside this grade shall be grounds for rejection.
- E. Small Vertical In-Line Multi-Stage Pumps (Nominal flow from 3 to 125 gallons per minute) shall have the following features:
  1. The pump impellers shall be secured directly to the pump shaft by means of a splined shaft arrangement.
  2. The suction/discharge base shall have ANSI Class 250 flange or internal pipe thread (NPT) connections as determined by the pump station manufacturer.



F. Pump Construction.

1. Suction/discharge base, pump head, motor stool: Cast iron (Class 30)
2. Impellers, diffuser chambers, outer sleeve: 304 Stainless Steel
3. Shaft 316 or 431 Stainless Steel
4. Impeller wear rings: 304 Stainless Steel
5. Shaft journals and chamber bearings: Silicon Carbide
6. O-rings: EPDM
  - a. Shaft couplings for motor flange sizes 184TC and smaller shall be made of cast iron or sintered steel. Shaft couplings for motor flange sizes larger than 184TC shall be made of ductile iron (ASTM 60-40-18).
  - b. Optional materials for the suction/discharge base and pump head shall be cast 316 stainless steel (ASTM CF-8M) resulting in all wetted parts of stainless steel.
7. The shaft seal shall be a balanced o-ring cartridge type with the following features:
  - a. Collar, Drivers, Spring: 316 Stainless Steel
  - b. Shaft Sleeve, Gland Plate: 316 Stainless Steel
  - c. Stationary Ring: Silicon Carbide
  - d. Rotating Ring: Silicon Carbide
  - e. O-rings: EPDM
  - f. The silicon carbide shall be imbedded with graphite.
8. Shaft seal replacement shall be possible without removal of any pump components other than the coupling guard, shaft coupling and motor. The entire cartridge shaft seal shall be removable as a one piece component. Pumps with motors equal to or larger than 15 hp (fifteen horsepower) shall have adequate space within the motor stool so that shaft seal replacement is possible without motor removal.

G. Large In-line Vertical Multi-Stage Pumps (Nominal flows from 130 to 500 gallons per minute) shall have the following features:

1. The pump impellers shall be secured directly to the smooth pump shaft by means of a split cone and nut design.

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2. The suction/discharge base shall have ANSI Class 125 or Class 250 flange connections in a slip ring (rotating flange) design as indicated in the drawings or pump schedule.
3. Pump Construction.
  - a. Suction/discharge base, pump head Ductile Iron (ASTM 65-45-12)
  - b. Shaft couplings, flange rings: Ductile Iron (ASTM 65-45-12)
  - c. Shaft 431 Stainless Steel
  - d. Motor Stool Cast Iron (ASTM Class 30)
  - e. Impellers, diffuser chambers, outer sleeve: 304 Stainless Steel
  - f. Impeller wear rings: 304 Stainless Steel
  - g. Intermediate Bearing Journals: Tungsten Carbide
  - h. Intermediate Chamber Bearings: Leadless Tin Bronze
  - i. Chamber Bushings: Graphite Filled PTFE
  - j. O-rings: EPDM
4. The shaft seal shall be a single balanced metal bellows cartridge with the following construction:
  - a. Bellows: 904L Stainless Steel
  - b. Shaft Sleeve, Gland Plate, Drive Collar: 316 Stainless Steel
  - c. Stationary Ring: Carbon
  - d. Rotating Ring: Tungsten Carbide
  - e. O-rings: EPDM
5. Shaft seal replacement shall be possible without removal of any pump components other than the coupling guard, motor couplings, motor and seal cover. The entire cartridge shaft seal shall be removable as a one piece component. Pumps with motors equal to or larger than 15 hp (fifteen horsepower) shall have adequate space within the motor stool so that shaft seal replacement is possible without motor removal.

#### 2.03 VARIABLE FREQUENCY DRIVES (PANEL MOUNT)

- A. See Section 16483 for requirements.

#### 2.04 PUMP SYSTEM CONTROLLER

- A. See Section 16900 for requirements.

## 2.05 SYSTEM CONSTRUCTION

- A. Suction and discharge manifold construction shall be done in a way that ensures minimal pressure drops, minimize potential for corrosion, and prevents bacteria growth at intersection of piping into the manifold. Manifold construction that includes sharp edge transitions or interconnecting piping protruding into manifold is not acceptable. Manifold construction shall be such that water stagnation cannot exist in manifold during operation to prevent bacteria growth inside the manifold.
- B. The suction and discharge manifolds shall be constructed of 316 stainless steel. Manifold connection sizes shall be as follows:
  - 1. 3 inch and smaller: Male NPT threaded
  - 2. 4 inch through 8 inch: ANSI Class 150 rotating flanges
  - 3. 10 inch and larger: ANSI Class 150 flanges
- C. Pump Isolation valves shall be provided on the suction and discharge of each pump. Isolation valve sizes 2 inch and smaller shall be nickel plated brass full port ball valves. Isolation valve sizes 3 inch and larger shall be a full lug style butterfly valve. The valve disk shall be of stainless steel. The valve seat material shall be EPDM and the body shall be cast iron, coated internally and externally with fusion-bonded epoxy.
- D. Spring-loaded non-slam type check valve shall be installed on the discharge of each pump. The valve shall be a wafer style type fitted between two flanges. The head loss through the check valve shall not exceed 5 psi at the pump design capacity. Check valves 1-1/2" and smaller shall have a POM composite body and poppet, a stainless steel spring with EPDM or NBR seats. Check valves 2" and larger shall have a body material of stainless steel or epoxy coated iron (fusion bonded) with an EPDM or NBR resilient seat. Spring material shall be stainless steel. Disk shall be of stainless steel or leadless bronze.
- E. For systems that require a diaphragm tank, a connection of no smaller than 3/4" shall be provided on the discharge manifold.
- F. A pressure transducer shall be factory installed on the discharge manifold (or field installed as specified on plans). Systems with positive inlet gauge pressure shall have a factory installed pressure transducer on the suction manifold for water shortage protection. See Section 17100 for requirements.
- G. A bourdon tube pressure gauge, 2.5 inch diameter, shall be placed on the suction and discharge manifolds. The gauge shall be liquid filled and have copper alloy internal parts in a stainless steel case. Gauge accuracy shall be 2/1/2 percent. The gauge shall be capable of a pressure of 30 percent above its maximum span without requiring recalibration.
- H. Systems with a flooded suction inlet or suction lift configuration shall have a factory installed water shortage protection device on the suction manifold.

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- I. The base frame shall be constructed of corrosion resistant 304 stainless steel. Rubber vibration dampers shall be fitted between each pumps and base frame to minimize vibration.
- J. Depending on the system size and configuration, the control panel shall be mounted in one of the following ways:
  1. On a 304 stainless steel fabricated control cabinet stand attached to the system skid.
  2. On a 304 stainless steel fabricated skid, separate from the main system skid on its own base (floor mounted with plinth)

### 2.06 TESTING

- A. The entire pump station shall be factory tested for functionality. Functionality testing shall include the following parameters: Dry Run Protection, Minimum Pressure and Maximum Pressure alarms (where applicable), Setpoint Operation, and Motor Rotation.
- B. The system shall undergo a factory hydrostatic test at the end of the production cycle. The system shall be filled with water and pressurized to 1.5 times the nameplate maximum pressure. Systems with 150# flange connections shall be tested at 350 psig, and systems with 300# flange connections shall be tested at 450 psig. The pressure shall be maintained for a minimum of 15 minutes with no leakage (slight leakage around pump(s) mechanical seal is acceptable) prior to shipment.

### 2.07 WARRANTY

- A. The warranty period shall be a non-prorated period of 24 months from date of installation, not to exceed 30 months from date of manufacture

## PART 3 EXECUTION

### 3.01 FACTORY TEST

- A. The completed pump system shall be given a hydrostatic test of all equipment at the factory to check for leaks in all piping or seals.
- B. The complete system shall be given a field test to demonstrate the complete operating range of the pumps from shut-off to maximum capacity. Results of system performance test shall be submitted to the ENGINEER for review and approval. Six copies shall be furnished.

### 3.02 FIELD TEST

- A. General
  1. Demonstrate the functional integrity of the mechanical, electrical, and control interfaces of the respective equipment and components comprising the pump system or as evidence of Substantial Completion.

2. Duration of Demonstration Period – 24 Consecutive Hours.
  - a. If, during the demonstration period, the aggregate amount of time used for repair, alteration, or unscheduled adjustments to any equipment or systems that renders the affected equipment or system inoperative exceed 10 percent of the demonstration. The demonstration of functional integrity will be deemed to have failed. In the event of failure, a new demonstration period will recommence after correction of the cause of failure. The new Demonstration Period shall have the same requirements and duration as the demonstration period previously conducted.
  - b. Conduct the demonstration of functional integrity under full operational conditions.
  - c. OWNER will provide operational personnel to provide process decisions affecting plant performance. OWNER'S assistance will be available only for process decisions. CONTRACTOR will perform all other functions including, but not limited to, equipment operation and maintenance until successful completion of the demonstration period.
  - d. OWNER reserves the right to simulate operational variables, equipment failures, routine maintenance scenarios, etc., to verify the functional integrity of automatic and manual backup systems and alternate operating modes.
  - e. Time of beginning and ending any demonstration period shall be agreed upon by CONTRACTOR and OWNER in advance of initiating demonstration period.
  - f. Throughout the demonstration period, provide knowledgeable personnel to answer OWNER'S questions, provide final field instruction on all systems and to respond to any system problems or failures which may occur.
  - g. Provide all labor, supervision, utilities, chemicals, maintenance, equipment, vehicles, or any other item necessary to operate and demonstrate all systems being demonstrated.

### 3.03 INSTALLATION

- A. Installed using manufacturer's written instructions.
- B. CONTRACTOR to furnish all labor and materials to completely install the station and render it operable.
- C. Pump system supplier shall take complete responsibility to deliver, offload and set house and pump system as an integral component on foundation, by others.

### 3.04 START-UP AND TESTING

- A. The manufacturer of the packaged water pressure booster system shall supply trained personnel to completely check the installation and adjust the station for operation. An additional period shall be included for training OWNER's personnel at the time of acceptance and field tests. Minimum of 3 days shall be allowed for start-up and training.

### 3.05 SPARE PARTS

- A. In addition to the manufacturer's standard spare parts, furnish sufficient to replace one pump mechanical seal, one complete set of gaskets required to assemble each pump.

### 3.06 MANUFACTURER'S RESPONSIBILITIES

#### A. Support Literature

##### 1. Operation and Maintenance Instructions

- a. The pump system manufacturer shall be responsible for supplying written instructions, which shall be sufficiently comprehensive to enable the operator to operate and maintain the pump system and all equipment supplied by the system manufacturer. Said instructions shall assume that the operator is familiar with pumps, motors, piping, and valves, but that he has not previously operated and/or maintained the exact equipment supplied.
- b. The instructions shall be prepared as a system manual applicable solely to the pump system and equipment supplied by the manufacturer to these specifications, and shall include those devices and equipment supplied by him. However, items of equipment for which the system manufacturer has made mounting or other provisions, but which he has not supplied, may be excluded from these instructions.

##### 2. The instructions shall include, but not limited to, the following:

- a. Descriptions of and operating instructions for, each major component of the pump system as supplied.
- b. Instructions for operation of the pump system in all intended modes of operation.
- c. Instruction for all adjustments which must be performed at initial start-up of the pump system, and adjustments which must be performed in the course of preventative maintenance as specified by the manufacturer.
- d. Service instructions for major components not manufactured by the pump system manufacturer but which are supplied by him in accordance with these specifications. The incorporation of literature produced by the actual component manufacturer shall be acceptable.

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- e. Layout drawing of the pump system as supplied, prepared in accordance with good commercial practice, showing the locations of all pumps, motors, valves, and piping.
- f. Operation and maintenance instructions which are limited to a collection of component manufacturer literature without overall pump station instructions shall not be acceptable.
- g. Operation and maintenance instructions shall be specific to the equipment supplied in accordance with these specifications. Instruction manuals applicable to many different configurations and pump stations, and which require the operator to selectively read portions of the instructions shall not be acceptable.

**B. Certification**

- 1. Within 10 days after the final inspection of the completed installation, the manufacturer's representative shall furnish a detailed report jointly to the ENGINEER and the CONTRACTOR which shall list any deficiencies found in the work and which shall recommend corrective action for each deficiency. Upon completion of any corrective action required, the manufacturer shall furnish a letter certifying that the equipment is now properly installed and ready for operation and beneficial use by the OWNER.

**END OF SECTION**

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**SECTION 15010**

**BASIC MECHANICAL MATERIALS AND METHODS**

**PART 1 GENERAL**

**1.01 WORK INCLUDED**

- A. Furnish all labor, materials, equipment and incidentals necessary to provide complete and operational mechanical systems as shown on the Drawings and as specified herein.
- B. Installation of equipment that has not been specifically detailed in the Drawings shall be installed per that equipment manufacturer's recommended installation instructions or industry Standard Methods. All hardware and materials required for said equipment installation shall be included in the bid price.

**1.02 RELATED WORK**

- A. The following work incidental to the mechanical system work shall be done under other Sections of the Specifications.
  - 1. Electric work (except as herein specified) is included in Division 16.
  - 2. Field painting is included in Division 9, Section 09900.

**1.03 PROTECTION OF MATERIALS, WORKS AND GROUNDS**

- A. Materials, fixtures, and equipment shall be properly protected and all pipe openings shall be temporarily closed so as to prevent obstruction and damage.
- B. Protect and preserve all materials, supplies and equipment of every description and all work performed. Damages shall be repaired or replaced promptly at no additional cost to the OWNER.

**1.04 CLEANING**

- A. During the progress of the work, clean up and remove all oil, grease and other debris. At completion, clean all equipment, piping and duct systems, remove all stickers, non-permanent tags, and leave all work in perfect operating condition.

**1.05 DRAWINGS**

- A. All work shown on the Drawings is intended to be approximately correct to scale, but figures dimensions and detailed drawings are to be followed in every case. The Drawings shall be taken in a sense as diagrammatic. Size of pipes and methods of running them are shown, but it is not intended to show every offset and fitting, nor every structural difficulty that may be encountered. To carry out the true intent and purpose of the Drawings, all necessary parts to make complete working systems ready for use shall be furnished without extra charge. All work shall be installed in such a manner to avoid being unsightly.



- B. Locations shown on the Drawings are approximate, and it is intended that all equipment shall be located in accordance with the general and detail Drawings of the construction proper. All measurements shall be taken at the site.

1.06 REFERENCES

- A. Kentucky Building Code
- B. Kentucky State Plumbing Law, Regulations and Code
- C. Standards for Gas Piping on Customer's Premises, Columbia Gas Distribution Companies
- D. Kentucky Regulation, 803 KAR 2:200, Confined Space Entry
- E. International Mechanical Code
- F. Kentucky Boiler and Pressure Vessel and Pressure Piping Law Rules and Regulations
- G. ASHRAE, American Society of Heating, Refrigeration and Air Conditioning Engineers, Inc.
- H. International Fire Code
- I. International Energy Conservation Code

1.07 CODES, ORDINANCES AND PERMITS

- A. The minimum standard for all work shall be the latest revision of the Kentucky Building Code (KBC), and the National Electrical Code (NEC). Whenever and wherever state laws and/or regulations and/or the ARCHITECT/ENGINEER'S design requires a higher standard than the current NEC or KBC, then these laws and/or regulations and/or the design shall be followed.
- B. Following is a list of applicable Standards or Codes:

	<u>Organization/Code/Standard</u>	<u>Abbreviated Title</u>
1.	International Mechanical Code	IMC
2.	Kentucky Building Code	KBC
3.	National Electrical Code	NEC
4.	National Electrical Safety Code	NESC
5.	Underwriters Laboratories, Inc.	UL
6.	Factory Mutual System	FM
7.	National Fire Protection Association	NFPA
8.	National Electrical Manufacturers Association	NEMA
9.	Occupational Safety and Health Administration	OSHA
10.	Instrument Society of America	ISA
11.	American National Standards Institute, Inc.	ANSI

12.	Anti-Friction Bearing Manufacturers Association, Inc.	AFBMA
13.	American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc.	ASHRAE
14.	Kentucky Boiler Law	
15.	Sheet Metal and Air Conditioning Contractors National Association, Inc.	SMACNA
16.	International Fire Code	IFC
17.	International Energy Conservation Code	IECC

- C. Obtain all required permits, pay all legal fees for the same, and in general, take complete charge and responsibility for all legal requirements pertaining to this Section of the work.

#### 1.08 LABELING

- A. All mechanical equipment and items utilizing electrical components shall be UL listed for the application, where a listing exists.

#### 1.09 COOPERATION WITH OTHER TRADES

- A. The work shall be so performed that the progress of the entire building construction including all other trades, shall not be delayed nor interfered with. Materials and apparatus shall be installed promptly when and as desired.
- B. Confer with all other trades relative to location of all apparatus and equipment to be installed and select locations so as not to conflict with work of other Sections. Refer to the General Conditions for Dispute Resolution Requirements. All work and materials placed in violation of this clause shall be readjusted to the ARCHITECT/ENGINEER'S satisfaction at no expense to the OWNER.
- C. Where work of this Section will be installed in close proximity to work of other Sections or where there is evidence that the work of this Section will interfere with work of other Sections, assist in working out space conditions to make satisfactory adjustment. If so directed, prepare and submit for approval 3/8-inch scale or larger working drawings and sections, clearly showing how this work is to be installed in relation to the work of other Sections. If the work of this Section is installed before coordinating with other trades or so as to cause interference with work of other trades, make changes necessary to correct conditions without extra charge.

#### 1.10 REVIEW OF MATERIALS

- A. Submit to the ARCHITECT/ENGINEER for review within 90 days after award of contract a complete list of materials and equipment to be incorporated in the work, together with the name and addresses of the manufacturer's and their catalog numbers and trade names.
- B. The CONTRACTOR is not allowed to substitute manufacturers listed in the Form of Proposal after the bid is accepted.

### 1.11 SUBMITTALS

- A. Submit to the ARCHITECT/ENGINEER for review, as provided in the General Conditions, the manufacturer's shop drawings and technical literature covering details and installation of all new equipment, fixtures, and accessories being furnished under this Section prior to fabrication, assembly, or shipment.
- B. Shop drawings will be required on the following materials as applicable to this Project:
  - 1. Hangers and Supports - all types and sizes.
  - 2. \*Unit Heaters.
  - 3. \*Air Conditioners, Furnaces, Heat Pumps.
  - 4. \*Unit Ventilators and PTAC units.
  - 5. \*HVAC Control Devices and Systems.
  - 6. Training Outline.
  - 7. Control Systems.

\* - A complete wiring diagram that relates specifically to this contract shall be included with submittal.
- C. Shop drawings shall be submitted only after the CONTRACTOR has checked and verified all field measurements, quantities, equipment dimensions, specified performance criteria, installation requirements, electrical requirements, materials, catalog numbers, and similar data with respect thereto and reviewed or coordinated each shop drawing with the requirements of the work and the Contract Documents.
- D. At the time of each submission the CONTRACTOR shall give the ARCHITECT/ENGINEER specific written notice of each variation that the shop drawings may have from the requirements of the Contract Documents.
- E. The shop drawings shall have a stamp or specific written indication that CONTRACTOR has satisfied the requirements stated herein before. Shop drawings submitted without the CONTRACTOR's review and stamp shall be immediately returned to the CONTRACTOR without the ARCHITECT/ENGINEER's review.

### 1.12 OPERATING AND MAINTENANCE MANUALS

- A. Four sets of O&M instructions and manuals shall be submitted in loose-leaf 3-ring cardboard reinforced vinyl binders to the ARCHITECT/ENGINEER in accordance with the General Conditions.
- B. Contained in each binder shall also be vendors, vendor phone numbers and addresses, list of materials, manufacturer's or vendor's web site, and materials parts list. Also included for each item shall be a copy of the approved shop drawing.
- C. The CONTRACTOR shall fill out the warranty card information (complete) for each and every piece of HVAC equipment and include a copy in each O&M manual.

- D. The O&M manual shall include each and every piece of HVAC equipment and accessories that a shop drawing was submitted on.

#### 1.13 POWER SUPPLY

- A. Refer to Division 16 (except as noted herein).

#### 1.14 SITE VISIT

- A. It shall be the responsibility of the bidder to visit the site before submitting his bid, and thoroughly note the conditions under which the work will be installed. No extra compensation will be later allowed for necessary work not figured that should have been foreseen.

#### 1.15 OPERATIONAL TEST

- A. After the various systems are completed and at which time the ARCHITECT/ENGINEER shall deem appropriate, the CONTRACTOR shall run an operation test for each system. The CONTRACTOR shall adjust all valves, equipment, controls and accessories so as to obtain maximum operating efficiency. Failure of any component to perform as specified shall constitute cause for rejection and removal.
- B. Some specific equipment may be noted to have the startup and checkout performed by an authorized representative of the manufacturer and a report submitted to the ENGINEER.

#### 1.16 NOISE AND VIBRATION

- A. Install vibration isolators, flexible connectors, expansion joints, and other safety measures to prevent noise and vibration from being transmitted to occupied areas. Equipment shall be selected to operate within the noise level recommended for the particular type installation in relation to its location.
- B. Following installation, make proper adjustments to eliminate excessive noise and vibration.

#### 1.17 OWNER TRAINING

- A. The CONTRACTOR supplying equipment for this division shall provide the OWNER's operations staff with training in the operation and maintenance on the equipment being furnished. The training shall be conducted at the project site by a qualified representative of the manufacturer.
- B. The cost of this training shall be included in the bid price.
- C. The required training shall consist of both classroom and hands-on situation. Classroom training shall include instruction on how the equipment works, its relationship to all accessories and other related units, detailed review of shop drawings, detailed presentation of written O&M instructions, troubleshooting and record-keeping recommendations. Hands-on training shall include a review of the manufacturer's O&M instructions, check out of each operator to identifying key elements of the equipment, tear down as appropriate,

calibration, adjustment, greasing and oiling points, and operating manipulations of all electrical and mechanical controls.

- D. The training shall be scheduled through the CONTRACTOR with the OWNER. The timing of the training shall closely coincide with the startup of the equipment, but no training shall be conducted until the equipment is operational.
- E. The minimum number of training hours to be provided by manufacturers supplying equipment on this project shall be in accordance with the following table as applicable to this Project:

<u>Item</u>	<u>Minimum Training Hours*</u>	
	<u>Classroom</u>	<u>Hands-on</u>
Heat Pumps/Air Conditioners	2	2
HVAC Controls	2	2
Fans/Louver Dampers/Unit Heaters	2	2

\* or until the OWNER is fully satisfied.

- F. At least 30 days prior to the training the manufacturer shall submit through the CONTRACTOR to the ENGINEER an outline of the training proposed for the ENGINEER's review and concurrence. The OWNER reserves the right to videotape all training sessions.

**1.18 WARRANTY**

- A. The CONTRACTOR shall guarantee all work including equipment, materials, and workmanship. This guarantee shall be against all defects of any of the above and shall start from the date of project substantial completion and continue for a minimum of 1 year. All compressors for heat pump or air conditioning equipment, as a baseline standard, shall have an additional 4-year parts only warranty beyond the CONTRACTOR'S 1-year parts and labor warranty for all equipment. Other items listed throughout Division 15 may have longer warranty requirements - see individual equipment specifications.
- B. Repair and maintenance for the guarantee period is the responsibility of the CONTRACTOR and shall include all repairs and maintenance other than that which is considered as routine. (That is replacement of filters, oiling, greasing, etc.) The ENGINEER shall be the judge of what shall be considered routine maintenance.
- C. See General Conditions for additional requirements.

**1.19 SEISMIC CONSIDERATIONS**

- A. Since this project is in Seismic Zone B, the CONTRACTOR shall be sure that all supports are consistent with the most recent state and local code requirements in this regard.

**END OF SECTION**

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## SECTION 15100

### SMALL PLUMBING VALVES, PLUMBING SPECIALTIES AND SERVICE ACCESSORIES

#### PART 1 GENERAL

##### 1.01 WORK INCLUDED

- A. Furnish all labor, materials, equipment, and incidentals required and install complete and ready for operation all valves and appurtenances as shown on the Drawings and as specified herein.

##### 1.02 RELATED WORK

- A. Large Plumbing Valves and Appurtenances are included in this Division, Section 15102.
- B. Mechanical Identification Markers, Tags and Plates are included in this Division, Section 15190.
- C. Excavation, Backfill and Grading are included in Division 2.
- D. Plumbing Piping and Fittings are included in this Division, Section 15400.
- E. Instrumentation is included in Division 13.
- F. Electrical is included in Division 16.
- G. Pipe Hangers and Supports are included in this Division, Section 15140.

##### 1.03 SYSTEM DESCRIPTION

- A. All of the equipment and materials specified herein is intended to be standard for use in controlling the flow of wastewater, sludges, water, air or chemicals, depending on the applications.

##### 1.04 QUALITY ASSURANCE

- A. All of the types of valves and appurtenances shall be products of well established firms who are fully experienced, reputable and qualified in the manufacture of the particular equipment to be furnished. All materials of construction shall be of an acceptable type and shall be designated for the pressure and temperatures at which they are to be operated, for the materials they are to handle and for the use for which they are intended. The materials shall meet established technical standards of quality and strength necessary to assure safe installations and conform to applicable standards. The equipment shall be designed, constructed and installed in accordance with the best practices and methods and shall comply with these Specifications as applicable.

##### 1.05 REFERENCES

- A. Kentucky Building Code.

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B. Kentucky State Plumbing Law, Regulations and Code.

#### 1.06 SUBMITTALS

- A. Copies of all materials required to establish compliance with these Specifications shall be submitted in accordance with the provisions of the General Conditions. Submittals shall include at least the following:
1. Certified drawings showing all important details of construction and dimensions.
  2. Descriptive literature, bulletins, and/or catalogs of the equipment.
  3. The total weight of each item.
  4. A complete total bill of materials.
  5. A list of the manufacturer's recommended spare parts.

#### 1.07 OPERATING INSTRUCTIONS

- A. Operating and maintenance instructions shall be furnished to the ENGINEER as required in the General Conditions. The instructions shall be prepared specifically for this installation and shall include all required cuts, drawings, equipment lists, descriptions, etc., that are required to instruct operating and maintenance personnel unfamiliar with such equipment.

### PART 2 PRODUCTS

#### 2.01 GENERAL

- A. All valves and appurtenances shall be of the size shown on the Drawings and as far as possible all equipment of the same type shall be from one manufacturer.
- B. All valves and appurtenances shall have the name of the maker, flow directional arrows, and the working pressure for which they are designed cast in raised letters upon some appropriate part of the body.
- C. All buried valves shall open left (counterclockwise). Insofar as possible, all valves shall open counterclockwise.

#### 2.02 BALL VALVES

- A. Ball valves shall normally be used in quick shut-off and frequent use applications.
1. Ball Valves for Water Service
    - a. Ball valves for water service 3-inch and smaller shall be rated for safe operation at 150 psi saturated steam and 600 psi WOG.
    - b. Ball valves in sizes 1/4 inch through 1 inch and 2-1/2-inch shall be full port type, other sizes to be conventional port.

- c. Ball valves shall be 2-piece bronze body construction with non-blowout stem, brass/chrome plated ball, TFE packing and reinforced TFE seat rings and seals.
- d. Exposed ball valves shall have a corrosion resistant handle operator with integral stop where exposed, key operators where buried.
- e. Threaded end connection ball valves shall be Milwaukee BA-100, Hammond 8301 or equal.
- f. Solder end connection ball valves shall be Milwaukee BA-150, Hammond 8311 or equal.

## 2.03 PRESSURE REGULATING AND PRESSURE RELIEF VALVES

### A. Water Pressure Reducing Valves

- 1. Pressure reducing valves for water service 2 inches and smaller shall be of the bronze body, renewable stainless steel seat type with threaded end connections. The device shall be rated for initial pressure up to 300 psi with an adjustable pressure range of 25 to 75 psi. The pressure reducing valves shall be Watts Regulator Series 223 or equal.

### B. Hydrants

#### 1. Freezeless Wall Hydrants

- a. Furnish and install freezeless wall hydrants at the locations shown on the Drawings. The device shall be automatic draining with vacuum breaker, 3/4 inch hose thread nozzle, one piece valve plunger to control both flow and drain functions, hardened stainless steel operating stem, and polished brass finish on brass castings enclosed in a flush mounted wall box. Two loose tee operating keys are to be furnished with each unit. The device shall include a brass casing pipe.
- b. Single temperature freezeless wall hydrant shall be approved under ASSE Standard 1019 and be Woodford Model B65 or equal.
- c. Hot and cold mixing freezeless wall hydrant shall be as specified above, Woodford Model HCB65 or equal.

#### 2. Interior Wall Hydrants

- a. Furnish and install a wall hydrant at the location shown on the drawings. The device shall have a polished chrome finish, vacuum breaker, loose key operating handle, and Teflon impregnated packing with "O" size washer.
- b. Interior wall hydrant shall be Woodford 24 or equal.



C. Hose and Nozzles

1. Hose

- a. Furnish 3/4 inch and 1 inch hose as indicated below. Hose shall be multi-purpose, heavy-duty type suitable for air or water applications. The 1 inch hose shall be rated for 250 psi, the 3/4 inch hose rated for 300 psi. The tube shall be medium-high oil resistant, the reinforcement high tensile synthetic cord and the cover EPDM. The hose shall be Gates "Contractor's Gold" or equal.
- b. Furnish one 3/4 inch x 50-foot hose for **each** 3/4 inch hose station and one 1 inch x 50-foot hose for **each** yard hydrant.

2. Nozzles

- a. Furnish 3/4-inch nozzles for each hose station.

D. Strainers, Filters, and Dryers

1. Strainers for Water Service

- a. Strainers for water service 1/4 inch - 2-1/2-inch shall be rated for safe operation at 250 psi saturated steam, 400 WOG.
- b. The strainers shall be the "Y" type with a cast iron body and 20 mesh stainless steel screen for sizes 1/4 inch to 2-inch, 3/64 inch perforation stainless steel screen for 2-1/2 inch size. End connections shall be screwed type.

**PART 3 EXECUTION**

3.01 INSTALLATION

- A. All valves and appurtenances shall be installed in the locations shown, true to alignment and rigidly supported. Any damage to the above items shall be repaired to the satisfaction of the ENGINEER before they are installed.
- B. Control valves in all locations shall be so grouped and located that they may be easily operated, through access panels, doors, or adjacent to equipment.
- C. After installation, all valves and appurtenances shall be tested at least 1 hour at the working pressure corresponding to the class of pipe, unless a different test pressure is specified. If any joint proves to be defective, it shall be repaired to the satisfaction of the ENGINEER.
- D. Install all brackets, extension rods, guides, the various types of operators and appurtenances as shown on the Drawings that in masonry floors or walls, and install concrete inserts for hangers and supports as soon as forms are erected and before concrete is poured. Before setting these items, the CONTRACTOR shall check all Drawings and figures which have a direct bearing on their

location and he shall be responsible for the proper location of these valves and appurtenances during the construction of the structures.

- E. All materials shall be carefully inspected for defects in workmanship and materials; all debris and foreign material cleaned out of valve openings, etc.; all operating mechanisms operated to check their proper functioning, and all nuts and bolts checked for tightness. Valves and other equipment which do not operate easily, or are otherwise defective, shall be repaired or replaced at no additional cost to the OWNER.
- F. Fire hydrants and yard hydrants shall be set at the locations as shown on the Drawings and bedded on a firm foundation. A drainage pit as detailed on the Drawings shall be filled with screened gravel and satisfactorily compacted.
- G. During backfilling, additional screened gravel shall be brought up around and 6 inches over the drain port. Each hydrant shall be set in true vertical alignment and properly braced. Concrete thrust blocks shall be placed between the back of the hydrant inlet and undisturbed soil at the end of the trench. Minimum bearing area shall be as shown on the Drawings. Felt roofing paper shall be placed around hydrant elbow before placing concrete. CARE SHALL BE TAKEN TO INSURE THAT CONCRETE DOES NOT PLUG THE DRAIN PORTS.
- H. If directed, the hydrant shall be tied to the pipe with suitable rods or clamps, galvanized, painted, or otherwise rustproof treated. Concrete used for backing shall be no leaner than 1 part cement, 2-1/2 parts sand, and 5-1/2 parts stone. Hydrant paint shall be touched up as required after installation.
- I. Buried flanged or mechanical joints shall be made with cadmium plated bolts. All exposed bolts and nuts shall be cadmium plated. All exposed bolts and nuts shall be heavily coated with 2 coats of bituminous paint.
- J. Yard hydrants shall be installed in accordance with manufacturer's recommendation and applicable requirements of fire hydrants above.
- K. Buried valves and valve boxes shall be set with the stem vertically aligned in the center of the gate box. Valves shall be set on a firm foundation and supported by tamping selected excavated material under the sides of the valve. The valve box shall be supported during backfilling and maintained in vertical alignment with the top flush with finish grade.

### 3.02 SHOP PAINTING

- A. Interior surfaces of all valves, the exterior surfaces of buried valves and miscellaneous piping appurtenances shall be given a shop finish of an asphalt varnish conforming to Federal Specification TT-V51e for Varnish Asphalt.
- B. The exterior surface of various parts of valves, operators, floor stands and miscellaneous piping shall be thoroughly cleaned of all scale, dirt, grease or other foreign matter and thereafter one shop coat of an approved rust-inhibitive primer such as Inertol Primer No. 621 shall be applied in accordance with the instructions of the paint manufacturer.

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- C. Ferrous surfaces obviously not to be painted shall be given a shop coat of grease or other suitable rust-resistant coating.
- D. Field painting is specified under Division 9.

### 3.03 INSPECTION AND TESTING

- A. The various pipelines in which the valves and appurtenances are to be installed are specified to be field tested. During these tests any defective valve or appurtenance shall be adjusted, removed and replaced, or otherwise made acceptable to the ENGINEER.
- B. Various regulating valves, strainer, or other appurtenances shall be tested to demonstrate their conformance with the specified operational capabilities and any deficiencies shall be corrected or the device replaced or otherwise made acceptable to the ENGINEER.

**END OF SECTION**

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**SECTION 15102**  
**VALVES (WATER RELATED)**

**PART 1 GENERAL**

**1.01 SCOPE OF WORK**

- A. Furnish all labor, materials, equipment, and incidentals required and install complete and ready for operation all valves and appurtenances as shown on the Contract Drawings and specified herein.
- B. The equipment shall include but not be limited to, the following:
  - 1. Gate valves
  - 2. Check valves
  - 3. Tapping valves, sleeves and crosses
  - 4. Butterfly valves
  - 5. Dry barrel fire hydrants

**1.02 RELATED WORK**

- A. Excavation, backfill and grading is included in Division 2.
- B. Piping is included in the respective sections of Division 2.
- C. Painting is in Division 9.
- D. Electrical work is in Division 16.
- E. Special sequence or schedule requirements (if any) are specified in Section 01010 - Summary of Work.
- F. Valves for HVAC systems are included in this Division, Section 15100.
- G. Valves and service accessories on all plumbing systems are included in this Division, Section 15100.
- H. Mechanical identification markers, tag and plates are included in this Division, Section 15190.

**1.03 DESCRIPTIONS OF SYSTEMS**

- A. All of the equipment and materials specified herein is intended to be standard for use in controlling the flow of water.
- B. See the valve schedule for valve sizes, quantities, connections, class, type of actuator and location.

#### 1.04 QUALIFICATIONS

- A. All of the types of valves and appurtenances shall be products of well established firms who are fully experienced, reputable and qualified in the manufacture of the particular equipment to be furnished. The equipment shall be designed, constructed and installed in accordance with the best practices and methods and shall comply with these specifications as applicable.
- B. Acceptable Manufacturers
  - 1. Gate Valves - Kennedy, Clow, Mueller, or equal.
  - 2. Check Valves - Clow, GA Industries, or equal.
  - 3. Tapping Sleeves - Clow, American-Darling, Mueller, M&H, or equal.
  - 4. Butterfly Valves - Milliken, Pratt, GA, Victaulic, or equal.

#### 1.05 SUBMITTALS

- A. Complete shop drawings of all valves and appurtenances shall be submitted to the ENGINEER in accordance with the requirements of Sections 00820 and 00700.
- B. The ENGINEER shall be furnished 2 certified copies of reports covering the required leakages, hydrostatic and proof-of-design tests on the valves.
- C. Gate Valves
  - 1. The manufacturer shall furnish the ENGINEER 2 copies of an affidavit stating that the valve and all materials used in its construction conform to the applicable requirements of ANSI/AWWA C509-94, and that all tests specified therein have been performed and that all test requirements have been met.
  - 1. The ENGINEER shall be furnished 2 copies of affidavit that the "Valve Protection Testing" has been done and that all test requirements have been met.
  - 2. The ENGINEER shall be furnished with 2 copies of affidavit that inspection, testing and rejection are in accordance with AWWA C509-94 Section 6.1 through Section 6.2.

#### 1.06 OPERATING INSTRUCTIONS

- A. Manufacturer's operating and maintenance instructions shall be furnished to the ENGINEER as set forth in Section 01600.

## **PART 2 PRODUCTS**

### **2.01 MATERIALS AND EQUIPMENT**

#### **A. General**

1. All valves and appurtenances shall be of the size shown on the Drawings and as far as possible all equipment of the same type shall be from one manufacturer.
2. All valves and appurtenances shall have the name of the maker, flow-directional arrows, and the working pressure for which they are designed cast in raised letters on some appropriate part of the body.
3. All buried valves shall open left (counter clockwise). Insofar as possible, all valves shall open counter clockwise.
4. All valves must be provided with suitable operating devices and adapted for operation in the position in which they are shown on the Drawings.
5. Valves shall have types of operators as shown on the Drawings and/or listed in the valve schedule.
6. All bolts and studs shall be in accordance with ASTM A-307 Grade B and nuts shall be in accordance with ASTM A-563. Bolts, studs and nuts shall be electrogalvanized according to ASTM B-633.

### **2.02 GATE VALVES**

#### **A. Resilient-Seated Gate Valve (AWWA Type)**

##### **1. General**

- a. Resilient-seated gate valves shall conform in all respects to ANSI/AWWA C509-94 with non-rising or rising stems, in sizes 3, 4, 6, 8, 10, and 12-inch NPS except as otherwise noted below. They shall be designed for a working water pressure of 200 psi.
- b. Valves shall have a clear unobstructed water way, without pockets or ridges in the seating area of the valve body. When fully open the water way shall be at least as large as the pipe diameter to which it is connected.
- c. All future references to section and paragraph numbers shall be those of ANSI/AWWA C509-94.

##### **2. Materials**

###### **a. Physical and Chemical Properties**

- (1) Physical and chemical characteristics of the valve components shall be in accordance with Section 2.2, except

that carbon steel castings for valves are not acceptable. Paint shall be as hereinafter specified under "Valve Protection."

3. Detailed Design
  - a. Valve Ends
    - (1) General
      - (a) Valve ends shall be flanged, mechanical joint, asbestos cement, PVC or rubber ring slip-on type as shown on the Drawings and/or as listed in the resilient seat valve schedule.
      - (b) In resilient seated tapping valves, end connections may be a combination of flanged and mechanical joint, flanged and asbestos cement or flange and flange.
    - (2) PVC Joints
      - (a) PVC joints shall be rubber ring slip-on type.
  - b. Stem Seal
    - (1) Stem seals shall be O-rings in accordance with Section 4.8, paragraph 4.8.2 and subparagraph 4.8.2.1, and materials shall be in accordance with paragraph 4.8.3.
  - c. Wrench Nuts and Handwheels
    - (1) Wrench nuts and handwheels shall be in accordance with Section 4.11 and subparagraphs 4.11.1 through 4.11.5, except that all valves whether NRS or O S & Y shall open by turning counterclockwise.
  - d. Gaskets
    - (1) Gaskets where used shall be in accordance with Section 4.15. O-rings of Buna-N or equal material.
  - e. Valve Seats
    - (1) Valve seats shall be in accordance with Section 4.16, except that seats applied to the valve body are not acceptable.
4. Valve Boxes
  - a. Valve boxes shall be provided for each buried valve. They shall be cast iron, of heavy pattern, adjustable type and provided with cast iron cover. The upper section of each box shall have a bottom

flange of sufficient bearing area to prevent settling. The bottom of the lower section shall enclose the stuffing box and operating nut of the valve. Boxes shall have barrels of not less than 5-inch in diameter and be of length adapted to pipe cover. Boxes shall be adjustable, with a lap of at least 6 inches when in the most extended position. Covers shall have the word "OPEN" and an arrow indicating the direction of opening cast into covers in raised letters. Provide valve stem extensions for all buried valves.

5. Fabrication

a. Valve Protection (Painting and Coating)

(1) Exterior

(a) Exterior painting of the valve may be in accordance with section 2.2.7, or it may be the same as that specified for interior painting of the valves.

(2) Interior

(a) The interior of the valve shall be prepared for and painted in accordance with AWWA C550-90. The coating may be a fusion bonded epoxy, in 8 to 10 mil thickness or it may be a two-part thermosetting epoxy having the same mil thickness. After application the interior coating shall be visually examined and holiday tested in accordance with AWWA C550-90.

6. Valve Stands and Extension Stems

- a. Valve stand shall be heavy pattern cast iron, at least 32 inches high. They shall be bronze mounted, handwheel operated on ball bearings. Valve stand handwheels shall be the same diameter as those shown for handwheels directly on valves. Non-rising stem stands shall have valve position indicator. Rising stem stands may be furnished without valve position indicators.
- b. Extension stems for non-rising stem valves shall have stem guides for each 10-foot length of extension stem.
- c. All extension stems shall be connected by bolted couplings for connection to a removal from the valves and stands. Nuts and bolts in connections shall be stainless steel. All extension stem connecting pins shall be stainless steel.



## 2.03 DRY-BARREL FIRE HYDRANTS

### A. General

1. This standard covers post-type dry barrel fire hydrants with compression type valves, operating against pressure. They shall meet all requirements of ANSI/AWWA Specification C502-94.
2. They shall have two 2-1/2 inch hose connection nozzles and one 4-1/2 inch steamer connection nozzle, all with caps and drains and have national standard threads (or insert required thread standard here).
3. Main valve opening size shall be 5-1/4 inch which must remain closed when the above ground breakable safety section of the hydrant barrel is broken off.
4. All hydrants shall have 6 inch mechanical joint bell connection designed for 200 pounds working water pressure, in accordance with ANSI/AWWA C110/A21.10-93. Joint accessories are to be furnished with the connecting pipe.
5. Finish paint color of the hydrant barrel above ground line shall be selected by the OWNER.
6. All hydrants shall have an automatic drain feature providing positive barrel drainage after hydrant use.
7. The lowest outlet level of the hydrant shall be located sufficiently above the indicated ground level to permit a 360° swing of a 15-inch hydrant wrench. One standard hydrant wrench is to be provided. All hydrants shall open by turning counterclockwise.
8. Where the OWNER has standardized on one particular make and model fire hydrant and desires that the hydrants furnished under this project be such standard, that make and model hydrant, shall be American-Darling Valve, a Division of American Cast Iron Pipe Co., hydrant **(B-62-B) (Mark-73) (B-84-B)**.
9. All further reference to section and paragraph numbers shall be those of ANSI/AWWA C502-94.

### B. Affidavit of Compliance

1. The manufacturer shall furnish the OWNER, through the ENGINEER, 3 copies of an affidavit in accordance with Section 1, paragraph 1.7.

### C. Materials

1. All materials used in the production of dry-barrel fire hydrants shall conform to the referenced standards for each material as set forth in Section 2 - Materials, paragraphs 2.2.1 thru 2.2.5.

D. General Design and Detailed Design

1. General Design

- a. General design of hydrants shall be in accordance with Section 3, paragraph 3.1 and subparagraphs 3.1.1 thru 3.1.6.

2. Detailed Design

a. Valves

- (1) Valves shall be in accordance with Section 3, paragraph 3.4.1 and subparagraphs 3.4.1.1 thru 3.4.1.4.

b. Size

- (1) Hydrant size shall be in accordance with Section 3, paragraph 3.2.4, except that main valve opening diameter may not be less than 5-1/4 inches.

c. Bury-length and Trench Depth

- (1) Unless otherwise noted, depth of hydrant will be 3'-6". In the event that a hydrant is installed at a location requiring greater than the "standard bury" depth, the CONTRACTOR will be required to provide the riser sections required at no additional cost to the OWNER.

d. Barrel Sections

- (1) Hydrant barrel sections shall be in accordance with Section 3, paragraph 3.2.2 and subparagraphs 3.2.2.1 and 3.2.2.2 except that the flange or other joint at 2 inches above the ground line shall be a breakable joint.

e. Outlet Nozzles

- (1) Hydrant outlet nozzles shall be in accordance with Section 3, paragraph 3.2.3 and subparagraph 3.2.3.1 and 3.2.3.2 except that leading shall not be used in fastening nozzles to the hydrant barrel.

f. Operating Stem and Mechanism

- (1) The hydrant operating mechanism shall be in accordance with Section 3, paragraph 3.2.5 and subparagraphs 3.2.5.1 thru 3.2.5.5.

g. Drain Outlet

- (1) An automatic drain outlet shall be provided. The outlet shall be located in the base or barrel or between the base and

barrel. Tapping of the outlet is not required. Other features of the drain outlet shall be in accordance with Section 3, paragraphs 3.4.2 thru 3.4.2.4.

h. O-ring Seals

- (1) A seal that uses O-rings shall be used. O-rings and their ring grooves shall be in accordance with Section 3, paragraph 3.6.1 and subparagraph 3.6.1.1.

i. Gaskets

- (1) Gaskets shall be in accordance with Section 3, paragraph 3.6.4.

j. Bolts and Nuts

- (1) With the exception of flange bolts at breakable hydrant barrel section, all bolts and nuts shall be of corrosion resistant material, in accordance with Section 3, paragraph 3.7. Breakable section bolts may be of steel.

k. Hydrant Inlet

- (1) The base of the hydrant shall have a side inlet provided with a hub end for mechanical joint connection provided with strapping lugs for strapping hydrant to water main to prevent separation of the hydrant and hydrant branch from the main line, or the hub end may be plain mechanical joint, provided locked type pipe joints are used between the hydrant and water main. Refer to Section 02610 of these Specifications for optional methods of restraint for fire hydrants.

E. Workmanship and Painting

1. Workmanship shall be in accordance with Section 4, paragraph 4.1 and subparagraph 4.1.1 through 4.1.3.
2. Painting shall be in accordance with Section 4, paragraph 4.2 and subparagraphs 4.2.1 through 4.2.4.

F. Inspection, Testing and Rejection

1. Testing shall be in accordance with Section 5, paragraph 5.1 and (subparagraphs 5.1.1 through 5.1.3). The ENGINEER shall be furnished 2 copies of all tests.
2. Inspection and rejection shall be in accordance with Section 5, paragraph 5.3, with 2 copies of affidavit being supplied the ENGINEER.

G. Marking and Shipping

1. Marking and shipping shall be in accordance with Section 6, paragraphs 6.1 and 6.2, except that hydrants having a depth of bury greater than the standard 3'-6", shall be given a tag number which corresponds to the hydrants plant location number. Tags, if required, shall be of durable materials and markings.

2.04 BUTTERFLY VALVES

A. General

1. All butterfly valves shown on the Drawings inside structures are shown as flanged valves.

B. AWWA Rubber Seated Gated Valves

1. General

- a. Unless otherwise noted in these Specifications or on the drawings, all flanged and mechanical joint butterfly valves shall meet the requirements of the latest edition of ANSI/AWWA Specification C504.
- b. Unless otherwise noted, all flanged valves shall be short body type.
- c. Unless otherwise shown on the Drawings, the maximum non-shock shutoff pressure will not exceed those specified for the various valve classes. Unless otherwise shown on the Drawings, all potable water valves shall be Class 250 B.
- d. Unless otherwise noted on the Drawings or called for in these Specifications, flow through the valves will be:

Normal:	Not more than 6 fps
When Opening:	10 fps
When Closing:	16 fps
- e. The manufacturer shall furnish the OWNER dimensions of the clearance required for the valve disc.
- f. The valves shall be Milliken Valve Company, Pratt, GA, Victaulic, or equal.

2. General Design

**Exceptions and Chosen Materials**

<b>Component</b>	<b>Material</b>	<b>Comment or Description</b>
Valve Body	Cast iron or ductile iron	Wafer body not acceptable
Valve Ends	Flanged, or groove joint, or mechanical joint	
Valve Shaft	Stainless steel or nickel-copper alloy	
Valve Disc	Cast iron, or alloy cast iron, or ductile iron, or stainless steel	
Valve Seal	Split V packing, standard O-rings, pull down packing	

**PART 3 EXECUTION**

3.01 INSTALLATION (IN STRUCTURES, VAULTS AND BASINS)

A. Exterior

1. Valves in ground shall be installed with operating stems vertical, unless otherwise shown on the Drawings or called for in these Specifications. Tops of operating nuts shall be not more than 30 inches below ground surface. Where valve operating nuts are more than 30 inches below tops of valve boxes, stems shall be provided to bring the operating nut to within 12 to 24 inches of box tops.
2. Valve boxes shall be accurately centered over valve operating nuts and the backfill shall be mechanically tamped about them, to prevent subsequent movement. Tops of boxes shall be flush with ground surface, paving, walk, or road surface.
3. The cost of the concrete collar, required about valve boxes, shall be included in the unit price for the valve and/or box.

- B. For gate valves, installation shall be in accordance with Appendix A, Sections A.5.1 through A.5.7 of ANSI/AWWA C509-94.

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### 3.02 SHOP PAINTING

- A. Interior surfaces of all valves, the exterior surfaces of buried valves and miscellaneous piping appurtenances shall be given a shop finish of an asphalt varnish conforming to Federal Specification TT-V51e for Varnish Asphalt.
- B. The exterior surface of various parts of valves, operators, floorstands and miscellaneous piping shall be thoroughly cleaned of all scale, dirt, grease, or other foreign matter and thereafter 1 shop coat of an approved rust-inhibitive primer such as specified in Section 09900 shall be applied in accordance with the instructions of the paint manufacturer.

### 3.03 INSPECTION AND TESTING

- A. The various pipelines in which the valves and appurtenances are to be installed are specified to be field tested. During these tests any defective valve or appurtenance shall be adjusted, removed and replaced, or otherwise made acceptable to the ENGINEER.
- B. Various regulating valves, strainer, or other appurtenances shall be tested to demonstrate their conformance with the specified operational capabilities any deficiencies shall be corrected or the device replaced or otherwise made acceptable to the ENGINEER.
- C. Testing shall be done in accordance with Section 02610 "Testing" with no visible leaks allowed on valves.

### 3.04 FIELD PAINTING

- A. Field painting is specified in Section 09900.
- B. The CONTRACTOR and the equipment manufacturer shall coordinate shop paint and field paint to assure compatibility, in accordance with Section 09900.

### 3.05 TOOLS AND SPARE PARTS

- A. All special tools required for normal operation and maintenance shall be furnished by the valve manufacturer.

### 3.06 METHOD OF PAYMENT

- A. Payment for the complete system shall be included in the lump sum or unit price bid for the project and shall include the furnishing of materials, equipment and parts and installation of all components to provide a completely functional system.

**END OF SECTION**

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**SECTION 15104**  
**SPECIALTY VALVES (WATER)**

**PART 1 GENERAL**

**1.01 SCOPE OF WORK**

- A. Furnish all labor, materials, equipment, and incidentals required and install complete and ready for operation all valves and appurtenances as shown on the Contract Drawings and as specified herein.
- B. The equipment shall include but not be limited to, the following:
  - 1. Surge relief valves.

**1.02 RELATED WORK**

- A. Excavation, backfill and grading is included in Division 2.
- B. Piping is included in the respective sections of Divisions 2 and 15.
- C. Valves and service accessories on all plumbing systems are included in Division 5.
- D. Painting is in Division 9.
- E. Electrical work is in Division 16.
- F. Special sequence or schedule requirements (if any) are specified in Section 01010 - Summary of Work.
- G. Valves and service accessories on all plumbing systems are included in this Division, Section 15100.

**1.03 DESCRIPTIONS OF SYSTEMS**

- A. All of the equipment and materials specified herein are intended to be standard for use in controlling the flow of water.

**1.04 QUALIFICATIONS**

- A. All types of valves and appurtenances shall be products of well established firms who are fully experienced, reputable, and qualified in the manufacture of the particular equipment to be furnished. The equipment shall be designed, constructed and installed in accordance with the best practices and methods and shall comply with these Specifications as applicable.
- B. Acceptable Manufacturers
  - 1. Surge Relief Valves - APCO, Golden Anderson, Ross, or equal.

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#### 1.05 SUBMITTALS

- A. Complete shop drawings of all valves and appurtenances shall be submitted to the ENGINEER in accordance with the requirements of Sections 00700 and 00820.
- B. The manufacturer shall furnish to the ENGINEER 2 copies of written certification that the valves have been tested hydrostatically and tested for proper performance, and that the materials of construction conform to the appropriate ASTM specifications. Refer to the Special Conditions for the number of copies of descriptive literature, catalog data sheets, and Drawings to be submitted to the ENGINEER, for review and comment.

#### 1.06 OPERATING INSTRUCTIONS

- A. Manufacturer's operating and maintenance instructions shall be furnished to the ENGINEER as set forth in Section 01600.

#### 1.07 EQUIPMENT OR SYSTEM WARRANTY

- A. Refer to Section 01600 for warranty requirements.

#### 1.08 DELIVERY, STORAGE AND HANDLING

- A. Refer to Section 01600 for these requirements.

### **PART 2 PRODUCTS**

#### 2.01 MATERIALS AND EQUIPMENT

##### A. General

1. All valves and appurtenances shall be of the size shown on the Drawings and as far as possible all equipment of the type shall be from one manufacturer.
2. All valves and appurtenances shall have the name of the maker, flow-directional arrows, and the working pressure for which they are designed cast in raised letters on some appropriate part of the body.
3. All buried valves shall open left (counterclockwise). Insofar as possible, all valves shall open counterclockwise.
4. All valves must be provided with suitable operating devices and adapted for operation in the position in which they are shown on the Drawings.

#### 2.02 SURGE RELIEF VALVES

##### A. General

1. The surge relief valve shall function to open to the atmosphere where the system pressure exceeds the pressure for which the pilot is set. It shall



open rapidly, and close slowly at a predetermined rate of speed. Provision shall be made to regulate the closing speed of the valve.

2. The valve shall be of the globe body design with the inlet pressure entering the valve under the piston.
3. It shall be possible to install the valve in any position without impairing its functional value.
4. The valve shall be hydraulically operated, designed with a differential type piston, such that the piston will expose a greater area to the closing bore than to the opening force. A vent to the atmosphere from the side of the rake body shall produce the differential piston area and also serve to provide shock absorption preventing hammer and shock.
5. All wear on the valve shall be absorbed by the cups and seat ring, and there shall be no metal to metal contacts within the main valve.
6. The valve shall be GA Industries, Pittsburgh, PA Figure 6600-D, or equal.
7. The pilot valve shall be of the diaphragm operated, spring loaded type, single seated, balanced design.
8. Adjustment of the opening pressure of the main valve shall be accomplished by regulation of the handwheel on the pilot, and shall provide for a range of 20 psi.
9. The valve shall provide full pipeline opening when opened to full stroke, and it shall be drop tight when closed.
10. It shall be possible to open the relief valve at any time by exhausting the pressure above the piston to the atmosphere.
11. The valve shall come completely piped, ready for installation.

#### B. Materials of Construction

1. The body and lids of the valve shall be constructed of high grade cast iron, ASTM A-126, Class B.
2. Interior parts of the valve, including the piston, liner and seat shall be of bronze conforming to ASTM B-62.
3. The liner and piston shall be equipped with renewable elastomer cups and the piston shall also have a leather or elastomer seat ring.
4. The pilot valve shall be of cast bronze conforming to ASTM B-62.

#### C. Testing

1. The body shall be hydraulically tested at a pressure of not less than 50 percent above the normal working pressure of the valve.

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2. The testing of the valve for tight seating shall be conducted at a pressure equal to the maximum pressure of the valve.
3. The purchaser reserves the right to witness any or all tests, and must be given free access to the place of manufacture at all times.

D. Painting

1. After testing, the valve and parts shall be cleaned and all surfaces, except machined surfaces, shall receive 2 coats of manufacturer's standard shop coat paint. Machined surfaces receive a coating of water repellent, rust inhibitive compound.

E. Marking

1. Cast marking on valve bodies or covers shall show: manufacturer's name or trademark, valve size and figure number.

**PART 3 EXECUTION**

**3.01 INSTALLATION (IN STRUCTURES, VAULTS AND BASINS)**

A. Interior

1. All valves and appurtenances shall be installed at the locations shown on the Drawings. All necessary materials, parts, operators and gaskets shall be furnished and installed under this Contract.
2. All valves shall be installed with their operators located in such a plane that it will not interfere with pedestrian traffic.
3. Particular attention shall be paid to the location and orientation of all valve operators to provide an accessible installation. Should any valve be located with the operator inaccessible and simple re-orientation of the valve would make it accessible, the valve shall be moved at no cost to the OWNER.
4. All pipe and valves shall be supported by pipe hangers, concrete piers or other special supports as required to prevent undue stress being placed on the pipe, any fitting, valve or item of equipment. Equipment shall not be used to support pipe and fittings. The pipe shall be free of all openings in walls and slabs when the final position of the piping is attained and before sealing the annular space about the pipe.
5. The CONTRACTOR shall thoroughly clean the valves and fittings before starting erection. All scale, rust and dirt shall be removed by power brushing and/or solvent cleaning.

B. Exterior

1. Valves in ground shall be installed with operating stems vertical, unless otherwise shown on the Drawings or called for in these Specifications.

Tops of operating nuts shall be no more than 30 inches below ground surface. Where valve operating nuts are more than 30 inches below tops of valve boxes, stems shall be provided to bring the operating nut to within 12 to 24 inches of box tops.

2. Valve boxes shall be accurately centered over valve operating nuts and the backfill shall be mechanically tamped about them, to prevent subsequent movement. Tops of boxes shall be flush with ground surface, paving, walk, or road surface.
3. The cost of the concrete collar, required about valve boxes, shall be included in the unit price for the valve and/or box.
4. All valves, valve stands, extension stems, and floor boxes, on or in structures, shall be installed as shown on the Drawings. Valve stands shall be set plumb and level and shall be anchored as shown on Drawings. Stands shall be properly centered over valve stems or operating mechanism. Any valve or stand found to be binding unduly shall be made to operate freely.

### 3.02 SHOP PAINTING

- A. Interior surfaces of all valves, the exterior surfaces of buried valves and miscellaneous piping appurtenances shall be given a shop finish of an asphalt varnish conforming to Federal Specification TT-V51e for Varnish Asphalt.
- B. The exterior surface of various parts of valves, operators, floorstands and miscellaneous piping shall be thoroughly cleaned of all scale, dirt, grease, or other foreign matter and thereafter on shop coat of an approved rust-inhibitive primer such as specified in Section 09900 shall be applied in accordance with the instructions of the paint manufacturer.
- C. Ferrous surfaces obviously not to be painted shall be given a shop coat of grease or other suitable rust-resistant coating.
- D. Field painting is included under Division 9.

### 3.03 INSPECTION AND TESTING

- A. The various pipelines in which the valves and appurtenances are to be installed are specified to be field tested. During these tests any defective valve or appurtenance shall be adjusted, removed and replaced, or otherwise made acceptable to the ENGINEER.
- B. Various regulating valves, strainer, or other appurtenances shall be tested to demonstrate their conformance with the specified operational capabilities and any deficiencies shall be corrected or the device replaced or otherwise made acceptable to the ENGINEER.

### 3.04 FIELD PAINTING

- A. Field Painting is specified in Section 09900.

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- B. The CONTRACTOR and the equipment manufacturer shall coordinate shop paint and field paint to assure compatibility, in accordance with Section 09900.

### 3.05 START-UP AND TRAINING

- A. The valve supplier shall include 1 day for startup and training of the Owner's personel.

### 3.06 TOOLS AND SPARE PARTS

- A. All special tools required for normal operation and maintenance shall be furnished by the valve manufacturer.

### 3.07 METHOD OF PAYMENT

- A. Payment for the complete system shall be included in the lump sum bid for the project, and shall include the furnishing of materials, equipment any parts and installation of all components to provide a completely functional and operational system.

**END OF SECTION**

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## SECTION 15107

### WATER METERS, SERVICE VALVES, STOPS AND MISCELLANEOUS APPURTENANCES FOR WATER LINE PROJECTS

#### PART 1 GENERAL

##### 1.01 WORK INCLUDED

- A. Furnish all labor, materials, and accessories to install equipment required by the Project, shown on the Drawings or specified herein, including the following:
  - 1. Water service meters and accessories
  - 2. Pressure regulating and relief valves for water services
  - 3. Blow-off hydrants
  - 4. Miscellaneous cocks and stops for water service

##### 1.02 RELATED WORK

- A. Excavation, backfill, and grading are included in Division 2.
- B. Piping is included in the respective sections of Divisions 2 and 15.
- C. Large plumbing valves and appurtenances are included in this Division, Section 15102.
- D. Plumbing piping and fittings are included in Division 2.

##### 1.03 QUALITY ASSURANCE

- A. All equipment and appurtenances shall be products of well established firms who are fully experienced, reputable, and qualified in the manufacture of the particular equipment to be furnished. All materials of construction shall be of an acceptable type and shall be designated for the pressure and temperatures at which they are to be operated, for the materials they are to handle and for the use for which they are intended. The materials shall meet established technical standards of quality and strength necessary to assure safe installations and conform to applicable standards. The equipment shall be designed, constructed, and installed in accordance with the best practices and methods and shall comply with these Specifications as applicable.

##### 1.04 SUBMITTALS

- A. Copies of all materials required to establish compliance with these Specifications shall be submitted in accordance with the provisions of Division 1, Section 00700 (00710).

## **PART 2 PRODUCTS**

### **2.01 GENERAL**

- A. All meters, valves, stops, and appurtenances shall be of the size shown on the Drawings and as far as possible all equipment of the same type shall be from one manufacturer.

### **2.02 MISCELLANEOUS COCKS**

#### **A. Air Release Cocks**

- 1. Air release cocks shall be for 125 pound pressure, 1/2-inch, bronze plug and body, with handle operator. Air cocks shall be Crane No. 256 Tee Head, Lunkenheimer No. 1571, or equal.

### **2.03 MISCELLANEOUS STOPS**

#### **A. Corporation Stops and Accessories**

- 1. Corporation stops to be used with threaded pipe where connected into cast iron pipe, shall be brass ground joint type with AWWA CC or CS taper thread inlets and iron pipe thread outlets for threaded iron pipe. Stops shall be Ford Type F-1600, or equal.
- 2. Corporation stops to be used with flared copper tubing where connected into ductile iron pipe, shall be brass ground joint type with AWWA CC or CS taper thread inlets and flared copper outlets and shall be Ford Type F-600, or equal.
- 3. Corporation stops to be used with plastic tubing where connected into ductile iron pipe shall be brass ground joint type with AWWA CC or CS taper thread inlets and compression connection outlets shall be Ford F-1000 or equal.
- 4. Corporation stops installed in plastic (PVC or Pe) mains shall be attached and installed using a tapping saddle. For ASTM specification PVC pipe, the tapping saddle shall be a bronze, 2 section saddle for 2-inch through 8-inch size mains or a bronze, 3 section saddle for 10-inch and 12-inch mains, double strap, Ford "Saddlestop," S-70, or equal. For AWWA specification PVC pipe (C-900) use Ford S-90, or equal.
- 5. Corporation stops shall be factory tested to 250 psi to be compatible with the pipes in which they are installed.

#### **B. Curb Stops and Accessories**

- 1. Curb stops to be used with threaded pipe shall be brass inverted key round way with female threaded iron pipe connections for threaded iron pipe. Curb stops shall be Ford or equal.

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2. Curb stops to be used with copper pipe, with flared type connections, shall be Mueller H-15200, Ford, or equal.
3. Curb stops to be used with plastic pipe shall be brass inverted key round way with compression type connections. Curb stops shall be Mueller H-15207, Ford, or equal.
4. Furnish and install with each curb stop, a cast iron curb valve box, cast iron extension type with arch pattern base, with lid marked "WATER." Also furnish 2 tee wrenches, 4 feet in length, for operation of curb stops.

#### 2.04 PRESSURE REGULATING AND PRESSURE RELIEF VALVES

##### A. Water Pressure Reducing Valves

1. Pressure reducing valves for water service 3 inches and smaller shall be of the bronze body, renewable stainless steel seat type with threaded end connections. The device shall be rated for initial pressure up to 300 psi with an adjustable pressure range of 25 to 75 psi. The pressure reducing valves shall be Watts Regulator Series 22323 or equal.

##### B. Pressure Relief Valves for Water Service

1. Pressure relief valves for water service shall be for sizes 1/2-inch through 2-1/2 inches and shall have bronze bodies, stainless steel spindle, and shall be rated for 1 to 250 psi maximum pressure. The valves shall be Keckly No. 42, Lunkenheimer No. 658, or equal.

#### 2.05 SPECIALTIES AND ACCESSORIES

##### A. Strainers

###### 1. Strainers for Water Service

- a. Strainers shall be "Y" type with a body made of ASTM A 126-73 Class B steel, sizes 1/4 inch through 3 inches, rated at 250 psi steam pressure, with stainless steel screen and screwed ends. Strainers shall be Keckley style "B," Hoffman Series 410, or equal.

##### B. Vacuum Breakers

###### 1. Vacuum Breakers for Water Service

- a. Vacuum breakers shall be designed to prevent back-siphonage of water lines. Valve types shall be either bottom inlet and side outlet, or top inlet and bottom outlet as required. Internal discs or floats shall be either plastic or silicone. Piping systems with solenoid-operated valves shall require a vacuum breaker with an "O" ring seal. Breakers shall be Sloan No. V-350-A, V-370-A, V-188-A, Wilkins, or equal.

C. Water Service Accessories

1. Hose Connections Vacuum Breaker
  - a. Hose connection vacuum breaker shall be brass body with soft rubber disc suitable for interior or exterior use. Where used in areas subject to freezing a manual drainage feature is required.
  - b. The device shall conform to ASSE 1011, and shall be Watts Series 8, or equal.

D. Water Meters

1. General
  - a. Where OWNER has standardized on one particular make and model meter, and desires that they be furnished on this project, then such standard, make and model, namely a Badger Model 25, 5/8-inch x 3/4-inch with Orion Radio Read, MS20R-C1-TG-X-T, with leak detector will govern.
2. Meter Settings (Residential)
  - a. Meter setters shall be copper, riser type with stabilizing rod, vertical inlet and outlet with angle stop on the inlet. The outlet shall be provided with end connection designed for applicable service pipe.
3. Meter Box (Residential)
  - a. The meter and valve box shall be a precast concrete or a high density polyethylene box 24 inches deep. The box shall be able to withstand 1,200 pounds compression. The cover shall be equipped with a reader lid.

**PART 3 EXECUTION**

3.01 INSTALLATION

- A. All water meters, miscellaneous water service valves, stops, and appurtenances shall be installed in locations shown, true to alignment and rigidly supported. Any damage to the above items shall be repaired to the satisfaction of the ENGINEER before they are installed.
- B. All meters in boxes or vaults shall be located so that they may be easily read and serviced.
- C. After installation, all valves and appurtenances shall be tested at least 1 hour at the working pressure corresponding to the class of pipe, unless a different test pressure is specified. If any joint proves to be defective, it shall be repaired to the satisfaction of the ENGINEER.



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- D. All materials shall be carefully inspected for defects in workmanship and materials; all debris and foreign material cleaned out of openings, etc.; all operating mechanisms operated to check their proper functioning, and all nuts and bolts checked for tightness. Equipment which does not operate easily, or is otherwise defective, shall be repaired or replaced at no additional cost to the OWNER.
- E. Blow-off hydrants shall be set at the locations as shown on the Drawings and bedded on a firm foundation.
- F. If directed, the hydrant shall be tied to the pipe with suitable rods or clamps, galvanized, painted, or otherwise rustproof treated. Concrete used for backing shall be no leaner than 1 part cement, 2-1/2 parts sand, and 5-1/2 parts stone.

### 3.02 INSPECTION AND TESTING

- A. The various pipelines in which the specified equipment is to be installed is specified to be field tested. During these tests any defective equipment shall be adjusted, removed and replaced, or otherwise made acceptable to the ENGINEER.
- B. Various meters regulating valves, strainers, or other appurtenances shall be tested to demonstrate their conformance with the specified operational capabilities and any deficiencies shall be corrected or the device replaced or otherwise made acceptable to the ENGINEER.

**END OF SECTION**

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**SECTION 15140**  
**HANGERS AND SUPPORTS**

**PART 1 GENERAL**

**1.01 SCOPE OF WORK**

- A. Furnish all labor, materials, equipment, and incidentals and install pipe (and tubing), hangers, supports, beam clamps, hanger rods, turnbuckles, rings, friction clamps, concrete inserts, and anchor bolts including, in general, all hanging and supporting devices for supporting piping, tubing, and appurtenances. Supports shall be as shown on the Drawings, as specified herein, in other sections, or as acceptable to the ENGINEER.
- B. Unless otherwise noted, whenever the word "support" is used herein it shall mean any overhead hangers, wall bracket, supports from the floor, friction clamps and attendant beam clamps, concrete inserts, rods, support pipes, and other necessary equipment for supporting and/or anchoring any pipes, tubing, or appurtenances. Where the word pipe is used it shall refer to valves, pipe, appurtenances, and tubing.
- C. Special supports shall be constructed in accordance with details shown on the Drawings.
- D. The CONTRACTOR shall be sure that all supports are consistent with the most recent state and local code regarding seismic design.

**1.02 RELATED WORK**

- A. Concrete is included in Division 3.
- B. Painting is included in Division 9, Section 09900.
- C. Valves, appurtenances pipe and fittings are included in this Division, Section 15100.

**1.03 DESCRIPTION OF SYSTEM**

- A. All piping, tubing, valves, fittings, and appurtenances shall be properly and adequately supported and anchored so as to maintain the supported loads in proper position under all operating conditions without unnecessary movement or strain on any piece of equipment. There shall be no visible sagging between supports. Supports shall be approved standard design and in compliance within MSS-SP-58 and SP-69 and all government codes, where applicable. All support of the same type shall be identical, varying only with size, and the product of one manufacturer or fabricator. Supports shall be provided where indicated on the Drawings, where required, and where acceptable to the ENGINEER to form a complete workable system. If other types of pipe support other than those shown on the Drawings or specified are required, they shall be as acceptable to the ENGINEER. Perforated or solid strap iron and strap copper will not be permitted.

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- B. The minimum working factor of safety for supports shall be a minimum of 5 based on the ultimate tensile strength of the material, assuming waterfilled pipe is being supported at the maximum spacing as specified.
- C. All pipe and appurtenances connected to equipment shall be supported in such a manner as to prevent any strain being imposed on the equipment. When manufacturers have indicated requirements that piping loads shall not be transmitted to their equipment, the CONTRACTOR shall submit written certification stating compliance.

#### 1.04 QUALIFICATIONS AND RESPONSIBILITY

- A. The CONTRACTOR shall have the sole responsibility for proper permanent support and/or anchorage of the piping systems.
- B. Any reference to specific manufacturer or model number is for the purpose of establishing a quality or parameter for specification writing and is not to be considered proprietary.

#### 1.05 SUBMITTALS

- A. A system schematic and loading calculations shall be submitted that shows the location types and maximum loads for each pipe support for all piping 3 inches in diameter or larger.
- B. Wherever exceptions to the Specifications are taken or substitute equipment is used, they shall be clearly defined by the CONTRACTOR in the Shop Drawing submitted.

### **PART 2 PRODUCTS**

#### 2.01 MATERIAL AND EQUIPMENT

- A. These Specifications call attention to certain features, but do not purport to cover all details of construction of the units.
- B. All the manufactured or fabricated items shall be fabricated in the manufacturer's or vendor's shop.
- C. Support and hangers should be as manufactured by Grinnel, Elcen, or equal.
- D. All parts of the supports shall be amply proportioned for all stresses that may occur during fabrication, erection, and operation.
- E. Anchor bolts, nuts, sleeves, plates, washers, and other hardware are to be supplied and installed by the CONTRACTOR and shall be of ample size and number for their intended use and installed as recommended by the appropriate manufacturer.
- F. For plastic and other similar piping as noted, supports shall be free of burrs with a suitable pliable support liner. They should also provide the maximum

support contact with the pipe for a minimum length of 3 inches along the length of the pipe.

## 2.02 PIPE HANGERS AND SUPPORTS FOR METAL PIPE

- A. Suspended single pipes shall be supported by hangers suspended by steel rods from concrete inserts as indicated on the Drawings and as follows:
1. Hanger rods shall be machine threaded and the strength of the rod shall be based on root diameter. Hanger rods shall be of carbon steel (except rods under and above water shall be stainless steel) and shall have the minimum diameters as indicated on the Drawings.
  2. Where applicable, concrete inserts for hanger rod sizes up to and including 3/4-inch diameter shall be continuous type slotted metal inserts designed to be used in ceilings, walls or floors before the concrete is poured, as manufactured by the Unistrut Corp., Wayne, Michigan, or equal. Series P3200 inserts shall be used where supports are parallel to the main slab reinforcement and Series P3300 where the supports are perpendicular to the main slab reinforcement. Spot inserts shall be equal to Catalog No. P3245 or M24, as applicable.
  3. Unless otherwise shown on the Drawings, concrete inserts for pipe hanger rods for pipes up to 8 inches shall be Grinnel "CB-Universal Concrete Insert" Figure 282 or Richmond "Malleable Adjustable Insert," or equal. For pipes larger than 8 inches, inserts shall be Richmond "Rocket Insert," or equal. Extra reinforcing steel must be placed around inserts so that the load from the pipe will be distributed over a greater area.
  4. Turnbuckles shall be forged steel, Grinnel Figure 230, Elcen Figure B1, or equal.
- B. Wall or column supported pipes shall be supported by welded steel brackets equal to Grinnel Figure 194, 195, and 199, or equal as required. Additional wall bearing plates shall be provided where required.
- C. Where the pipe is located above the bracket, the pipe shall be supported by an anchor chair and U-bolt assembly supported by the bracket for pipes 4 inches and larger and by a U-bolt for pipes smaller than 4 inches. Anchor chairs shall be equal to Carpenter & Patterson Figure No. 127, or equal. U-bolts shall be equal to Grinnel Figure 120 and 137, or equal.
- D. Where the pipe is located below the bracket, the pipes shall be supported by hangers suspended by steel rods from the bracket. Hangers and steel rods shall be as specified above.
- E. Wall or column-supported pipes 2 inches and smaller may be supported by hangers equal to Carpenter & Patterson Figures 74, 179, or 237, or equal, as required.

- F. Floor-supported pipes 3 inches and larger in diameter shall be supported by either cast-in-place concrete supports or adjustable pipe saddle supports as indicated on the Drawings. In general, concrete supports shall be used when lateral displacement of the pipes is probable (unless lateral support is provided), and pipe stanchion-type supports shall be used where lateral displacement of the pipes is not probable.
- G. Each concrete support shall conform to the details shown on the Drawings. Concrete shall be poured after the pipe is in place with temporary supports. Top edges and vertical corners of each concrete support shall have 1-inch bevels. Each pipe shall be secured on each concrete support by a wrought iron or steel anchor strap anchored to the concrete with cast-in-place bolts or with expansion bolts. Where directed by the ENGINEER, vertical reinforcement bars shall be grouted into drilled holes in the concrete floor to prevent overturning or lateral displacement of the concrete support. Unless otherwise directed by the ENGINEER, maximum support height shall be 5 feet.
- H. Concrete piers used to support base elbows and tees shall be similar to that specified above. Piers may be square or rectangular.
- I. Each adjustable pipe saddle support shall be screwed or welded to the corresponding size 150-lb. companion flanges or slip-on welding flanges, respectively. Supporting pipe shall be of Schedule 40 steel pipe construction. Each flange shall be secured to the concrete floor by a minimum of 2 expansion bolts per flange. Adjustable saddle supports shall be equal to Grinnel Figure No. 264, or equal. Where used under base fittings, a suitable flange shall be substituted for the saddle.
- J. Floor-supported pipes less than 3 inches shall be supported by fabricated steel supports.
- K. Vertical piping shall be supported as follows:
  - 1. Where pipes change from horizontal to vertical, the pipes shall be supported on the horizontal runs within 2 feet of the change in direction by pipe supports as previously specified herein.
  - 2. For vertical runs exceeding 15 feet, pipes shall be supported by approved pipe collars, clamps, brackets, or wall rests at all points required to insure a rigid installation.
  - 3. Where vertical piping passes through a steel floor sleeve, the pipe shall be supported by a friction type pipe clamp which is supported by the pipe sleeve. Pipe clamps shall be equal to Grinnel Figure 261, or equal.
- L. Unless otherwise noted on the Drawings or in the Specifications, concrete anchors shall be Hilti Fastening Systems "KWIK-BOLT," ITT Phillips Drill Division "Wedge Anchor," Ramset "Trubolt Wedge Anchor," or equal. Where required by the Drawings or Specifications, chemical grout-type anchors shall be Hilti "HVA Adhesive Anchor," Ramset "Chemset Chemical Anchors," or equal. Installation

shall be in strict accordance with the manufacturer's recommendations which shall be available on the job site.

- M. All rods, hangers, inserts, brackets, and components shall be furnished with galvanized finish, except that stainless steel is required for use in concrete, under and above water, and all outside locations.

## 2.03 PIPE HANGER AND SUPPORTS FOR NON-METAL PIPE

- A. Single plastic pipes shall be supported by pipe supports as previously specified herein.
- B. Multiple, suspended, horizontal plastic pipe runs, where possible, shall be supported by ladder-type cable trays such as the Electray Ladder by Husky-Burndy, the Globetray by the Metal Products Division of United States Gypsum, or equal. Ladder shall be of mild steel construction. Rung spacing shall be approximately 18 inches. Ladder-type cable trays shall be furnished complete with all hanger rods, rod couplings, concrete inserts, hanger clips, etc., required for a complete support system. Individual plastic pipes shall be secured to the rungs of the cable tray by strap clamps or fasteners equal to Globe Model M-CAC, Husky-Burndy Model SCR, or equal. Spacing between clamps shall not exceed 9 feet. The cable trays shall provide continuous support along the length of the pipe.
- C. Individual clamps, hangers, and supports in contact with plastic pipe shall provide firm support but not so firm as to prevent longitudinal movement due to thermal expansion and contraction.
- D. Pipe supports shall be provided to support the vertical runs of all plastic pipes. The pipes shall be supported by means of a supporting framework suitably anchored into the floor or curbing. The vertical piping shall be suitably secured to horizontal support members connected at each end to vertical support members and spaced to provide a rigid installation.
- E. The complete supporting system shall be as manufactured by the Unistrut Corporation, Globe-Strut as manufactured by the Metal Products Division of U.S. Gypsum, or equal.
- F. Vertical and horizontal supporting members shall be U-shaped channels similar to Unistrut Series P1000, or equal. Vertical piping shall be secured to the horizontal members by pipe clamps or pipe straps equal to Unistrut Series P1100M and Series P2558, or equal. All components shall be of mild steel.
- G. The assemblies shall be furnished complete with all nuts, bolts, and fittings required for a complete assembly.
- H. The design of each individual framing system shall be the responsibility of the CONTRACTOR. Shop drawings shall show all details of the installation, including dimensions and types of supports.

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## 2.04 SPECIAL SUPPORTS

- A. Any required pipe supports for which the supports specified in this Section are not applicable shall be fabricated or constructed from standard structural steel shapes, concrete and anchor hardware similar to items previously specified herein, and shall be subject to the review of the ARCHITECT/ENGINEER.
- B. All parts of the supports shall be amply proportioned for all stresses that may occur during fabrication, erection, and operation.
- C. Anchor bolts, nuts, sleeves, plates, washers, and other hardware are to be supplied and installed by the CONTRACTOR and shall be of ample size and number for their intended use and installed as recommended by the appropriate manufacturer.
- D. For plastic and other similar piping as noted, supports shall be free of burrs and shall include a suitable pliable support liner. They should also provide the maximum support contact with the pipe for a minimum length of 3 inches along the length of the pipe.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. All required piping, tubing fittings, valves, and appurtenances shall be rigidly supported from the structures by approved supports, hangers, inserts, or clamps, with adequate provisions for expansion and contraction. Support shall be provided at, or near, changes in direction, hubs, joints, valves, appurtenances, branches, and elsewhere within 3 feet of couplings in accordance with the manufacturer's recommendations, as shown on the Drawings, and as specified with the following support spacings:

Horizontal Runs

<u>Type of Pipe</u>	<u>Maximum Support Spacing (Unless Otherwise Noted)</u>
Soil, waste drain, vent, and other gravity pipe of any size below or in concrete (except concrete pipe)	5 ft.
Metal tubing of any size, and any metal pipe 1-1/2 inch in diameter or smaller	6 ft.
Cast or ductile iron process	12 feet with at least one support for each section of 4 inch in diameter or larger.
Plastic pipe	3.5 feet
All other metal pipe	10 ft.
All other types of pipe	As above

- B. Additional supports and anchors where required, other than the type of pipe supports shown on the Drawings, shall be the CONTRACTOR'S responsibility and as acceptable to the ENGINEER.
- C. All vertical pipes shall be supported at each floor or at intervals of minimum 10 feet, except at 3.5 feet interval for plastic pipe, and at all points necessary to ensure rigid construction by pipe collars or clamps that shall rest on floor sleeves, brackets, or wall rests.
- D. Piping shall not be supported from other piping ductwork, or from metal stairs, ladders, or walkways unless specifically directed by the ENGINEER. Piping shall be a minimum distance of 1-1/2 inches (flanges or bells, 1 inch) from finished floors, walls, or ceilings unless otherwise shown on the Drawings, or specified. Where piping is installed on structural steel supports, blocking of pipe rolls shall be provided to arrest lateral pipe movement.
- E. Concrete inserts shall have faces flush with the exposed concrete face. Where dimensions correspond, inserts may be used as the support for the reinforced steel during the concrete pour. A waxed cardboard filler shall be placed in the insert to prevent concrete from flowing into the slot.
- F. Supports in contact with plastic and other piping, where noted, shall provide firm support but not so firm as to prevent longitudinal pipe movement due to thermal contraction and expansion. In addition, point loading shall be avoided for the above piping. Plastic pipe shall be securely anchored to continuous supports with U-bolts spaced at a maximum of 4 feet along the pipe.



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- G. Each section of pipeline shall be laid out and all connections (cemented, welded, screwed, flanged, couplings, etc.), made while the pipe is held in temporary supports. After completion of connections, the pipe may be clamped in position. When piping is correctly installed on its permanent supports, a temporary clamp or pipe may be loosened or removed without displacement of the pipeline.
- H. All pipe shall be anchored at locations and by methods acceptable to the ENGINEER. Special attention is drawn to the need to anchor plastic piping and metal tubing at every 90° and 45° elbow. All continuous pipe supports shall be anchored to the structure at a maximum of every 5 feet.

### 3.02 COATING

- A. After installation, all metal surfaces of pipe supports, anchors, rods, support pipes, brackets, nuts, bolts, washers, and other metal used shall be painted as specified in Division 9.

### 3.03 INSPECTION AND TESTING

- A. Hangers, supports, and anchors installed on the piping system shall operate satisfactorily as specified during the testing of the respective pipe systems. The hangers, supports, and anchors shall maintain the pipelines in position without evidence of bending, sagging, warping, vibration, or stress.

**END OF SECTION**

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**SECTION 15190**  
**MECHANICAL IDENTIFICATION**

**PART 1 GENERAL**

1.01 SCOPE OF WORK

- A. Provide all labor, materials, and services required to install the identification products as specified herein.

1.02 RELATED WORK

- A. Mechanical insulation is included in this Division, Section 15260.
- B. Plumbing pipe is included in this Division.
- C. Ductwork is included in this Division, Section 15890.

1.03 SUBMITTALS

- A. Shop drawings and other items needed to establish compliance with the Drawings and these Specifications shall be submitted to the ENGINEER in accordance with the General Conditions.
- B. Submit list of working symbols, letter size, and color coding for mechanical identification. Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

**PART 2 PRODUCTS**

2.01 MARKERS

- A. Colors unless specified otherwise shall conform with ANSI/ASME A13.1.
- B. Plastic nameplates shall be laminated three-layer plastic with engraved black letters on light contrasting background color.
- C. Plastic tags shall be laminated three-layer plastic with engraved black letter on light contrasting background color. Tag size minimum 1-1/2 inch diameter/square.
- D. Metal tags shall be brass or aluminum with stamped letters. Tag size shall be minimum 1-1/2 inch diameter with smooth edges.
- E. Stencils shall have the following size letters:

<u>*Outside Diameter of Pipe</u>	<u>Arrow Length x Width (Inches)</u>	<u>Size of Letters (Inches)</u>
Less than 1-1/2	1-1/2 x 1/2	1/2
1-1/2 - 2	4 x 1	3/4
2-1/2 - 6	8 x 2	1-1/4
8 - 10	12 x 3	2-1/2
Over 10	20 x 5	3-1/2
Ductwork & Equipment	12 x 3	2-1/2

\*Including insulation if applicable.

- F. Stencil paint shall be in accordance with paint specification contained herein.
- G. Plastic pipe markers shall be factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and fluid being conveyed.
- H. Plastic tape pipe markers shall be flexible vinyl film tape with pressure sensitive adhesive backing and printed markings.
- I. Underground plastic pipe markers shall be bright colored continuously printed plastic ribbon tape of not less than 6-inch wide by 4-mil thick, manufactured for direct burial service.

## 2.02 PAINTING

- A. All piping that is exposed or located in accessible pipe chases shall be painted.
- B. The paint system to be used shall be recommended by the manufacturer for the particular surface to be painted and certified by the manufacturer for long term compatibility of all coatings with all substrates, both new and existing. Shop drawing submittal shall contain sufficient information to confirm the compatibility of the paint system for the surface to be painted and manufacturers recommendations for application.
- C. Where prime coats are required they shall be of the same manufacture as the finish coat.
- D. Painting systems shall be as manufactured by Rustoleum Corp., Porter International, Sherwin-Williams, or equal.
- E. Colors shall be in accordance with ANSI A13.1 unless otherwise specified in the following table:

### COLOR CODES/MARKING FOR PIPE

<u>Service</u>	<u>Pipe Color</u>	<u>Arrow</u>	<u>Marking</u>
Cold Water (potable)	Blue	Black	POTABLE

## **PART 3 EXECUTION**

### **3.01 PREPARATION**

- A. Degrease and clean surfaces to receive adhesive for identification materials. Prepare surfaces to be painted in accordance with manufacturer's instructions.

### **3.02 INSTALLATION**

- A. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive.
- B. Install plastic or metal tags with corrosive resistant chain.
- C. Apply stencil painting in accordance with paint manufacturer's instructions.
- D. Plastic pipe markers shall be installed in accordance with manufacturer's instructions.
- E. Underground plastic pipe markers shall be installed 6 to 8 inches below finished grade, directly above buried pipe.
- F. Identify all fans, louvers, unit heaters, packed AC and heat pump units, air handling units, controls, pumps, test transfer equipment, tanks, and water treatment devices with plastic nameplates and stencil painting. Small devices, such as in-line pumps, may be identified with plastic/metal tags.
- G. All control panel and major control components outside panels with plastic nameplates.
- H. Identify all valves in main and branch piping with tags.
- I. Identify piping, concealed or exposed, with plastic pipe markers, plastic tape pipe markers, stenciled painting or tags may be used on small diameter piping. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and "T," at each side of penetration of structure or enclosure, at each obstruction, fitting and change of direction.
- J. Identify ductwork with plastic nameplates or stenciled painting. Identify as to air handling unit number, and area served. Locate identification at air handling unit, at each side or penetration of structure or enclosure, and at each obstruction.
- K. Surfaces to be painted shall be cleaned, primed, and painted in strict conformance with paint manufacturer's instructions.

**END OF SECTION**

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## SECTION 15261

### PROCESS PIPE INSULATION

#### PART 1 GENERAL

##### 1.01 WORK INCLUDED

- A. The CONTRACTOR will furnish and install insulation on all process piping as indicated on the Drawings. The insulation thickness for cold process pipe insulation shall be 1 inch. The insulation thickness for hot process pipe insulation shall be 2 inches. The CONTRACTOR will provide all hardware, hangers and accessories necessary for a complete and airtight installation of the process pipe insulation system.

##### 1.02 RELATED WORK

- A. Piping is specified in Section 02610.

##### 1.03 SUBMITTALS

- A. The CONTRACTOR will submit for review manufacturers shop drawings and technical literature. Literature will include description of materials construction and thermal conductivities (as a function of temperature). Samples of the products shall be submitted for inspection.

##### 1.04 STORAGE AND HANDLING

- A. Materials will be stored in manufacturer's unopened containers. Materials will be stored in such a manner as to prevent physical damage through construction operations or environmental exposure.

##### 1.05 LEAK TESTING

- A. Leak testing of the systems to be insulated shall be performed prior to the insulation being installed.

##### 1.06 INSULATION

- A. Insulation shall not be applied until all surfaces are clean, dry, free of dirt, grease, moisture, and generally any foreign element.

#### PART 2 PRODUCTS

##### 2.01 ELASTOMERIC INSULATION – COLD PROCESS PIPING

- A. These Specifications are based on products and data of Armacell and designate the type and quality of work intended under this section. Products of other manufacturers will be considered. Proof of equality is the CONTRACTOR'S responsibility. Supporting technical data, samples, published specifications and

the like must be submitted for comparison. The CONTRACTOR should warrant that proposed substitutions, if accepted, will provide performance equal to the materials specified herein.

- B. Insulation material shall be flexible, closed-cell elastomeric insulation in tubular or sheet form, Armstrong, AP Armaflex pipe insulation, AP Armaflex self-sealing pipe insulation, and AP Armaflex sheet and roll insulation (for piping larger than 6").
- C. Materials shall have a flame spread rating of 25 or less and a smoke developed rating of 50 or less when tested in accordance with ASTM E84, latest revision. Sheet material with a thickness greater than 3/4" shall have a flame spread rating of 25 or less and a smoke developed rating of 100 or less when tested in accordance with ASTM E84, latest revision. In addition, the product when tested shall not melt or drip flaming particles, and the flame shall not be progressive. In addition, all materials shall pass simulated end-use fire tests.
- D. Materials shall have a maximum thermal conductivity of 0.27 Btu-in/h-ft.<sup>2</sup>F at 75 F mean temperature when tested in accordance with ASTM C177 or ASTM C518, latest revision.
- E. Materials shall have a maximum water vapor transmission of 0.10 per-inches when tested in accordance with ASTM E96 (Procedure A), latest revision.
- F. The material shall be manufactured under an independent third party supervision testing program covering the properties of fire performance, thermal conductivity and WVT.

## 2.02 INSULATION - HOT OR COLD PROCESS PIPES

- A. The insulation will be of mineral wool capable of withstanding a temperature of 1200 degrees Fahrenheit. The insulation will be made from inorganic fibers derived from basalt and bonded with thermosetting resin. The insulation will be of a one piece hinged construction and have a maximum thermal conductivity of .23 Btu in./ft.<sup>2</sup>/hr. at a temperature of 100 degrees Fahrenheit. The insulation will possess the following properties:

Maximum Service Temperature	1200 DEG F
Moisture Absorption	< 1% by weight and <0.02% by volume
Corrosivity	< 5 ppm chloride solution
Shrinkage	None
Resistance to Fungi	Does not breed or promote
Surface Burning Characteristics	Composite FHC 25/50 per ASTM E84, UL 723, NFPA 255, CAN/ULC S102-M88
Complies with	ASTM C547 Types I, II, III, and IV Grades A and B

- B. The insulation will be Johns Manville Minwool 1200, or equal.

## 2.03 INSULATION JACKET

A. The insulation shall be jacketed with either an aluminum jacket meeting ASTM C1729 or a stainless steel jacket meeting ASTM C1767.

## B. Aluminum Jackets

1. Aluminum jackets shall be either type 3003 or 3105 series aluminum meeting ASTM B209, tempers H12, H14 or H24. The jacket shall be lined with a 3 mil thick co-extruded polyethylene film that has been bonded to the aluminum jacket for a superior moisture barrier.
2. Aluminum jacket thickness shall be as noted below:

Outer Insulation Diameter (in)	Minimum Jacket Thickness (in)	
	Rigid Insulation	Non-Rigid Insulation
≤ 8	0.016	0.016
Over 8 thru 11	0.016	0.020
Over 11 thru 24	0.016	0.024
Over 24 thru 36	0.020	0.032
Over 36	0.024	0.040

## C. Stainless Steel Jackets

1. Stainless steel jackets shall be either type 304/304L or 316/316L meeting ASTM A240, annealed temper. For use over steel pipe or in very corrosive environments the jacket shall have a 3 mil polyfilm moisture barrier and be of 316/316L stainless steel.
2. Stainless steel jacket thickness shall be as noted below:

Outer Insulation Diameter (in)	Minimum Jacket Thickness (in)	
	Rigid Insulation	Non-Rigid Insulation
≤ 8	0.010	0.016
Over 8 thru 11	0.010	0.016
Over 11 thru 24	0.010	0.020
Over 24 thru 36	0.016	0.024
Over 36	0.020	0.024

## F. Jacket Sealing

1. The jacket shall be butt joined and have a longitudinal seam closure with a 2 joint construction or equal method for locking the insulation and jacket securely. A sealant shall be used on all jackets between the overlapping pieces of metal not as a bead of caulk on the exterior lip of the joint. Jacket sealants shall be vapor retarder type, moisture and water resistant, non-hardening and flexible with a service temperature range of -40 °F to 250 °F. Sealants shall be Childers Chil-Byl CP-76, Foster Elastolar 95-44 from H.B. Fuller Construction Products, Inc., or equal.

G. Jacket Banding

1. Jacket sections shall be butt joined and banded with aluminum or stainless steel straps. The straps shall contain a permanent plastic sealing compound providing a weathertight circumferential seal or the joints shall be sealed as specified under jacket sealing
2. Aluminum bands shall only be used when the entire jacket is aluminum, the jacket thickness is equal to or less than the banding, the banding will not be subject to excessive forces from wind, expansion/contraction, etc., the piping is not in chemical storage and feed areas, the outer diameter is less than or equal to 8 inches and the insulation is not rigid. Bands shall be 0.020 inches thick by 1/2 or 3/4 inches wide of type 3003 or 3105 aluminum.
3. Stainless steel banding shall be 0.020-inch thick stainless steel of type 304 or 316 with annealed temper. For outer insulation diameters less than 16 inches, bands shall be 1/2 or 3/4 inches wide and for 16 inches and greater bands shall be 3/4 inches wide.

H. The insulation jacket shall be Johns Manville Pabco-Childers, Ideal Products, or equal.

2.04 PRE-INSULATED BRIDGE CROSSING PIPE

- A. As an alternative to insulating and jacketing the pipe in the field the Contractor may provide pre-insulated pipe as specified below.
- B. The carrier pipe shall be as shown on the drawings and specified in Section 02610.
- C. Insulation used shall be rigid polyisocyanurate or polyurethane foam, having a density (ASTM D1622) of 2.0 lbs/cf, a compressive strength (ASTM D1621) of 18 to 27 lbs/sq. in, a minimum closed cell content (ASTM D6226) of 90 percent, a maximum water absorption (ASTM C272) of 2 percent by volume, a maximum K factor (ASTM C518) of 0.19 Btu · in/ft<sup>2</sup> · hr · °F, and a thickness of 2 inches.
- D. The insulation shall be jacketed of cut and rolled aluminum or stainless steel sheets meeting the requirements noted in article 2.03 Insulation Jacket. Jackets of galvanized steel may also be used for outer diameters to 18 inches of 22 gauge material and 18 gauge for outer diameters greater than 18 inches.
- E. The pre-insulated pipe shall be +GF+ Urecon, Perma-Pipe, or equal

**PART 3 EXECUTION**

3.01 PIPING

- A. Install pipe insulation by slitting tubular sections and applying onto piping or tubing. Alternately, whenever possible, slide unslit sections over the open ends of piping or tubing. All seams and butt joints shall be adhered and sealed using



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Armstrong 520 adhesive. When using AP Armaflex SS only the butt joints shall be adhered using 520 adhesive.

- B. Insulation shall be pushed on the pipe, never pulled. Stretching of insulation may result in open seams and joints.
- C. All edges shall be clean cut. Rough or jagged edges of the insulation shall not be permitted. Proper tools such as sharp knives must be used.
- D. On cold piping, insulation shall be adhered directly to the piping at the high end of the run using a one inch strip of 520 adhesive on the ID of the insulation and on the pipe. All exposed end cuts of the insulation shall be coated with 520 adhesive.
- E. Sheet insulation shall be used on all pipes larger than 6" IPS. Insulation shall not be stretched around the pipe. On pipes larger than 12" IPS, adhere insulation directly to the pipe on the lower 1/3 of the pipe.
- F. Seams shall be staggered when applying multiple layers of insulation.

### 3.02 VALVES, FLANGES AND FITTINGS

- A. All fittings shall be insulated with the same insulation thickness as the adjacent piping. All seams and mitered joints shall be adhered with 520 adhesive. Screwed fittings shall be sleeved and adhered with a minimum 1 inch overlap onto the adjacent insulation.
- B. Valves, flanges, strainers and Victaulic couplings shall be insulated using Armaflex donuts that shall then be covered with sheet or oversized tubular insulation.

### 3.03 HANGERS

- A. Standard and split hangers – Piping supported by ring hangers shall have hangers insulated with the same insulation thickness as the adjacent pipe. All seams and butt joints shall be sealed with 520 adhesive. Ring hangers may be sleeved using oversized tubular insulation, on cold piping, insulation shall extend up the hanger rod a distance equal to 4 times the insulation thickness. Insulation tape may be used to a thickness equal to the adjacent insulation thickness.
- B. Clevis hangers or other pipe support systems – Saddles shall be installed under all insulated lines at unistrut clamps, clevis hangers or locations where the insulation may be compressed due to the weight of the pipe. Cold piping over 1-1/2 inch in diameter shall have wooden dowels or blocks, or a thickness equal to the insulation, inserted and adhered to the insulation between the pipe and saddle.

**END OF SECTION**

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**SECTION 15781**

**SELF-CONTAINED WALL MOUNTED VERTICAL AIR CONDITIONERS**

**PART 1 GENERAL**

**1.01 SCOPE OF WORK**

- A. Provide all labor, materials, equipment and services required to install complete and operable air conditioning equipment as shown on the Contract Drawings and as specified herein. See the equipment schedule and Contract Drawings for additional requirements.

**1.02 RELATED WORK**

- A. Special requirements for materials and equipment are given in Section 15010 and the General Conditions.
- B. Electrical work is specified in Division 16.
- C. OWNER training for HVAC Equipment and Systems is specified in Section 15010 and the General Conditions.

**1.03 QUALIFICATIONS**

- A. Equipment shall be UL listed and ARI certified.

**1.04 SUBMITTALS**

- A. Shop drawings and other items needed to establish compliance with the Drawings and these Specifications shall be submitted to the ENGINEER in accordance with Section 15010 and the General Conditions.
- B. Submit ladder-type wiring diagrams for power and control wiring required for final installation of equipment. Clearly differentiate between portions of wiring that are factory-installed and portions to be field-installed.
- C. O&M instructions shall be submitted to the ENGINEER in accordance with Section 15010 and the General Conditions.

**1.05 WARRANTY**

- A. Air conditioners shall have a 1 year parts and labor warranty against defects in materials and workmanship and hermetically sealed units (compressors) shall have an additional 4 year parts only warranty. Submit written proof, by the manufacturer, of the primary and extended compressor warranties during shop drawing review.

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## **PART 2 PRODUCTS**

### **2.01 PRODUCTS**

#### **A. General**

1. Furnish and install a self-contained wall mount air conditioner suitable for outdoor use as described herein and noted on the Contract Drawings. The unit shall be as manufactured by Marvair or equal. The wall mount unit shall be completely factory assembled and tested, and shall include compressor, indoor and outdoor coils, fans, and motors as required, prewired controls, interconnecting refrigerant tubing, wiring, circuit breakers, and other necessary components mounted in a corrosion resistant cabinet. Unit shall be shipped from the factory with a full operating refrigerant and oil charge.
2. The complete package shall be ETL listed and tested to UL Standard 1995, latest edition, and CAN/CSA-C22.2 No. 236-95, latest edition. The unit shall be certified to Air Conditioning and Refrigeration Institute (ARI) Standard 210. For 6-ton, 3-phase units, the applicable standard is ARI 340/360. The manufacturer of the unit shall be ISO 9001 2000 certified.

#### **B. Cooling Capacity**

1. Total and sensible cooling capacity shall be as noted on the Drawings at ARI conditions of 67 degrees Fahrenheit wet bulb, 80 degrees Fahrenheit dry bulb entering indoor air, and condenser entering air temperature of 95 degrees Fahrenheit dry bulb. Equipment must have an SEER/EER of 11 or higher at this condition.

#### **C. Heating Capacity**

1. Supplemental electrical resistance heat in the amount as noted on the Drawings shall be provided internally to the unit.

#### **D. Cabinet**

1. The weatherproof cabinet shall be constructed of zinc-coated, 20 gauge galvanized G60 steel. The conditioned air section shall be insulated with 1/2-inch, 2 pound dual density fiberglass. Two-inch throw away type filter shall be mounted internally, factory supplied, and accessible through a hinged type panel. Unit color shall be selected by the ENGINEER during shop drawing review. Submit color chart including non-standard optional colors. The cabinet shall include a sloped top and built-in mounting flanges.

#### **E. Compressor/Refrigeration Circuit**

1. The compressor, for all units except a one ton unit, shall be a scroll type, 2-stage. One ton units shall be equipped with an immersion type self-regulating crankcase heater for use with a reciprocating compressor or if recommended by the manufacturer on various size scroll compressor

units in low ambient applications. The refrigeration circuit shall contain a liquid filter dryer, suction and liquid access valves. The refrigeration circuit shall include high and low pressure switches with a lockout relay. The compressor motor shall be protected by an internal line break thermostat. Electrical wiring connections at the compressor shall be protected by receptacle housing.

F. Outdoor Section

1. The condenser coil shall be constructed of aluminum plate fins mechanically bonded to seamless copper tubes. Outdoor fan shall be direct driven, slow speed propeller type for quiet operation. The outdoor motor shall be equipped with a thermal protector.

G. Indoor Section

1. The evaporator coil shall be constructed of aluminum plate fins mechanically bonded to seamless copper tubes. Two direct driven indoor blowers shall be of centrifugal type, forward curved. The indoor motor shall be equipped with a thermal protector.

H. Control Circuit

1. The internal control circuit shall consist of a current limiting type transformer to generate 24 VAC, switching devices to operate the compressor, indoor fan motor, and electrical heater(s). The control circuit shall incorporate a manual reset safety circuit to render the refrigerant system (compressor and outdoor fan motor) inoperative should there be a loss of air flow or refrigerant. System lockout condition shall be indicated by contact closure available at low voltage terminal block. The safety circuit shall be resettable at the wall thermostat.
2. A low ambient outdoor fan control shall be factory installed for operation of the air conditioner in the cooling mode down to zero degrees Fahrenheit. To prevent rapid compressor cycling and to delay startup of compressor on a call for cooling, an automatic resetting adjustable time delay circuit shall also be factory-installed. A timed low pressure bypass switch (Compac I A/C only) for startup of the air conditioner below 20 degrees Fahrenheit and down to 0 degrees Fahrenheit shall be factory-installed. Auto-reset low pressure control shall be factory-installed.
3. Unit shall have a factory-installed built-in circuit breaker or disconnect switch.
4. A hard-start kit shall be factory-installed for all single-phase reciprocating units. The kit is not required for units with scroll compressors unless recommended by the manufacturer for low ambient applications.

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### I. Blank-Off Plate

1. The Compac I units shall have a blank-off plate installed to prevent any outdoor air from entering the conditioned space or an adjustable fresh air damper capable of being set to 0 percent outside air. Blank-off plate not required if equipment schedule calls for economizer-type unit.

### J. Supply/Return Grille

1. The supply grille shall be an adjustable aluminum, double deflection grille, factory provided. The return grille shall be an aluminum grille, factory provided.

### K. Thermostat(s)

1. See the equipment schedule on the Drawings to determine which of the following thermostats are required.
  - a. Furnish and install a non-programmable electronic thermostat that does not require batteries and has a non-volatile program memory. It shall be an automatic change-over type with the following: System switch (heat, auto, cool, off), fan switch (auto, on), room temperature display, and selectable 5° deadband.
  - b. The control of 1 or 2 air conditioning units shall be by the Marvair CommStat 4 lead lag controller or equal. The CommStat 4 shall be factory programmed with standard industry set points, but each of these set points shall have the capability to be changed in the field after installation. Instructions for programming the controller shall be printed on the front of the controller. Temperature display shall be in Fahrenheit. The lead lag changeover shall be adjustable from 1/2 day to 7 days in 1/2 day increments to ensure equal run time on each air conditioner. The controller shall allow the lag unit to assist upon demand. The cooling range shall be adjustable from 65 degrees Fahrenheit to 95 degrees Fahrenheit (18 degrees Celsius to 35 degrees Celsius). The heating range shall be adjustable from 50 degrees Fahrenheit to 80 degrees Fahrenheit (10 degrees Celsius to 27 degrees Celsius). The On/Off differential of each stage and the interstage differential of each stage shall be adjustable. The controller shall operate on 24 VAC and shall be insensitive to phasing of the air conditioners. The controller shall have LED's to indicate control power from each air conditioner, function (heating or cooling), the lead unit and high or low refrigerant pressure lockout. A comfort button shall be readily accessible on the front of the controller to override the cooling and heating set points for 90 minutes. The temperature during the 90 minutes shall be user selectable—either 72 degrees Fahrenheit (22 degrees Celsius) or 77 degrees Fahrenheit (25 degrees Celsius). If one of the air conditioners loses power, the controller shall automatically advance the other unit to lead control. The controller shall indefinitely retain its settings on a power loss. The controller

shall have dry contacts to provide remote alarm or notification. The relays shall be either normally open or normally closed. The controller shall have alarm relays for power to indicate a loss of power to the CommStat 4 controller, low building temperature, high building temperature, refrigerant pressure lock out and a smoke alarm output. The controller shall have an input for a smoke detector. The enclosure of the controller shall be constructed of a non-corroding polycarbonate material.

L. Configuration and Manufacturer

1. See the equipment schedule on the Drawings to determine which of the following units (described below) are required. Units shall be ComPac I or ComPac II air conditioner units as manufactured by Marvair, or equal, as noted on the Drawings and described herein.
  - a. ComPac I A/C—Not applicable for this project.
  - b. ComPac II A/C
    - (1) The ComPac II air conditioner shall have a factory-installed, full flow economizer. The economizer shall be factory-installed within the cabinet of the air conditioner. Slip-in or field-installed economizers are not acceptable. The economizer shall be designed to assure easy access to the air conditioning electrical controls. The economizer shall maintain a fixed supply air temperature of 50 degrees Fahrenheit (10 degrees Celsius) to 56 degrees Fahrenheit (13 degrees Celsius) during the “free” cooling operation by providing full range modulation for the outside return/air damper. The air conditioning unit shall include a method of pressure (exhaust) relief. The economizer shall be capable of introducing outside air and exhausting indoor air at a rate equal to the rated airflow of the air conditioner. The package shall be complete with necessary damper, linkage, and spring-return modulating damper motor. The economizer controls shall include an enthalpy sensor capable of controlling the damper by measuring the total heat content of the outside air. Field installed or removable economizer shall not be permitted.

**PART 3 EXECUTION**

3.01 INSTALLATION

A. Wall Mount Air Conditioner or Heat Pump

1. Install the unit as shown on the Drawings and as recommended by the manufacturer for the type of installation required. Installation shall be plumb and true, with clearance from combustible materials as recommended by the manufacturer and UL.

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2. Connect power as required by the local codes, and secure their acceptance of the installation.
3. Operate the unit and test the controls for proper setting and operation.
4. Install clean filters in the unit when warranty starts and furnish 4 extra filters per unit for OWNER use.
5. All duct connections at unit shall be airtight. Adhesive-backed tape shall not be used, either inside or outside of the ductwork, to cover or seal any openings or leaks. Use duct sealing compound as required.
6. Connect all controls and verify that they are functioning properly on heating and cooling as well as in the economizer mode if equipped.
7. Verify wall type from the Contract Drawings and mount per manufacturer's recommendations.
8. Keep combustible wall materials 3 inches away from supply duct through wall.
9. Use stainless steel mounting hardware for wall installation and caulk perimeter flange watertight.
10. Checklist, test, and startup with a report to the ENGINEER shall be performed by a technician from the manufacturer's representative and the cost shall be included in the bid price.

**END OF SECTION**

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**SECTION 16020**  
**PUMPING STATION ELECTRICAL**

**PART 1 GENERAL**

**1.01 SCOPE OF WORK**

- A. Provide all labor, material, tools, approvals, utility connection fees, excavation, backfill, and other services and equipment necessary to install the electrical system as shown on the Contract Drawings and as specified herein.
- B. Each Contractor bidding on the work included in these Specifications shall view the building site and carefully examine the contract Drawings and Specifications, so that he/she may fully understand what is to be done, and to document existing conditions.

**1.02 RELATED WORK SPECIFIED ELSEWHERE**

- A. Contractors bidding work under this Contract shall read and understand Division Zero and Division 1 - General Requirements. If any discrepancies are discovered between this Division and the General Requirements, the above-mentioned documents shall overrule this section.
- B. Section 16900 - Pump Control Panel
- C. Section 17010 - Instrumentation/SCADA

**1.03 SUBMITTALS**

- A. Provide shop drawings including descriptive literature and/or installation, operation and maintenance instructions. Shop drawings shall be submitted for all equipment proposed to be furnished under this Division.
- B. Electrical submittals shall be submitted after the pumping/process equipment has been approved. Otherwise the CONTRACTOR is responsible for any changes and costs incurred as a result of changes necessary to the electrical equipment.
- C. Shop Drawings shall be clearly marked and or highlighted as to which product, type, option, etc. is being submitted.
- D. Where wiring diagrams are not shown on the Contract Drawings, they are to be provided by the supplier of the equipment served.
- E. O&M manuals are required and shall consist of approved shop drawings, manufacturer O&M instructions, and test reports.

**1.04 SYMBOLS AND ABBREVIATIONS**

- A. The symbols and abbreviations generally follow standard electrical practice, however, exceptions to this shall be as shown on the Contract Drawings.



1.05 COORDINATION WITH OTHER TRADES

- A. The CONTRACTOR shall coordinate the electrical work with that of other trades to ensure proper final location of all electrical equipment and/or connections.

1.06 CODES

- A. Comply with the latest revision of the following codes:

- |     |   |       |
|-----|---|-------|
| 1.  | Kentucky Building Code                                | KBC   |
| 2.  | National Electrical Code                              | NEC   |
| 3.  | National Electrical Safety Code                       | NESC  |
| 4.  | Underwriters Laboratories, Inc.                       | UL    |
| 5.  | National Fire Protection Association                  | NFPA  |
| 6.  | National Electrical Manufacturers Association         | NEMA  |
| 7.  | Occupational Safety and Health Administration         | OSHA  |
| 8.  | Insulated Cable Engineers Association                 | ICEA  |
| 9.  | Instrument Society of America                         | ISA   |
| 10. | American National Standards Institute, Inc.           | ANSI  |
| 11. | Anti-Friction Bearing Manufacturers Association, Inc. | AFBMA |
| 12. | Federal Communications Commission                     | FCC   |

- B. Comply with any other applicable federal, state, or local laws and ordinances.
- C. Where the ENGINEER's design requires a higher standard than the applicable code, the ENGINEER's design shall be followed.

1.07 INSPECTIONS AND PERMITS

- A. Inspection of the electrical system on all construction projects is required. If the local government has appointed a state licensed inspector, the CONTRACTOR shall be required to use that person to perform the inspections. If a locally mandated inspector does not exist, the CONTRACTOR shall select and hire a state licensed inspector, who has jurisdiction before any work is concealed.
- B. At the time of completion of the project, there shall be furnished to the OWNER and ENGINEER a certificate of compliance, from the agency having jurisdiction pursuant to all electrical work performed.
- C. All permits necessary for the complete electrical system shall be obtained by the CONTRACTOR from the authorities governing such work.

## 1.08 STORAGE

- A. All work, equipment, and materials shall be protected against dirt, water, or other injury during the period of construction. Complete replacement with new equipment is required for any damaged materials.
- B. Sensitive electrical equipment such as motor starters, controls, transmitters, etc., delivered to the jobsite, shall be protected against injury or corrosion due to atmospheric conditions or physical damage by other means. Protection is interpreted to mean that equipment shall be stored under roof, in a structure properly heated in cold weather and ventilated in hot weather. Provision shall be made to control the humidity in the storage area at 50 percent relative. The stored equipment shall be inspected periodically, and if it is found that the protection is inadequate, further protective measures shall be employed.

## 1.09 MATERIALS

- A. All materials used shall be new and at least meeting the minimum standards as established by the NEC and/or National Electrical Manufacturers Association. All materials shall be UL listed for the application where a listing exists. All equipment shall meet applicable FCC requirements and restrictions.
- B. The material and equipment described herein has been specified according to a particular trade name or make to set quality standards. However, each CONTRACTOR has the right to substitute other material and equipment in lieu of that specified, other than those specifically mentioned at matching or for standardization, providing such material and equipment meets all of the requirements of those specified and is accepted, in writing by the ENGINEER.
- C. The reuse of salvaged electrical equipment and/or wiring will not be permitted unless specified herein or indicated on the Contract Drawings.
- D. All salvaged or abandoned electrical materials shall become the property of the CONTRACTOR and shall be removed from the job site upon completion of the project, unless otherwise noted on the Contract Drawings or specified herein.

## 1.10 ERRORS, CORRECTIONS, AND/OR OMISSIONS

- A. Should a piece of utilization equipment be supplied of a different size or horsepower than shown on the Contract Drawings, the CONTRACTOR shall be responsible for installing the proper size wiring, conduit, starters, circuit breakers, etc., for proper operation of that unit and the complete electrical system at no extra cost to the OWNER.
- B. It is the intent of these Specifications to provide for an electrical system installation complete in every respect, to operate in the manner and under conditions as shown in these Specifications and on the Contract Drawings. The CONTRACTOR shall notify the ENGINEER, in writing, of any omission or error at least 10 days prior to opening of bids. In the event of the CONTRACTOR's failure to give such notice, he/she may be required to correct work and/or furnish items omitted without additional cost.

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- C. Necessary changes or revisions in electrical work to meet any code or power company requirement shall be made by the CONTRACTOR without additional charge.

#### 1.11 GUARANTEES AND WARRANTIES

- A. The CONTRACTOR shall guarantee all work including equipment, materials, and workmanship. This guarantee shall be against all defects of any of the above and shall run for a period of 1 year from the date of acceptance of the work, concurrent with the one-year guarantee period designated for the general construction contract under which electrical work is performed.
- B. Repair and maintenance for the guarantee period is the responsibility of the CONTRACTOR and shall include all repairs and maintenance other than that which is considered as routine. (That is oiling, greasing, etc.) The ENGINEER shall be the judge of what shall be considered as routine maintenance.

#### 1.12 TESTING

- A. After the wiring system is complete, and at such time as the ENGINEER may direct, the CONTRACTOR shall conduct an operating test for acceptance. The equipment shall be demonstrated to operate in accordance with the requirements of these Specifications and the Contract Drawings. The test shall be performed in the presence of the ENGINEER or his authorized representative. The CONTRACTOR shall furnish all instruments and personnel required for the tests, as well as the necessary electrical power.
- B. Before energizing the system, the CONTRACTOR shall check all connections and set all relays and instruments for proper operation. He shall obtain all necessary clearances, approvals, and instructions from the serving utility company prior to placing power on the equipment.
- C. Cost of utilities for testing done prior to beneficial occupancy by the OWNER shall be borne by the CONTRACTOR.

#### 1.13 CLEANUP

- A. Cleanup shall be performed as soon as possible after the electrical installation is complete. All control panels, switches, etc., shall be free from tags, stickers, etc. All painted enclosures shall be free from scratches or splattered paint. The interior of all enclosures shall be clean from dust, wire strippings, etc. Surplus material, rubbish, and equipment shall be removed from the jobsite upon completion of the work.
- B. During construction, cover all OWNER equipment subject to damage.

#### 1.14 EXCAVATION AND BACKFILL

- A. Excavation for conduits shall be of sufficient width to allow for proper jointing and alignment of the type conduit used. Conduit shall be bedded on original ground unless indicated otherwise on the Drawings. Where conduit is in solid

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rock, a 6-inch earth cushion must be provided. Conduit shall be laid in straight lines between pull boxes and/or structures unless otherwise notes on the Contract Drawings. The cost of solid rock excavation shall be included in the lump sum bid.

- B. Backfill shall be hand placed, loose granular earth for a height of 6 inches above the top of the largest conduit. This material shall be free of rocks over ½ inches in diameter. Above this, rocks up to 3” diameter may be included but must be mixed with sufficient earth to fill all voids.

#### 1.15 POWER COMPANY COORDINATION

- A. The CONTRACTOR is responsible for coordinating all activities onsite by the power company.
- B. The CONTRACTOR is required to meet all requirements and special provisions of the power company. The CONTRACTOR shall coordinate with the utility prior to bidding the project. No extras will be allowed for provisions required by the power company.

#### 1.16 TEMPORARY ELECTRICAL POWER

- A. The CONTRACTOR shall be responsible for providing temporary electrical power as required during the course of construction and shall remove the temporary service equipment when no longer required.

#### 1.17 OVERCURRENT PROTECTION

- A. Circuit breakers or fused switches shall be the size and type as written herein and shown on the Contract Drawings. Any additional overcurrent protection required to maintain an equipment listing by an authority having jurisdiction shall be installed by the CONTRACTOR at no extra cost to the OWNER.

#### 1.18 TRAINING

- A. Provide onsite training on major items of equipment. The training shall be conducted by a qualified representative of the manufacturer, and shall be sufficient in content and length such that the OWNER’s personnel are fully qualified to operate, maintain, and troubleshoot the equipment. O&M manuals must be approved before training can commence. Only one training class is required for each item of equipment. Coordinate the time/date with the OWNER.
- B. An official training report shall be submitted to the ENGINEER. It shall be signed by OWNER’s personnel.

#### 1.19 RECORD DRAWINGS

- A. The CONTRACTOR shall maintain 1 set of the Contract Drawings on the job in good condition for examination at all times. The CONTRACTOR's qualified representative shall enter upon these Drawings, from day to day, the actual “as-built” record of construction and/or alteration progress. Entries and notes shall be made in a neat and legible manner and these Drawings delivered to the

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ENGINEER after completion of the construction, for use in preparation of Record Drawings. Underground lines must be dimensioned to permanent structures.

#### 1.20 MAINTAINING CONTINUOUS ELECTRICAL SYSTEM AND SERVICE

- A. Existing pump station operation shall be maintained at all times until the new station is online. In no way shall be installation and/or alteration of the electrical work interfere with or stop the normal operation of the existing facilities, except where prior arrangements have been made. Provide all equipment necessary (including temporary switchgear, controls, and rental power generation equipment if necessary) to ensure that the existing system remains operational until the new system is fully functional.

#### 1.21 GROUNDING AND BONDING

- A. All metallic conduit, cabinets, equipment, and service shall be grounded in accordance with NEC requirements. All supporting framework in contact with electrical conduit, cable, and/or enclosures, shall be properly grounded.

#### 1.22 SERVICE ENTRANCE

- A. Conductors and terminations for service entrances shall be furnished and installed by the CONTRACTOR. Voltage, phase, and number of wires shall be as shown on the Drawings. Clearances for overhead entrance wires shall be per power company, NEC, and NESC requirements.

#### 1.23 CONTRACTOR LICENSING

- A. The CONTRACTOR performing the electrical work on this project shall be a licensed electrical contractor in the State of Kentucky.

#### 1.24 ELECTRICAL COMPONENT MOUNTING HEIGHTS

- A. Mounting heights shall be as shown on the Contract Drawings. Operators and control devices shall not be mounted higher than 6'6" above finished floor or grade.

#### 1.25 EQUIPMENT IDENTIFICATION

- A. All starters, feeder units, disconnects, instruments, etc., shall be marked to indicate the motors, circuit, they control or monitor. Marking is to be done with engraved laminated nameplates. Nameplates shall be fastened to equipment with stainless steel screws, one each side. In no way shall be installation of the mounting screws void the NEMA enclosure rating of the equipment in which they are installed. If there are more than one number, the equipment shall be number consecutively and labeled as such. Nameplate background color shall be white, with black engraved letters.
- B. Disconnect switches, control panels, transfer switches, panelboards etc. shall be labeled with orange OSHA-compliant vinyl self-adhesive signs that list the maximum voltage contained inside the cabinet or panel.

## 1.26 EQUIPMENT CONFIGURATION/PROGRAMMING

- A. Any equipment furnished by the CONTRACTOR is required to be configured or programmed by the CONTRACTOR or his subcontractor/vendor. Any necessary studies or engineering necessary to configure or program this equipment shall be provided by the CONTRACTOR as needed to place the equipment into successful operation. ENGINEER or OWNER will not be responsible for equipment configuration or programming.
- B. If a manufacturer or manufacturer's representative is required to startup/commission the equipment in these Specifications, then it is required that the CONTRACTOR provide the services of the manufacturer to configure/program the equipment. This includes the provision of any necessary studies or engineering necessary for the configuration/programming.

## PART 2 PRODUCTS

### 2.01 ACCEPTABLE MANUFACTURERS

#### A. Raceways

- 1. Rigid Aluminum Conduit - "Allied," "Wheatland," "Indalex," or equal.
- 2. PVC Conduit - "Allied," "Carlson," "Cantex," or equal.
- 3. Liquidtight Flexible Metal Conduit - "Allied," "Anaconda," or equal.

#### B. Wires and Cables

- 1. Building Wire (Types THWN and THW) - "Collyer," "Rome," "American," "Carol," or equal.
- 2. Instrumentation Cables - "Eaton-Dekoron," "Manhattan," "American," "Belden," "Okonite," or equal.

#### C. Boxes - "Appleton," "Crouse-Hinds," "Hoffman," "Rittal," or equal.

#### D. Wire Connections and Connecting Devices

- 1. Termination and Splice Connectors - "3M Scotchlok," "Anderson," "T&B," "Burndy," or equal.
- 2. Connectors, Lugs, etc. - "T&B," "Anderson," "Burndy," or equal.

#### E. Grounding Equipment - "Cadweld," "ITT Blackburn," "Copperweld Bimetallics Group," "Cathodic Engineering Equipment Co.," or equal.

#### F. Motor Control Equipment - "Square D," "Allen Bradley," "Eaton Cutler-Hammer," "G.E.," or equal.

## 2.02 MATERIALS

### A. Conduit and Fittings

1. Aluminum Conduit
  - a. Aluminum conduit shall be extruded from alloy 6063 and shall be the rigid type, non-toxic, corrosion resistant, and non-staining. It shall be manufactured per UL standards as well as listed/labeled by same.
  - b. Fittings, boxes, and accessories used in conjunction with aluminum conduit shall be die cast, copper free type. They shall be resistant to both chemical and galvanic corrosion. All covers shall have neoprene gaskets. Aluminum fittings containing more than 0.4 percent copper are prohibited.
2. Aluminum conduit proposed for concrete slab or underground applications shall be UL listed for the purpose and factory pre-coated. Corrosion-resistant taping is allowed for stubouts out of the ground.
3. Polyvinylchloride (PVC) Conduit - PVC conduit and fittings shall be Schedule 80 heavy wall and UL listed. Expansion joints shall be used as recommended by the manufacturer in published literature. PVC systems shall be 90 degrees Celsius minimum UL rated, have a tensile strength of 7,000 psi @ 73.4 degrees Fahrenheit, flexural strength of 11,000 psi and compressive strength of 8,000 psi.
4. Liquidtight Flexible Conduit - Flexible conduit shall be the metallic liquidtight type UA constructed from flexibly or spirally wound electro-galvanized steel with light gray PVC coating. Connections shall be by means of copper-free aluminum fittings.
5. Locknuts shall be bonding type with sharp edges for digging into the metal wall of an enclosure. Myer-style aluminum hubs shall be used rather than locknuts for all NEMA 4X and exterior penetrations.
6. Bushings shall be metallic insulating type, consisting of an insulating insert molded or locked into the metallic body of the fitting. Bushings made entirely of metal or nonmetallic material are not permitted.
7. Corrosion-Protection Tape: The corrosion protection tape shall be Scotchrap 51 or equal with 20mil thickness PVC tape and high-tack adhesive. Degreasing and priming of the conduit is required prior to applying the corrosion-protection tape.

### B. Conductors (600 Volts and Below)

1. All conductors shall be insulated so that they are rated at 600 volts.
2. Insulated conductors shall be minimum #12 AWG for power or #14 AWG for control and shall be stranded.

3. All conductors brought to the job site shall be new and unused and where no special factory cut lengths are involved, shall be delivered to the job site in standard coils. CONTRACTOR shall provide verification to the ENGINEER of wire condition before wire is installed.
4. All conductors shall be soft drawn, 98% conductivity copper conforming to the latest ASTM Specifications and the requirements of the National Electrical Code.
5. Conductors shall be insulated with type THWN insulation and all conduits shown on the Drawings are sized accordingly.

C. Instrumentation Cable - Instrumentation cable shall have individually shielded and twisted pairs or triads. Conductors shall be tinned copper, and the cable shall include a separate drain conductor. Voltage rating shall be 600 Volt. Conductor colors shall be black and white. Shielding shall be a combination braid/foil with 100% coverage. Insulation shall be PVC or XLPE. Conductors shall be #18AWG minimum, but no smaller than the size indicated on the Drawings. Insulation shall be polyethylene, rated for underground wet location use, and resistance at 68 degrees Fahrenheit between conductors and between conductors and ground should be at least 500 megohms per 1,000 feet.

D. Boxes and Enclosures

1. Junction boxes for outdoors surface mounting shall be stainless NEMA 4X, with at least 5 ½ full threads for each conduit opening, and shall be suitable for surface mounting as required with drilled external, cast mounting extensions. Box covers shall be hinged or cap screw retained as required, of the same material as the box and provided with stainless steel hardware.

E. Wire Connections and Connecting Devices

1. Terminals and splice connectors from #22 to #4 AWG shall be compression type with barrels to provide maximum conductor contact and tensile strength. Performance, construction, and materials shall be in conformance with UL standards for wire connectors and rated for 600 Volts and 105 degrees Celsius.
2. Lugs and splice connectors from #6 AWG to 1000 kcmil shall be compression types with barrels to provide maximum conductor contact and tensile strength. They shall be manufactured from high conductivity copper and entirely tin plated. They shall be crimped with standard industry tooling. The lugs and connectors must have a current carrying capacity equal to the conductors for which they are rated and must also meet all UL requirements. All lugs above #4/0 shall be 2 hole lugs with NEMA spacing. The lugs shall be rated for operation through 35 KV. The lugs shall be of closed end construction to exclude moisture migration into the cable conductor.



F. Wiring Devices

1. General – All receptacles shall be heavy duty specification grade duplex receptacle, NEMA 5-20R, 20A, 125V, 3-wire. Provide weatherproof cover where indicated on the Drawings.
2. Duplex outlet (interior) - “Hubbell” catalog series 5362, or equal.
3. Ground fault interrupting receptacles shall be required where shown on the Contract Drawings, and shall be indicated by the abbreviation “GFI” beside the circuit symbol on the Contract Drawings. They shall be rated 20 amps (125 volts) and shall be of the duplex, feed through type, capable of protecting all downstream receptacles on the same circuit. They shall be UL listed and shall comply with UL 943 and interrupt the current between 4-6 milliamps of ground fault leakage. Appropriate plates shall be furnished and installed. The 20 ampere rating shall apply not only to device internals but to the faceplate as well. Receptacle shall be Hubbell GFI 5352, or equal.
4. Weatherproof covers shall be Hubbell WP series, Thomas and Betts 2CKG, or equal. They shall be weatherproof-in-use with cast aluminum construction. Mounting screws shall be stainless. Protection shall be NEMA 3R.
5. General – Switches shall be industrial grades, 120/227VAC, 20A
  - a. Single pole (exterior) - “Hubbell” cat. no. 1222-gray, or equal.
  - b. Weatherproof switch covers shall be Hubbell 7420 series, or equal, with stainless mounting screws, cast aluminum construction and wet location rating.

G. Panelboards

1. Shall be UL listed with copper bussing.
2. Enclosure shall be NEMA 1.
3. Circuit breakers shall be bolt-in.
4. Panelboards rated for 120/208V service shall have an interrupting capacity of not less than 10,000A, RMS symmetrical.
5. Panelboards shall have an integral TVSS surge suppressor.

H. Motors

1. Ratings and Electrical Characteristics:
  - a. Time: All motors shall be rated for continuous duty.

- b. Temperature: Maximum ambient temperature of 40 degrees C. and an altitude of 3,300 feet or less, according to service factor and insulation class employed.
  - c. Voltage: All single-phase motors shall be rated 115/208/230 volts and all polyphase motor 230/460 volts. All motors shall be capable of normal operation at balanced voltages in the range of + 10 percent from rated winding voltage.
  - d. Frequency: All AC motors shall be rated for 60 hz. operation. All motors shall be capable of normal operation at frequencies 5 percent above or below the normal rating of 60 hz.
  - e. Locked Rotor Current: Locked rotor current shall be in accordance with NEMA standards.
  - f. Efficiency: NEMA premium efficiency is required.
  - g. Speed: Slip shall not exceed 4 percent at full load.
  - h. Service Factor: The service factor shall be 1.15 unless requirements of the driven load necessitate a higher service factor.
  - i. Insulation Class: Insulation shall be NEMA Class F or Class H. All motors shall be inverter-duty and suitable for operation on variable frequency drives.
  - j. Design Level: Motors shall be NEMA design B, except as otherwise noted.
  - k. Enclosure: Motors for process equipment 2 HP and smaller shall be totally enclosed. All motors for process equipment larger than 2 HP shall be TEFC (totally enclosed fan cooled), suitable for use indoors or outdoors, except as otherwise noted.
  - l. Winding Overtemperature Sensors: All pump motors shall be provided with motor winding thermostats. The devices shall be hermetically sealed, snap-acting thermal switches, actuated by a thermally responsive bi-metallic disk. A minimum of 1 per phase is required, with switches wired into the control circuit of the starter to provide de-energization should overheating threaten.
2. Tests, Nameplates and Shop Drawings:
- a. Test: Tests shall be required on integral horsepower motors only. A factory certified test report of "electrically duplicate motors previously tested" shall be supplied on all motors under 200 horsepower. The test shall be certified by the factory and shall contain a statement to the effect that complete tests affirm the guaranteed characteristics published in the manufacturer's

catalogs or descriptive literature. Tests shall be in accordance with IEEE test procedures.

- b. Nameplates: Each motor shall have a permanently affixed nameplate of brass, stainless steel, or other metal of durability and corrosion resistance. The data contained on the nameplate shall be in accordance with NEMA standards. Provide a spare nameplate with each motor and mount the nameplate in the starter cabinet. A Brady label with equivalent nameplate information will be accepted in lieu of an actual spare nameplate.

### 3. Efficiency Requirements

- a. The following motor full load efficiency requirements shall be met as a minimum for totally enclosed 3 phase integral horsepower motors (per NEMA test Methods):

Horsepower	Nominal 3600 RPM (Minimum %)	Nominal 1800 RPM (Minimum %)	Nominal 1200 RPM (Minimum %)
1	75.5	82.5	80.0
1.5	82.5	84.0	85.5
2	84	84.0	86.5
3	85.5	87.5	87.5
5	87.5	87.5	87.5
7.5	88.5	89.5	89.5
10	89.5	89.5	89.5
15	90.2	91.0	90.2
20	90.2	91.0	90.2
25	91.0	92.4	91.7
30	91.0	92.4	91.7
40	91.7	93.0	93.0
50	92.4	93.0	93.0
60	93.0	93.6	93.6
75	93.0	94.1	93.6
100	93.6	94.5	94.1
125	94.5	94.5	94.1
150	94.5	95.0	95.0
200	95.0	95.0	95.0

- b. Motors shall be energy efficient and shall be documented in the shop drawings submittal in sufficient detail to allow the ENGINEER complete review of what is offered. Motors shall meet NEMA premium efficiency standards.

I. Surge Protection Devices

1. Distribution Equipment SPD/TVSS

- a. The TVSS shall be suitable for application in category C3 environments as described in ANSI/IEEE C62.41. The TVSS shall be of parallel design and provide protection, line to ground, neutral to ground, and line to neutral for wye or delta distribution systems. The TVSS shall be compatible with the indicated electrical system, voltage, current and distribution configuration.
- b. TVSS shall comply with ANSI/IEEE C62.1, C62.41, and C62.45. The TVSS shall be capable of surviving 1,000 sequential category C3 surges without failure following IEEE test procedures established in C62.45.
- c. The TVSS shall have LED indicators that provide indication of suppression failure. It shall also have a surge counter. It shall also have a relay contact that provides remote indication of surge protection failure.
- d. The TVSS maximum continuous operating voltage (MCOV) shall be capable of sustaining 110 percent of the nominal RMS voltage continuously without degradation.
- e. TVSS shall have surge current capacity of 80,000 amps minimum per mode with a response time no greater than 5 nanoseconds, for any of the individual protection modes, under laboratory conditions with optimum lead lengths.
- f. The TVSS UL 1449 surge suppression rating for any suppression mode shall not exceed:

Electrical System Voltage	Phases	UL 1449 Surge Suppression Ratings
120/240	1	330V
120/240	3	330V
120/208	3	330V
208	3	700V
277/480	3	700V
480	3	1500V

J. Safety Switches

1. All safety switches shall be heavy-duty load break type with a quick-make, quick-break, switch mechanism. The switches shall be fused or unfused as indicated on the Drawings. The handle position shall give visual indication of open and closed switch position. Padlocking capability shall be provided for locking the switch in the "OFF" (open) position. Switches are required to be UL98 listed and shall comply with NEMA KS-1 latest version.
2. The switch jaws shall be multi-spring type for positive grip of the switch blades and shall be provided with arc suppressors. The fuse clips shall be spring reinforced, positive pressure type of electrolytic copper. Fuse clips shall be rejection type.
3. The switch shall be provided with cover-blade interlock so that the cover cannot be opened when the switch blades are closed, nor can the switch blades be closed with the cover open. Interlock bypassing devices shall be included for use by authorized personnel. Note: where indicated, safety switches shall have integral electrical interlocks. Contacts shall be open when the switch is in the off position.
4. Enclosures shall be NEMA 4X stainless steel where used outside unless otherwise shown on the Drawings.
5. Each safety switch shall be provided with ground lugs as required to accept grounding conductors as shown on the Drawings. The grounding lugs shall be factory installed and shall have direct metal-to-metal contact with the switch enclosure.
6. Double throw fused safety switches shall be furnished where indicated. They shall be lockable in any position and shall be service-entrance rated. They shall be heavy-duty NEMA 4X stainless steel unless noted otherwise.

K. Motor Control

1. See Section 16900 for requirements.

L. Lighting

1. All fixtures shall be delivered complete with suspension and mounting accessories, ballasts, diffusers, reflectors, etc., all wired and assembled. All accessory wiring shall be furnished and installed as shown on the Contract Drawings.
2. All supports required for luminaires shall be furnished and installed by the CONTRACTOR.

- M. Supporting Devices – All strut, channel, conduit clamps/straps, and other supporting devices shall be either stainless steel or aluminum. All hardware such as nuts, bolts, anchors, washers, etc. shall be stainless steel.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION/APPLICATION/ERECTION**

#### **A. Conduit**

1. PVC conduit shall be utilized below grade, and aluminum conduit shall be used above grade. The transition from PVC to aluminum shall occur below grade prior to the elbow. The aluminum conduit shall be taped with corrosion-prevention tape from the transition point to 6" above finished grade.
2. The CONTRACTOR shall be responsible for setting of all sleeves for his work. Passage of conduit through masonry and concrete walls shall be provided with steel pipe sleeves. Sleeves shall be flush with each face of the wall. Seal space between sleeve and conduit with oakum and waterproof mastic.
3. All conduit 1-1/4 inches and larger shall be sleeved.
4. Concrete encasements of underground conduit - not required on this project.
5. During construction, all new conduits shall be kept dry and free of moisture and debris. Before the wire is pulled in, all conduits shall be swabbed to clear all moisture and debris which may have unavoidably accumulated.
6. Rigid conduits, where they entered panelboards, cabinets, pull boxes or outlet boxes shall be secured in place by galvanized, double locknuts (one inside and one outside) and bushings. Conduit bushings shall have insulating material which has been permanently fastened to the fittings. Bushings for conduit 1-1/2 inches trade size and larger shall be complete with grounding lug and shall be bonded to the box by means of bare copper wire. Myers hubs shall be utilized rather than locknuts for all exterior and NEMA 4X penetrations.
7. All field bends shall be made with standard tools and bending equipment manufactured especially for this purpose. Bends in metallic conduit shall be made while cold and in no case shall the conduits be heated. Conduits shall not be bent through more than 90 degrees.
8. Size of conduits shall not be less than that required by the National Electrical Code. The CONTRACTOR shall install larger size conduits than detailed where there is more than 100 feet of unbroken run or where the total of the angles through which the conduit has been bent during a single run exceeds 270 degrees.
9. In general, flexible conduit is prohibited. Where absolutely necessary, it shall be liquidtight, with maximum lengths of 3 feet.

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10. All conduit joints shall be made up tight and no running threads shall be permitted on threaded connections. No kinked, clogged or deformed conduits shall be permitted on the job.
11. During construction, all installed conduits shall be temporarily capped or corked.
12. All moisture proofing or other material for thread protection shall be removed from conduit threads prior to installation. No material of insulating quality shall be used on the conduit threads or other places which will reduce the overall conductivity of the conduit system.
13. Raceways shall be securely and rigidly fastened in place with conduit clamps or approved conduit hangers. Bolts, screws, etc. used in securing the work shall be stainless steel and of ample size for the service. Assembly bolts, nuts, washers, etc., shall be stainless steel. Raceways shall NOT be welded to steel structures.
14. Horizontal and vertical conduit runs shall be supported by one hole straps with clamp backs, special brackets, or other approved devices with suitable bolts, expansion shields where required. All mounting hardware shall be stainless steel.
15. The use of perforated iron straps or wire for supporting conduits will not be permitted.
16. Where conduit is run in a concrete slab, the conduit shall be installed as close to the middle of the concrete slabs as practicable without disturbing the reinforcement. The outside diameter shall not exceed one-third of the slab thickness and conduits shall be placed not closer than three diameters on centers, except at cabinet locations where the slab thickness shall be increased upon consultation with and approval by the ENGINEER.
17. Depth of bury for all conduit shall be as indicated but not less than 30 inches below finished grade.
18. All conduit shall have an insulated ground wire pulled to all equipment.
19. All conduits penetrating enclosures shall have duct seal applied to seal the conduit and prevent moisture from entering the enclosure.

B. Wire and Cable (600 Volts and Below):

1. All wiring shall be installed in conduit. Wire shall not be installed until all work of any nature that may cause injury to the wire is completed.
2. Mechanical means shall not be used in pulling in wires No. 8 or smaller.

3. Approved wire pulling lubricant shall be used as required to prevent insulation damage and over stressing of the wire while pulling through conduit. In no case shall conductors be greased or coated with any substance injurious to the conductor insulation or sheath.
4. All wiring in control equipment, cabinets, etc., shall be neatly wrapped, taped, or laced into groups to provide a neat and orderly appearance in the equipment.
5. Where the wire is shown larger than that required for the load, it is done so for voltage drop or other purposes and must be installed as shown. Where the wire is stranded, the removal of strands in order to install the wire into a lug provided on any equipment will not be permitted. A larger lug shall be installed which will accept the wire size indicated.
6. For the wiring of circuits consisting of AWG No. 10 or smaller wire, self-insulated pressure connectors (wirenuts) shall be utilized for all splices or joints.
7. Each wire shall be labeled at both termination points. Individual conductor or circuit identification shall be carried throughout, with circuit numbers or other identification clearly stamped on terminal strips and shown in wiring diagrams.
8. In all junction boxes, cabinets, control compartments and terminal boxes where no terminal board is provided, each wire, including all power wires, shall be properly identified by plastic coated, self-adhesive, wire marker.
9. In cases similar to the above where the terminal boards are provided for the control, indicating, and metering wires, all wires including motor leads and other power wires shall be identified by wire markers as specified above.
10. Equipment ground wire insulation shall be colored green or green with two or more yellow stripes. Isolated grounding conductors shall be green with striping that identifies the conductor as "isolated ground" and different from the equipment (bonded) ground.
11. In general and unless otherwise shown on the drawings, no 2 wires of the same color shall be run in the same conduit except such as control wiring, switch legs, neutral, and ground. Where a conduit run is shown on the drawings to have two or more wires connected to the same phase and, therefore, are the same color, pressure sensitive, plastic marked wire marker identification tape shall be used wherever the wire is accessible (junction boxes, panels, device boxes, etc). The numbers shall in each case, correspond to the circuit number and panelboard from which the circuit emanates. Control wiring inside any compartment which may be energized from a source outside the compartment shall have insulation. Where yellow insulated wires are used inside any cabinet, compartment, etc., a machine engraved, laminated plastic identification marker shall be installed on the outside of the compartment.



12. Insulation on ungrounded conductors larger than AWG #10 and on grounded (neutral) and grounding (equipment ground) conductors larger than AWG #6 may be black with color coding accomplished with the use of colored plastic tape. Tape shall be installed on the conductors wherever they are visible and shall be wrapped at least three (3) turns around the conductor.
13. All wiring on this project, except control wiring, shall reflect the phase relationship as follows:
  - 480 volt system: brown, orange and yellow for ungrounded conductors, gray with brown tracer for neutral conductors.
  - 208Y/120 volt system: black, red and blue for ungrounded conductors, white for neutral conductors.
  - 120/240 volt, 3-phase 4-wire, delta system: black, red for ungrounded conductors, orange for ungrounded conductor connected to "high leg", white for neutral.

#### C. Grounding

1. Ground rods shall be driven vertically into the earth to at least one foot below finished grade. Where a counterpoise or grounding grid is indicated and where rock is encountered at a depth of less than four (4) feet, rods shall be buried in a trench at not less than two feet below finished grade, and at equal angles from any two adjacent sides on the outside of the counterpoise or grid. In these cases, at the CONTRACTOR's option, equal lengths of bare conductor of the same size as the counterpoise or grid may be used in place of ground rods.
2. Conductors connecting the main ground bars in switchgear to the earth shall be continuous without joints or splices. Connections to the grounding system at the switchgear shall be made with pressure connectors such as defined in Article 100, "Connector, Pressure (Solderless)," of the National Electrical Code.
3. Connections to ground rods and all other ground connections below grade shall have a minimum mechanical contact surface area between the conductor and the ground rod of not less than 3 square inches.
4. All connections made below finished grade shall be exothermic.
5. Installation of grounding conductors shall be such that they are not exposed to physical damage. All connections shall be firm and tight. Conductors and connectors shall be so arranged and provided so that there is no strain upon the connection. Buried equipment grounding conductors shall be buried at least 24 inches below finished grade and shall not be buried below concrete pads, paving, etc. except where

running a tap to the grid or where shown on the contract drawings. Where buried below concrete or paving, grounding conductors shall be in rigid conduit unless shown on the drawings as a part of a grid.

6. Resistance measurements shall be made between the main grounding bar in the switchgear and a good earth ground. If this resistance is not equal to or less than 5 Ohms, an additional grounding electrode system in the form of ground rods installed and connected together in a 10-foot by 10-foot grid shall be added. The rods shall be connected together and this grid connected to the system with AWG #3/0 bare tinned copper. The number of rods shall be as required to register the resistance value mentioned above. Measurements shall be made in normally dry conditions and, in no case, less than 48 hours after rainfall. Submit a ground test report to the ENGINEER using the "Fall of Potential" method and appropriate ground testing instrumentation.
7. Where a bare conductor is the only conductor installed in conduit or other raceway, and this conductor is serving as a grounding conductor, it shall be bonded to the raceway that contains it at each end of the raceway. The bond shall be made using a grounding type bushing and bonding jumper. The size of the jumper shall be the maximum size that the grounding bushing lug will accept and it shall be connected to the bushing with the lug and to the grounding conductor with a split bolt connector.
8. All metal electrical equipment cabinets (wireways, panels, switchgear, device boxes, junction and pull boxes, motor control panels, etc.) shall be securely bonded to a grounding conductor running through any conduit terminating at the cabinet or enclosure by use of a grounding lug bushing and jumper wire to the enclosure wall. Switchgear, panelboards and motor control equipment shall be provided with an equipment ground bus (including lugs or screw terminals) securely bonded to the enclosure. Junction boxes and other enclosures shall utilize an equipment ground bus or lug as required to securely bond the equipment grounding conductor to the enclosure. The grounding conductor shall be connected with pressure connectors at the main switchgear to the main grounding system. Where screw terminals or set screw lugs are used, sufficient lugs shall be provided such that not more than one conductor is installed into each lug or terminal.
9. No raceway (including rigid steel conduit, EMT, etc.) shall serve as a grounding conductor.
10. All main feeder circuits and all branch circuits shall contain a grounding conductor sized according to Table 250-95, Article 250 of the National Electrical Code or as shown on the drawings. This grounding conductor shall be connected to the main grounding conductor in the switchgear from which the circuit emanates. Individual components of the system served by the main feeder circuit shall have their enclosures connected to the main feeder grounding conductor with pressure connectors.

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11. The grounding conductor serving motor circuitry shall be connected inside the entrance compartment to the motor frame with a bolted solderless pressure connector. Bolts, nuts, washers and other assorted hardware shall be bronze, cadmium plated steel, or other corrosion resistant material. The motor ground connection shall be to the motor frame and independent of the mounting bolts or sliding base.
12. Grounded and Grounding Conductor: Connections to the grounding conductor and/or the neutral (grounded) conductor shall be made in such a manner that removal of any device or equipment will not interrupt the continuity of these conductors to any device downstream from the device removed.

#### D. Lighting

1. The CONTRACTOR shall furnish all light fixtures, lighting equipment, components, hangers, etc., as shown on the Contract Drawings and shall install them at the locations shown on the Contract Drawings.
2. Mounting heights specified as indicated shall be to bottom of fixture. Coordinate exact mounting of lighting fixture with type, style and pattern of ceiling being installed.
3. Clean interior lighting fixtures of dirt and debris upon completion of installation. Protect installed fixtures from damage during remainder of construction period.
4. No light fixtures shall be hung or installed until after painting is completed, however, the CONTRACTOR shall provide temporary lighting.

**END OF SECTION**

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**SECTION 16483**  
**ADJUSTABLE FREQUENCY DRIVES**

**PART 1 GENERAL**

1.01 SCOPE

- A. Provide adjustable frequency drives (AFD) as specified herein and as shown on the Contract Drawings.

1.02 RELATED SECTIONS

- A. Section 16010 General Electrical Requirements
- B. Section 16900 Pump Control Panel

1.03 REFERENCES

- A. The adjustable frequency drives and all components shall be designed, manufactured and tested in accordance with the latest applicable standards including the following:
  - 1. Underwriters Laboratories (UL508C: Power Conversion Equipment)
  - 2. IEC 61800-3

1.04 SUBMITTALS

- A. The following information shall be submitted to the ENGINEER for approval:
  - 1. Dimensioned outline drawing
  - 2. Schematic diagram
  - 3. Power and control connection diagram(s)
  - 4. Descriptive bulletins
  - 5. Product sheets
- B. O&M manuals are required in accordance with Section 16020 requirements. As-built wiring diagrams and as-built parameter settings list are required.

1.05 QUALIFICATIONS

- A. For the equipment specified herein, the manufacturer shall be ISO 9001 certified.

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## 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Equipment shall be handled and stored in accordance with manufacturer's instructions. A copy of these instructions shall be included with the equipment at time of shipment.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. Rockwell
- B. Eaton
- C. Square D
- D. ABB
- E. Danfoss
- F. Or equal.

### 2.02 ADJUSTABLE FREQUENCY DRIVES (AFD)

- A. Adjustable frequency drives shall have the following features:
  - 1. The AFD shall be rated for the voltage indicated on the Drawings. The AFD shall provide microprocessor-based control for 3-phase induction motors. The AFD may be variable torque or constant torque rated, but it must have the ambient temperature rating specified below.
  - 2. The AFD shall be of the Pulse Width Modulated (PWM) design converting the utility input voltage and frequency to a variable voltage and frequency output via a 2-step operation. Adjustable Current Source AFDs are not acceptable. Insulated Gate Bipolar Transistors (IGBT's) shall be used in the inverter section. Bipolar Junction Transistors, GTO's or SCR's are not acceptable.
  - 3. The AFD shall have efficiency at full load and speed of at least 97 percent.
  - 4. The AFD shall maintain the line side displacement power factor at no less than 0.97, regardless of speed and load.
  - 5. The AFD shall have a 1 minute overload current rating of 150 percent and a 3 second overload current rating of 180 for constant torque drives. The AFD shall have a 1 minute overload current rating of 110 percent for variable torque drives.
  - 6. The AFD shall be rated for at least the amount of short circuit current indicated on the Drawings, but in no case less than 35kA RMS symmetrical.

7. The AFD shall be capable of operating of operating any NEMA design B squirrel cage induction motor, regardless of manufacturer, with a horsepower and current rating within the capacity of the AFD.
8. The AFD shall have an integral EMI/RFI filter.
9. All AFDs are required to have either a line reactor or a combination of a DC link choke and surge protection device. AFDs up to 20HP shall have a 3 percent nominal impedance AC 3-phase line reactor. AFDs above 20HP shall have a 5 percent nominal impedance AC 3-phase line reactor. The line reactors may be integral to or separate from the drive. If separate, the line reactors must be enclosed in a NEMA enclosure compliant with the specification for the area. If a DC link choke is included in lieu of a line reactor, it shall be nominal 5 percent impedance with dual coils around the positive and negative DC bussing. It is also required (if proposing to use a link choke in lieu of a line reactor) that a surge protection device (SPD) be included immediately upstream of the drive.
10. The AFD shall be able to start into a spinning motor. The AFD shall be able to determine the motor speed in any direction and resume operation without tripping. If the motor is spinning in the reverse direction, the AFD shall start into the motor in the reverse direction, bring the motor to a controlled stop, and then accelerate the motor to the preset speed.
11. Standard operating conditions shall be:
  - a. Incoming Power: As indicated voltage (+10 percent to -15 percent) and 50/60 Hz (+/-5 Hz)
  - b. Frequency stability of +/-0.05 percent for 24 hours with voltage regulation of +/-1 percent of maximum rated output voltage.
  - c. Speed regulation of +/- 0.5 percent of base speed.
  - d. Load inertia dependant carryover (ride-through) during utility loss.
  - e. Insensitive to input line rotation.
  - f. Humidity: 0 to 95 percent (non-condensing and non-corrosive).
  - g. Altitude: 0 to 3,300 feet (1000 meters) above sea level.
  - h. Ambient Temperature: The AFD shall be rated for operation down to 0°C (32°F). The AFD shall be rated for no less than 50°C (122°F) operating ambient temperature.
12. Control Functions
  - a. AFD programmable parameters shall be adjustable from a digital operator keypad. The AFD shall have an alphanumeric programmable display with status indicators. Keypads must use plain English words for parameters, status, and diagnostic

messages. Keypads that are difficult to read or understand are not acceptable, and particularly those that use alphanumeric code and tables. Keypads shall have backlighting.

- b. The keypad shall include a Local/Remote pushbutton selection. Both start/ stop source and speed reference shall be independently programmable for Keypad, Remote I/O, or Field Bus.
- c. The frequency drive shall include an ethernet port for programming, monitoring, and control. Ethernet/IP is the required protocol.
- d. The operator shall be able to scroll through the keypad menu to choose between the following:
  - (1) Monitor
  - (2) Operate
  - (3) Parameter setup
  - (4) Actual parameter values
  - (5) Active faults
  - (6) Fault history
  - (7) Information to indicate the standard software and optional features software loaded.
- e. The following setups and adjustments, at a minimum, are to be available:
  - (1) Start command from keypad, remote or communications port
  - (2) Speed command from keypad, remote or communications port
  - (3) Motor direction selection
  - (4) Maximum and minimum speed limits
  - (5) Acceleration and deceleration times, two settable ranges
  - (6) Critical (skip) frequency avoidance
  - (7) Torque limit
  - (8) Multiple attempt restart function
  - (9) Multiple preset speeds adjustment

- (10) Catch a spinning motor start or normal start selection
- (11) Programmable analog output
- (12) DC brake current magnitude and time
- (13) PID process controller

13. The AFD shall have the following system interfaces:

- a. Inputs - A minimum of 4 programmable digital inputs, 2 analog inputs and ethernet communications interface shall be provided with the following available as a minimum:

- (1) Remote manual/auto
- (2) Remote start/stop
- (3) Remote forward/reverse
- (4) Remote preset speeds
- (5) Remote external trip
- (6) Remote fault reset
- (7) Process control speed reference interface, 4-20mA DC
- (8) Potentiometer and 1-10VDC speed reference interface
- (9) Ethernet programming and operation interface port

- B. Outputs - A minimum of 3 discrete programmable digital outputs and 2 programmable analog outputs shall be provided, with the following available at minimum.

1. Programmable relay outputs with 1 set of Form C contacts for each, selectable with the following available at minimum:

- a. Fault
- b. Run
- c. Ready
- d. Reversed
- e. Jogging
- f. At speed
- g. Torque Limit Supervision
- h. Motor rotation direction opposite of commanded
- i. Over-temperature

2. Programmable analog output signal, selectable with the following available at minimum:

- a. Motor current
- b. Output frequency
- c. Frequency reference
- d. Motor speed
- e. Motor torque
- f. Motor power
- g. Motor voltage
- h. DC-bus voltage



- i. AI1 (Analog Input 1)
  - j. AI2 (Analog Input 2)
  - k. PT100 temperature
3. Monitoring and Displays
- a. The AFD display shall be a LCD type capable of displaying the following thirteen (13) status indicators:
    - (1) Run
    - (2) Forward
    - (3) Reverse
    - (4) Stop
    - (5) Ready
    - (6) Alarm
    - (7) Fault
    - (8) Input/Output (I/O) terminal
    - (9) Keypad
    - (10) Bus/Communication
    - (11) Local (LED)
    - (12) Remote (LED)
    - (13) Fault (LED)
4. The AFD keypad shall be capable of displaying the following monitoring functions at a minimum:
- a. Output frequency
  - b. Frequency reference
  - c. Motor speed
  - d. Motor current
  - e. Motor torque
  - f. Motor power
  - g. Motor voltage
  - h. DC-bus voltage
  - i. Unit temperature
  - j. Calculated motor temperature
  - k. Voltage level of analog input
  - l. Current level of analog input
  - m. Digital inputs status
  - n. Digital and relay outputs status
  - o. Analog Input
5. Protective Functions
- a. The AFD shall include the following protective features at minimum:
    - (1) Over-current
    - (2) Over-voltage
    - (3) Inverter fault
    - (4) Under-voltage

- (5) Input phase loss
  - (6) Output phase loss
  - (7) Under-temperature
  - (8) Over-temperature
  - (9) Motor stalled
  - (10) Motor over-temperature
  - (11) Motor under-load
  - (12) Logic voltage failure
  - (13) Microprocessor failure
- b. The AFD shall provide ground fault protection during power-up, starting, and running. AFD with no ground fault protection during running are not acceptable.
- 6. Diagnostic Features
    - a. Fault History
      - (1) Record and log faults.
      - (2) Indicate the most recent first, and store up to 30 faults.
- 7. Enclosure
    - a. See Section 16900 for enclosure requirements. The drive's human interface module (HIM) shall be panel-mounted such that operator can access the HIM without opening the cabinet/MCC door.
- 8. The AFD manufacturer shall maintain, as part of a national network, engineering service facilities within 150 miles of project to provide start-up service, emergency service calls, repair work, service contracts, maintenance and training of customer personnel.

## 2.03 SPARE PARTS

- A. The main logic board, keypad, power supply board, and I/O board shall be supplied as spares, one for each different part number supplied.
- B. Alternatively, a full spare AFD may be supplied in lieu of the individual components specified above – one for each different part number supplied.

## PART 3 EXECUTION

### 3.01 FACTORY TESTING

- A. The following standard factory tests shall be performed on the equipment provided under this section. All tests shall be in accordance with the latest version of UL and NEMA standards.
  - 1. All printed circuit boards shall be functionally tested via automatic test equipment prior to unit installation.

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2. Each AFD shall be put through a motor load test before inspection and shipping.

B. The manufacturer shall provide three (3) certified copies of factory test reports.

3.02 INSTALLATION

A. Install per manufacturer's instructions.

B. Configure parameters according to actual driven motor nameplate data.

C. Set the minimum and maximum speeds as directed by the motor manufacturer.

3.03 FIELD QUALITY CONTROL

A. Provide the services of a qualified manufacturer's employed Field Service ENGINEER to assist the CONTRACTOR in installation and start-up of the equipment specified under this section. Field Service personnel shall be factory trained with periodic updates and have experience with the same model of AFD on the job site. Sales representatives will not be acceptable to perform this work. The manufacturer's service representative shall provide technical direction and assistance to the CONTRACTOR in general assembly of the equipment, installation as specified in manufacturer's installation instructions, wiring, application dependant adjustments, and verification of proper AFD operation.

B. The CONTRACTOR under the technical direction of the manufacturer's service representative shall perform the following minimum work.

1. Inspection and final adjustments.

2. Operational and functional checks of AFD and spare parts.

3. The CONTRACTOR shall certify that he has read the drive manufacturer's installation instructions and has installed the AFD in accordance with those instructions.

C. The CONTRACTOR shall provide 3 copies of the manufacturer's field start-up report.

3.04 MAINTENANCE / WARRANTY SERVICE

A. Warranty shall be a minimum of 2 years from the date of start-up and include all parts, labor, and travel time.

3.05 TRAINING

A. The CONTRACTOR shall provide a training session for up to 5 OWNER's representatives for one normal workday. Training and instruction time shall be in addition to that required for start-up service.

B. The manufacturer's qualified representative shall conduct the training.

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C. The training program shall consist of the following:

1. Instructions on the proper operation of the equipment.
2. Instructions on the proper maintenance of the equipment.

**END OF SECTION**

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**SECTION 16610**  
**ELECTRIC VALVE ACTUATORS**

**PART 1 GENERAL**

1.01 SCOPE OF WORK

- A. Provide valve actuators as indicated on the Contract Drawings and as specified herein. The actuators shall be factory-installed onto the valves and tested and shall be shipped as a complete assembly.

1.02 RELATED WORK

- A. Division 15 - Valves

1.03 SUBMITTALS

- A. Shop drawing approval is required. Valve and actuator submittal shall be combined into a single submittal. Include complete wiring diagrams and electrical information.
- B. Operation and Maintenance Manuals shall be submitted in accordance with Section 16020.

1.04 QUALITY ASSURANCE

- A. Actuators shall comply with AWWA C540 or its successor standards.

1.05 WARRANTY AND SERVICE

- A. See Section 16020 for requirements.

1.06 TRAINING

- A. Training shall be in accordance with Section 16020.

**PART 2 PRODUCT**

2.01 MANUFACTURERS

- A. Acceptable manufacturers for motorized actuators shall be Limitorque, EIM, Auma, or equal.

2.02 VALVE ACTUATOR CONSTRUCTION

- A. Actuators shall consist of an electric motor, worm gear reduction, electronic torque sensor, mechanically and electrically interlocked reversing motor contactor, electronic control, protection, and monitoring package, manual override handwheel, valve interface bushing, LCD (Liquid Crystal Display), and local control switches. Actuator design life shall be at least one million drive sleeve turns.

- B. Actuator Housing: Actuators shall be NEMA 6P & IP-68 rated to 15 meters for 96 hours.
- C. Actuators shall have limit switches to indicate position status.
- D. The power transmission shall be completely bearing-supported, and consist of a hardened alloy steel worm and bronze alloy worm gear; oil-bath lubricated using synthetic oil designed specifically for extreme pressure worm and worm gear transmission service.
- E. The actuator voltage rating shall be as indicated on the Drawings. If the voltage is not indicated on the Drawings, the actuator shall be 120V single phase. The motor shall have Class F insulation and a thermistor embedded within the motor windings to prevent damage due to overload. The motor shall be easily removed through the use of a plug-in connector and shaft coupling. Valve motors shall be listed for continuous duty operation.
- F. An electronic torque sensor shall be included. The torque limit may be adjusted from 40-100 percent of rating in 1 percent increments. The motor shall be deenergized if the torque limit is exceeded. A boost function shall be included to prevent torque trip during initial valve unseating and during extreme arctic temperature operation (-50°C), and a "Jammed Valve" protection feature, with automatic retry sequence, shall be incorporated to de-energize the motor if no movement occurs.
- G. A Phase Correction circuit shall be included to correct motor rotation faults caused by incorrect site wiring. The phase correction circuit shall also detect the loss of a phase and disable operation to prevent motor damage. The monitor relay shall trip and an error message shall be displayed on the LCD screen when loss of phase occurs and indicate the fault for Remote operation.
- H. A monitor relay shall be included and shall trip when the actuator is not available for remote operation. Both N/O and N/C contacts shall be included, rated 125VAC, 0.5A and 30VDC, 2 amps. The monitor relay shall be configurable for three additional fault indications; lost phase, valve jammed, and motor overtemp. The yellow LED shall blink when the monitor relay is active.
- I. A padlockable LOCAL-STOP-REMOTE switch and an OPEN-CLOSE switch shall be included for local valve actuator control. The control switches shall not penetrate the controls cover and shall be designed to electrically isolate the actuator's internal components from the external environment. The OPEN-CLOSE switch may be configured for maintained or push-to-run (inching) control.
- J. Double sealed terminal compartment & Terminal block - All customer connections shall be located in a terminal chamber that is separately sealed from all other actuator components. Site wiring shall not expose actuator components to the environment.
- K. Coatings - The actuator shall be coated with a polymer powder coat. The coating system shall be suitable for an ASTM B117 salt spray test of 1500 hours. External fasteners shall be stainless steel or high-strength carbon steel that has

been chromate-hexavalent coated, and then top coated with a high-strength, high-endurance polymer. The fasteners shall be suitable for an ASTM B117 salt spray test of 500 hours.

- L. A handwheel and declutch lever shall be provided for manual operation. The handwheel shall not rotate during electric operation nor can a seized motor prevent manual operation. Changing from motor to manual operation is accomplished by engaging the declutch lever. Energizing the motor shall return the actuator to motor operation. The lever to enable the declutch shall be padlockable to permit motor operation only.
- M. The actuator shall include a removable torque or thrust bushing to mate with the valve shaft.
- N. Factory testing - Every actuator shall be factory tested to verify: rated output torque, output speed, handwheel operation, local control, control power supply, valve jammed function, all customer inputs and outputs, motor current, motor thermistor, LCD and LED operation, direction of rotation, microprocessor checks, and position-sensor checks. A report confirming successful completion of testing shall be included with the actuator.
- O. Communications: Fieldbus communications are not required on this project.
- P. Actuators shall include an internal anti-condensation heater.
- Q. The actuator must have a method of adjusting the rate at which the valve opens and closes in order to reduce water hammer. The rate of opening/closing shall be adjustable out to at least 5 minutes.

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION**

- A. Install the valve and actuator per manufacturer's instructions.
- B. Test to ensure proper operation.

**END OF SECTION**

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**SECTION 16900**  
**PUMP CONTROL PANEL**

**PART 1 GENERAL**

1.01 SCOPE OF WORK

- A. The pump control panel shall be as specified herein and as shown on the Contract Drawings.

1.02 RELATED WORK

- A. Drawings and General and Supplementary Conditions of the Contract and Division 1 Specifications sections apply to this Section.
- B. Section 16483-Adjustable Frequency Drives

1.03 SUBMITTALS

- A. Panel and enclosure plan and elevation drawings depicting all components and wiring duct.
- B. Complete wiring diagrams.
- C. Catalog cut-sheets on all components, with options clearly indicated and non-applicable items clearly excluded.
- D. Enclosure heat gain calculation - Shall indicate the maximum temperature inside the enclosure taking into account heat losses and inefficiencies of all panel components. The maximum operating temperature of all major equipment and panel components shall be listed. The heat transfer calculation shall be based on the enclosure manufacturer's published heat transfer data. This manufacturer's data or curve shall be submitted with the calculation for review.
- E. Shop Drawings shall be clearly marked and or highlighted as to which product, type, option, etc. is being submitted. Product literature with one or more styles/configurations for a single product shall have a written description of use for each of the styles/configurations represented on the literature.
- F. O&M manuals shall be submitted in accordance with Section 16020. They shall include all field modifications made such that the wiring diagrams exactly match the field-installed equipment and control panels. They shall also include complete cut-sheets, product data, operation, and maintenance information.

1.04 REFERENCES

- A. NFPA 79 - All control panels shall comply with NFPA 79.
- B. NEC - All control panels shall comply with NEC article 409.
- C. UL508 - All control panels shall be listed to UL508 and shall bear the UL label.



## 1.05 GENERAL REQUIREMENTS

- A. All control panels furnished under this Contract shall be manufactured in accordance with industry standards and as herein specified. The CONTRACTOR shall coordinate all subcontractors and vendors to ensure that the control panels are furnished and meet the requirements specified herein.
- B. Control panels shall be as manufactured by ControlWorks, Inc., Quality Controls, ADGO, or other UL or ETL qualified panel vendor. Panel construction shall comply with OSHA requirements and shall be either UL or ETL listed.
- C. Control panels to be furnished on this project shall be wired to function according to schematics shown on the Contract Drawings. All Control Panels shall be manufactured using "relay logic" as shown on schematics (control circuits) located in the Contract Drawings. In addition to the requirements shown on the Contract Drawings, the panels shall adhere to additional requirements as written herein, and in the utilization equipment specifications.
- D. All components shall be mounted with threaded screws to a subpanel inside the enclosure such that they are replaceable without removing the subpanel. All wiring must be stranded and protected by a circuit breaker. Supplementary circuit breakers may be utilized for circuits that require wiring smaller than 14 gauge. Wiring ducts for cable/conductor management are required to be utilized for routing of conductors and cables. Ducts are also required to be provided for field-wiring at the top and bottom of the panels. All field wires should terminate at a terminal strip upon entering the control panel enclosure.
- E. Elementary control schematics and connection diagrams showing the spatial relationship of components and wiring shall be submitted for review. Also, a bill of materials, drawing of device arrangement on front, and enclosure fabrication drawings shall be submitted. Further, descriptive literature is required on all components. A copy of the as-built wiring diagrams and BOM shall be stored in a pocket inside the control panel enclosure.
- F. Labels shall be installed on all wires, keynoted back to the elementary schematic or the connection diagram, and all terminals identified.
- G. Short circuit ampacity: The minimum short circuit ampacity of the control panel shall be 14kA.
- H. Controlled equipment shall restart automatically after a power outage is restored, unless specifically exempted by ENGINEER due to safety concerns.

## PART 2 PRODUCTS

### 2.01 ENCLOSURES

- A. Control panel enclosure shall be floor-mount type, double-door. Enclosure shall include a NEMA flange-mounted lockable disconnect for three-phase power supply. Enclosures shall be manufactured by Hoffman, or equal.

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- B. Enclosure NEMA rating shall be NEMA 1. Enclosure shall be steel with ANSI 61 gray finish. The enclosure shall be sized to provide 10 percent spare panel space. Seams shall be continuously welded and ground smooth.
- C. Enclosure door shall have a 3-point latch. Screw clamps are not acceptable. The latch handle shall have a padlock hasp.
- D. Operator devices shall be mounted on the exterior of the enclosure. The enclosure shall also have an interior pocket for holding wiring diagrams, and an interior sub-panel for mounting control equipment.

### 2.02 WIRING REQUIREMENTS

- A. Wire and cable shall comply with Section 16020 except Type MTW conductors shall be used inside the control panel for control circuits. Control circuit wiring shall be 18 gauge or larger.
- B. Control wiring shall be terminated using crimp-type ferrule, fork, or ring terminals. Power wiring shall utilize compression lugs.
- C. Wiring shall extend to terminal blocks for connection to external equipment.

### 2.03 TEMPERATURE CONTROL DEVICES

- A. The panel shall be designed such that an air conditioner is not required. Fans and louvers are required to dissipate the heat with a minimum of two fans required each with capacity to dissipate heat from a 30 HP drive. The ventilation shall be designed for a 90° ambient temperature in the room.

### 2.04 MOTOR CONTROLS

- A. Variable Frequency Drives – See Section 16483 for requirements.

### 2.05 POWER SUPPLIES

#### A. DC Power Supplies

1. DC power supplies shall be switched mode and Din-rail mountable.
2. Input power range shall be from 85-264 VAC.
3. Output voltage range shall be as needed with a tolerance of 1 percent. Output voltage shall be adjustable up and down at least 10 percent from the nominal value.
4. The power supply shall include an internal input fuse.
5. Power supply shall have a “DC Ok” signaling LED.
6. Operating temperature rating shall be -25 C to +70 C and up to 95 percent relative humidity.

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7. Output power shall be buffered for full output power ride-through for 20 milliseconds in the event of a power outage.
8. The power supply shall be able to supply 150 percent of its continuous capacity for short periods of time.
9. The power supply shall have internal short circuit protection with automatic recovery.
10. The power supply shall be Phoenix Contact, Sola, Allen-Bradley, or equal.

## 2.06 OVERCURRENT PROTECTION

- A. Main 3-Phase Breakers - Shall be thermal-magnetic, molded-case, Type FA or KA as needed, Square D or equal. See short circuit rating requirements above. Provide cable assembly to connect to flange-mounted disconnect.
- B. Main Single-Phase Breakers - Shall be Din-rail mountable with clear "on," "off," and "tripped" positions, Square D QOU or equal. Where a substantial number of breakers are used, provide a panelboard mounting base.
- C. Supplementary Protectors - Shall be Din-rail mountable UL489 listed. Trip rating shall match load served.

## 2.07 MISCELLANEOUS PANEL COMPONENTS

- A. Terminal Blocks, #10 conductor size and smaller.
  1. Terminal blocks shall be Din-rail mountable IEC style with minimum width of 6.2 mm. They shall be rated for conductors from #10 to #24 AWG. Current rating shall be 30A, minimum. Terminal blocks shall be finger-safe. Double level terminal blocks may be utilized where necessary to conserve space.
  2. Screw clamp terminal blocks are required. Terminal blocks that rely upon spring pressure only for conductor termination are not acceptable.
  3. Provide cross connection bridges, partition plates, end anchors, zack strip labels, and all other components necessary for a complete installation. Each block shall be labeled with a machine-printed label. No more than 2 conductors may be landed under on single terminal block terminal screw.
  4. Utilize the following terminal block colors:
    - a. 120V Power - Black
    - b. 120V Control - Red
    - c. 120V Neutral - White
    - d. Equipment Grounding - Green or Green/Yellow

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- e. DC Positive – Blue
  - f. DC Negative/Grounded – Gray
  - g. Conductor energized from remote source: Yellow
5. Terminal blocks shall be manufactured by Phoenix Contact, Allen-Bradley, or equal.
- B. Fuse blocks (control circuits) – Fuse blocks shall be finger safe and shall have LED indication when the fuse is blown. Fuses may be used only where indicated on the Drawings; otherwise use circuit breakers.
- C. Conductor Labels – Shall be the heat-shrink type, machine printed. Brady, or equal.
- D. Component nameplates – Shall be engraved, rigid, laminated plastic with adhesive back and letter height of 3/16” minimum. Nameplates shall be white with black letters.
- E. Provide a 3-phase surge protection device, 50kA minimum. The SPD shall have status indicators for each phase, and a relay output for alarm condition.
- F. Control transformers shall be machine tool type transformers with epoxy encapsulated coils or resin impregnated coils, high quality silicon steel laminations, copper magnet wire, molded-in terminals, and 55°C rise insulation system.
- G. Pilot Devices
- 1. Selector switches shall be NEMA 4X, 30mm, oil-tight construction, and of the quick-make, quick-break type.
  - 2. Pushbuttons shall be NEMA 4X oil-tight, 30mm.
  - 3. Pilot lights shall be 30mm, oil-tight, push-to-test, NEMA 4X LED type.
  - 4. Elapsed time meters shall be non-resettable.
  - 5. Timing relays shall have an adjustable time range suitable for the application, with the time delay occurring after energization.
- H. Control Relays
- 1. Control relays shall be magnetic, general purpose, "ice cube" type with 3-pole (minimum), double throw contacts rated at 5 amperes (minimum), 120 volts (minimum). Coils shall be rated to operate at the indicated control voltage.

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2. Provide proper bases, mounting track, etc. for a complete installation. All relays shall have a retainer clip, manual operator, and pilot light. Coils connected to solid-state digital outputs shall have transient surge protection.

### **PART 3 EXECUTION**

#### **3.01 LABELING**

- A. Provide labels for all conductors and components.
- B. Legends for starter nameplates shall be taken from the one-line diagram in the Contract Drawings. Wire and miscellaneous component labels shall match the O&M manual wiring diagrams.

#### **3.02 GROUNDING**

- A. Enclosures shall be grounded in accordance with the NEC.
- B. Each analog signal loop shall be grounded at a single point for the loop.

#### **3.03 PROTECTION**

- A. All electrical and electronic components of the Control Panel shall be protected against damage due to electrical transients induced in interconnecting lines from lightning discharges and surges in nearby electrical systems. Provide a surge protection device (SPD).

#### **3.04 INSTALLATION/ERECTION**

- A. Equipment furnished under this section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with the Drawings, Specifications, manufacturer Shop Drawings, and manufacturer installation instructions.

**END OF SECTION**

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## SECTION 17010

### GENERAL INSTRUMENTATION AND SCADA REQUIREMENTS

#### PART 1 GENERAL

##### 1.01 SCOPE OF WORK

- A. The CONTRACTOR shall furnish and install all materials, services, spare parts, commissioning, and other services as shown and specified and as required to install a complete, functional, calibrated, instrumentation system and integrate the booster pump station into the District's existing supervisory control and data acquisition (SCADA) system as indicated on the Drawings and as described herein. This includes integration with the existing water tank level sensors and other booster pump stations as described herein, and integration of the new booster pump station into the OWNER's existing central station software.
- B. Microcomm, Inc. is the required SCADA system supplier to integrate into the OWNER's existing system.
- C. This section also includes installation and connection of all instrumentation equipment, along with SCADA connections to all equipment, included in this Contract but furnished by other contractors or suppliers.
- D. All Instrumentation/SCADA equipment shall be installed, connected, and left in operating condition. The number and size of cables and conductors between all equipment and SCADA monitoring/control devices shall be as required to obtain the operation described in these Specifications, and/or by the Contract Drawings, and/or as shown in manufacturer-furnished, ENGINEER-reviewed Shop Drawings. The CONTRACTOR shall be responsible for supplying all components such as relays, loop isolators, transducers, etc., as necessary, whether indicated or not, at no additional cost to the OWNER in order to leave a complete functional instrumentation system. The CONTRACTOR shall ensure compatibility between all system components and provide any necessary peripheral equipment as required to make the components compatible.
- E. The CONTRACTOR shall be responsible for making any modifications to the existing SCADA radio system or computer/software system, where required to accept the new booster pump station SCADA provisions.
- F. Where wiring diagrams are not shown on the Contract Drawings, they are to be furnished by the SCADA supplier and such diagrams shall be adhered to except as herein modified.
- G. Bidders are required to carefully examine the Contract Drawings and Specifications so that he/she may fully understand what is to be done and to document existing conditions. Any discrepancies, questions, or omissions must be brought to the attention of the ENGINEER at least 10 days prior to the bid opening date.

## 1.02 RELATED WORK

- A. Contractors bidding work under this Contract shall read and understand Division Zero and Division 1 - General Requirements. If any discrepancies are discovered between the General Instrumentation and Supervisory Control and Data Acquisition (SCADA) Requirements and General Requirements, the above-mentioned documents shall overrule this section. The General Instrumentation/SCADA Requirements are intended as a supplement to the above-mentioned documents. The CONTRACTOR shall bid as outlined in the above-mentioned Specifications and shall be governed by any alternates or unit prices called for in the form of proposal.
- B. Division 16 - Electrical

## 1.03 SUBMITTALS

- A. Shop Drawings including descriptive literature and/or installation, operation and maintenance instructions shall be submitted in the amount of copies as listed in the General Conditions, but no less than 8 copies. All Shop Drawings shall be submitted in loose-leaf three-ring cardboard reinforced vinyl binders with extensive indexing. Each sheet in the binder shall have hole reinforcements. Should there be any exceptions to the Specifications, the Supplier shall completely describe such in front of the submittal via a point-by-point letter referencing the specification paragraph number. The submittal shall be arranged as follows:
  - 1. Front Cover – Project description and pertinent information
  - 2. First Page – Review stamp page.
  - 3. Next – Index
  - 4. Next – Overall description of the system
  - 5. Next – Complete manufacturer’s information on all equipment and software
  - 6. Next – Complete manufacturer drawings of RTU panels including a detailed point by point wiring diagram of each. Drawings shall be either 8.5”x11” or 11”x17”. The first page of each product literature shall have the tag designation clearly indicated. Provide for each loop, the selected size of the equipment being submitted, NEMA classification, sizing calculations, and calibration data for all metering devices. Selected options shall be clearly indicated and excluded items shall be clearly marked out.
- B. Next – Complete list of spare parts, training program outline, Warranty description and information.

- C. Shop Drawings shall be submitted on all equipment specified in this Division unless a specific written exemption is obtained from the ENGINEER. The CONTRACTOR shall not procure or install any materials or equipment without approved shop drawings.
- D. The ENGINEER reserves the right to make modifications to instrumentation and SCADA equipment after Shop Drawing review, if the Instrumentation/SCADA Shop Drawings are submitted prematurely (prematurely meaning submitted before all process equipment has been reviewed and accepted). Cost of modifications shall be the CONTRACTOR's responsibility.
- E. Software Submittals: Provide a submittal for the proposed sequence of operation and screen modifications. List and briefly describe all operator interface functions provided at the PC, including: alarm annunciation and acknowledgment, status displays, control capabilities, report generation, event logging, charting and trending, etc.
- F. Operation and Maintenance: Manuals shall be accepted shop drawings with the following modifications:
  - 1. Include complete addresses of all equipment manufacturing representatives and phone numbers of each.
  - 2. Incorporate complete record drawings indicating final installation of equipment and wiring.
  - 3. Include complete manufacturer's installation, operations, and maintenance manual for each piece of equipment and software supplied.
  - 4. Complete parts lists with stock numbers.
  - 5. Include a configuration record for each piece of equipment, including all parameter settings and set points.
  - 6. Include NIST or other calibration certificates for Instrumentation.
  - 7. The manuals shall include a USB thumb drive with the following saved information:
    - a. Backup of all programs developed in the course of the project.
    - b. Backup of all reports, databases, set point listings, and all other electronic information utilized in the project.
    - c. Electronic copy of all installation, operations, and maintenance manuals which are available from the manufacturer in electronic format.



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#### 1.04 SYMBOLS AND ABBREVIATIONS

- A. The symbols and abbreviations generally follow standard instrumentation and electrical practice, however, exceptions to this shall be as shown on the Contract Drawings.

#### 1.05 COORDINATION WITH OTHER TRADES

- A. The CONTRACTOR shall coordinate the instrumentation/SCADA work with that of other trades to ensure proper installation and functionality of all equipment and process control/monitoring programs. Installation of equipment may be performed by other trades unless specified otherwise.

#### 1.06 CODES

- A. The minimum standard for all work shall be the latest revision of the Kentucky Building Code (KBC), and the National Electrical Code (NEC). Whenever and wherever state and/or local laws or ordinances and/or regulations and/or the ENGINEER's design require a higher standard than these codes, then these laws and/or regulations and/or the design shall be followed.

- B. Following is a list of other applicable Standards or Codes:

1.	Kentucky Building Code	KBC
2.	National Electrical Code	NEC
3.	International Electrotechnical Commission	IEC
4.	Underwriters Laboratories, Inc.	UL
5.	Factory Mutual System	FM
6.	National Fire Protection Association	NFPA
7.	National Electrical Manufacturers Association	NEMA
8.	Occupational Safety and Health Administration	OSHA
9.	National Institute of Standards and Technology	NIST
10.	Instrument Society of America	ISA
11.	Institute of Electrical and Electronic Engineers, Inc.	IEEE
12.	American National Standards Institute, Inc.	ANSI
13.	Federal Communications Commission	FCC
14.	American Society for Testing and Materials	ASTM

#### 1.07 STORAGE

- A. All work, equipment, and materials shall be protected against dirt, water, or other injury during the period of construction.
- B. Sensitive instrumentation/SCADA equipment shall be protected against injury or corrosion due to atmospheric conditions or physical damage by other means. Protection is interpreted to mean that equipment shall be stored under roof, in a structure properly heated in cold weather and ventilated in hot weather. Provision shall be made to control the humidity in the storage area to 50 percent relative. The stored equipment shall be inspected periodically, and if it is found that the protection is inadequate, further protective measures shall be

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employed. Instrumentation/SCADA equipment shall not be installed until the structure is under roof with doors and windows installed.

#### 1.08 ERRORS, CORRECTIONS, AND/OR OMISSIONS

- A. Should a piece of process equipment be supplied of a different type or manufacture than shown or specified in the Contract documents, the CONTRACTOR shall be responsible for installing, programming, and commissioning the proper instrumentation/SCADA equipment for proper operation, control, and monitoring of that process equipment at no extra cost to the OWNER.
- B. It is the intent of these Specifications to provide for an instrumentation/SCADA system installation complete in every respect, to operate in the manner and under conditions as shown in these Specifications and on the Contract Drawings. The CONTRACTOR shall notify the ENGINEER, in writing, of any omission or error at least 10 days prior to opening of bids. In the event of the CONTRACTOR's failure to give such notice, he/she may be required to correct work and/or furnish items omitted without additional cost. The submission of a bid indicates that the CONTRACTOR believes the design to be sound and can provide a fully functional and complete instrumentation and SCADA system. Further requirements on this subject may be found in the General Requirements, Division 1.

#### 1.09 GUARANTEES AND WARRANTIES

- A. The CONTRACTOR shall guarantee all work including equipment, materials, and workmanship. This guarantee shall be against all defects of the electrical system or improper equipment operation. It shall last for the period of time specified in the General Conditions of the Contract, but not less than one year from the date of system acceptance (i.e. - when the ENGINEER accepts that the punchlist is complete.)
- B. Equipment manufacturers shall provide a minimum of one-year of technical support and software updates dating from final acceptance. The costs of this shall be included in the bid Certification of this shall be provided to the OWNER with the O&M manuals.

#### 1.10 TESTING

- A. After the instrumentation/SCADA system is complete, and at such time as the ENGINEER may direct, the CONTRACTOR shall conduct an operating & performance test for acceptance. The system shall be demonstrated to operate in accordance with the requirements of these Specifications and the Contract Drawings. The test shall be performed in the presence of the ENGINEER or his authorized representative. The CONTRACTOR shall furnish all instruments, hardware, software, and personnel required for the tests.

### 1.11 UTILITY AND REGULATORY COORDINATION

- A. The CONTRACTOR is responsible for coordinating all activities required by the necessary utilities and regulatory agencies. This includes obtaining telemetry licensing by the FCC.
- B. Any special provisions required by the utilities or regulatory agencies shall be as outlined on the Contract Drawings or as advised by the utility at the time of construction, and work required by these special provisions shall be executed with no extra cost to the OWNER.
- C. Fees charged by the utilities shall be included in the CONTRACTOR's lump sum bid.

### 1.12 TRAINING

- A. All manufacturers supplying equipment for this division shall provide the OWNER's operations staff with training in the operation and maintenance on the equipment being furnished. The training shall be conducted at the project site by a qualified representative of the manufacturer.
- B. The cost of this training shall be included in the bid price.
- C. The required training shall consist of both classroom and hands-on situation. Classroom training shall include instruction on how the equipment works, its relationship to all accessories and other related units, detailed review of shop drawings, detailed presentation of written O & M instructions, troubleshooting and record-keeping recommendations. Hands-on-training shall include a review of the manufacturer's O & M instructions, check out of each operator as to identifying key elements of the equipment, tear down as appropriate, calibration, adjustment, and operating manipulations of all controls.
- D. The training shall be scheduled through the CONTRACTOR with the OWNER. The timing of the training shall closely coincide with startup of the equipment, but no training shall be conducted until the equipment is operational. The training program shall not begin until operations and maintenance manuals have been reviewed and sent to the OWNER. Training shall use the accepted O & M manuals. Training shall not begin until the CONTRACTOR's instrumentation/SCADA punchlist is completed and all loops have been calibrated and are fully operational.
- E. The training program length shall be as described in the individual Division 17 sections. A training report and sign-in sheet is required to be submitted for documentation.

### 1.13 RECORD DRAWINGS

- A. The CONTRACTOR shall maintain 1 set of the Contract Drawings on the job in good condition for examination at all times. The CONTRACTOR's qualified representative shall enter upon these drawings, from day to day, the actual record of construction and/or alteration progress. Entries and notes shall be

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made in a neat and legible manner and these drawings delivered to the ENGINEER after completion of the construction, for use in preparation of Record Drawings.

#### 1.14 RECEIPTS

- A. Some sections of the Specifications call for equipment, materials, accessories, etc. to be furnished and “turned over to the OWNER” or like requirements. The CONTRACTOR shall obtain a receipt for each item turned over, signed by the OWNER or his representative. A copy of this receipt shall be transmitted to the ENGINEER.
- B. When a question arises concerning whether items have been turned over to the OWNER, and there is no signed receipt, it may be assumed that the items were not furnished.

### PART 2 PRODUCTS

#### 2.01 MATERIALS

- A. All materials used shall be new unless noted otherwise. All materials shall be UL listed for the application, where a listing exists. Additional requirements are found in Division 1. All equipment shall meet applicable FCC requirements and restrictions.
- B. The material and equipment described herein has been specified according to a particular trade name or make to set quality standards. However, each CONTRACTOR has the right to substitute other material and equipment in lieu of that specified, other than that specifically mentioned for standardization, providing such material and equipment meets all of the requirements of that specified and is accepted, in writing by the ENGINEER.
- C. The reuse of salvaged equipment will not be permitted.

### PART 3 EXECUTION

#### 3.01 GROUNDING AND BONDING

- A. All metallic conduit, cabinets, supporting framework and instrumentation/SCADA equipment shall be grounded in accordance with the latest issue of the National Electrical Code.

#### 3.02 ANCHORING/MOUNTING

- A. Instrumentation/SCADA equipment other than computer equipment located in the office/control room shall be rigidly supported. Anchors used shall be metallic expansion type, or if appropriate to prevent spalling concrete, epoxy set type. Plastic or explosive type anchors are prohibited.

**END OF SECTION**

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## SECTION 17100

### PROCESS INSTRUMENTATION

#### PART 1 GENERAL

##### 1.01 SCOPE OF WORK

- A. The Contractor shall provide instrumentation as indicated on the Contract drawings and as specified herein. Provide all materials, labor, spare parts, start-up services, as shown and specified and as required to install a complete, functional, calibrated instrumentation system.
- B. Provide instrumentation training services.
- C. Additional requirements are in Section 17010.

##### 1.02 RELATED WORK

- A. Installation of all electrical equipment, conductors, and related items shall be in accordance with all applicable sections of Division 16 of these specifications.
- B. General Requirements are included in Division 1.
- C. Section 17010 - General Instrumentation and SCADA requirements.

##### 1.03 SUBMITTALS

- A. Shop drawing approval is required before the Contractor purchases or installs any equipment. Submit in accordance with Section 17010.
- B. Operation and Maintenance Manuals shall be submitted in accordance with Section 17010.

##### 1.04 QUALITY ASSURANCE

- A. See Section 17010 for requirements.
- B. Manufacturer NIST or equal calibration certificate is required for all instruments with an analog current signal output.

##### 1.05 WARRANTY AND SERVICE

- A. See Section 17010 for requirements.

##### 1.06 SPARE PARTS

- A. Provide a calibration/verification kit for the proposed magmeter.
- B. Provide 1 spare pressure switch for each model provided.
- C. Provide 1 spare pressure transmitter for each model provided.

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## 1.07 TRAINING

- A. Training shall be in accordance with Section 17010.
- B. The instrumentation training program shall be a minimum of one-half day on-site.

## 1.08 DELIVERY AND STORAGE

- A. See Section 17010 for requirements.

## PART 2 PRODUCTS

### 2.01 GENERAL

- A. Acceptable manufacturers/suppliers for the instrumentation equipment shall be Rosemount, Foxboro, Endress-Hausser, ABB, or equal. Manufacturers of small peripheral equipment are listed with each piece of equipment.
- B. All equipment shall be UL listed where a listing exists.
- C. All electronic instrumentation equipment shall be of the solid-state type and shall utilize linear transmission signals of 4 to 20 mA dc. No zero-based signals will be allowed for remote transmission.
- D. All instrumentation supplied shall be of the manufacturer's latest design and be compatible for the industry it is being applied.
- E. All scales and readouts shall be direct reading in process units. Conversions are not acceptable.
- F. All transmitters shall be provided with indicators, either integral or remote mounted, but must be within site of the transmitter unless specifically indicated otherwise on the Contract drawings.
- G. All equipment must be able to reset after a power outage without having to be manually reset.

### 2.02 INSTRUMENTATION EQUIPMENT

#### A. Pressure Switches

- 1. Pressure switches shall be industrial type NEMA 4X epoxy-coated aluminum or stainless steel body with UL listing.
- 2. The pressure switch shall have a single pole double throw relay output. The setpoint shall have an adjustable range suitable for operation in the conditions shown on the Drawings and in the equipment specifications.
- 3. The switch shall be rated for operation in -25°F to 130°F ambient. Setpoint shall drift no more than 1.5% for a 50°F ambient temperature change.

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4. Setpoint repeatability shall be within 1.5% of adjustable range, maximum.
5. Electrical connection shall be either a ½" or ¾" threaded connection.
6. Pressure connection shall be NPT.
7. Provide isolation valve and bleed valve suitable for removing the pressure switch from its connection under pressure.
8. The pressure switch shall be Allen-Bradley, or equal.

B. Pressure Cell and Transmitter

1. The transmitter shall be a Wika Model A-10 or equal designed for measuring gauge pressure in PSI.
2. The transmitter shall loop-powered
3. The transmitter shall transmit a 4-20 mA signal when supplied with voltage in a range from 11.5 to 42 VDC
4. The transmitter shall be rated NEMA 4X and constructed of stainless steel.
5. The transmitter shall either be equipped with a stainless two-valve manifold, or provide separate valves to accomplish the isolation and bleed functions.
6. Accuracy shall be +/-0.5 percent of calibrated span, minimum. Repeatability shall be better than 0.5 percent of calibrated span.
7. Mounting bracket, if used, shall be stainless steel.
8. Provide a snubber appropriately sized for the application.
9. Manufacturer warranty shall be 2 years, minimum.

C. Electromagnetic Flowmeter and Transmitter

1. The electromagnetic flow meter shall consist of a flow sensor based on Faraday's Law of Electromagnetic Induction and microprocessor-based signal converter & transmitter.
2. The sensor flow tube liner material shall be EPDM rubber for drinking water applications. Measurement and grounding electrodes shall be 316 stainless steel. Flow tube shall have corrosion resistant epoxy coating. Flow meter shall be approved by NSF for drinking water.
3. Operating temp: Operating Temp: -5 to +120° F minimum acceptable band
4. Display: Background illumination with alphanumeric 3-line, 20-character display to indicate flow rate, totalized values, settings, and faults

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5. Power supply: 115/230 VAC as indicated on Contract Drawings.
6. Outputs: 4-20 mA into 800 ohms max. One relay rated at 42 VAC/2 A, 24 DC/1A. Provide Digital pulse for external display of flow rate or totalizer.
7. Flow Range: 1.5 fps to 33 fps for accuracies stated below.
8. Accuracy: 0.5% of actual flow.
9. Provide Bi-directional flow capabilities
10. Totalizer: Two eight-digit counters for forward, net, or reverse flow.
11. The transmitter shall be mounted integrally to the flow tube as indicated on the Drawings.
12. Insertion type flow meters will not be accepted.

D. Instrument Valves (1/4" through 3/4")

1. Shutoff valves shall be provided on each pressure line to an instrument and accessory item, and shall be bronze 1/4 turn ball valves with Teflon seats as manufactured by Whitey Co., Gould, Hoke, Apollo, or equal. Valves shall have a corrosion resistant handle.

E. Tubing

1. Tubing for pressure lines to transmitters shall be hard drawn copper or 316 stainless steel. Bulkhead fittings, bushings, etc., shall be those especially designed for the tubing and used at all terminations. Tubing shall be Type "L" copper bent with bending tools, so as to have a minimum number of joints. Solder joint fittings are not allowed; compression type shall be utilized, Swagelok or equal.
2. All runs of tubing shall be straight, parallel to walls with a slope to a drip leg at each connection to a transmitter, where the transmitter is below the primary element. Horizontal liquid-filled lines shall slope at least 1 inch per foot downward toward the measuring element to ensure that air or gas bubbles return to the main flow line or tank.

2.03 2.03 MISCELLANEOUS ACCESSORIES

- A. A. Flange Adapters - Dresser Style 128 or equal for steel, ductile iron, or cast iron piping. Contractor must ensure the proper type of flange is procured. Provide restraints where specified in Division 2.



## **PART 3 EXECUTION**

### **3.01 EQUIPMENT INSTALLATION**

#### **A. General**

1. All piping to and from field instrumentation shall be provided with necessary unions, tees, adapters, and shut-off valves.
2. Install all equipment in accordance with the manufacturer's installation and maintenance information.
3. Provide and install all necessary mounting equipment, brackets, required for mounting of equipment.
4. Instrument cables shall be pulled without undo stress that may aggravate the number of twists per foot. Shields shall be continuous and shall be only grounded at one end.
5. 5. Place duct seal around the wires in each conduit entering every instrument enclosure for the project.
6. All instruments and equipment shall be left free from shipping burrs, paint overspray, grease, etc. All scratches shall be touched up with manufacturer's matching paint.
7. Install on each instrument, transmitter, recorder, indicator, etc., a plastic engraved white with black letters nameplate secured to the panel. Nameplates shall be permanently secured with stainless steel screws if it does not interfere with the NEMA rating of the box. Instruments shall be supplied with a stainless or aluminum engraved tag with black letters if no flat spot exists for a nameplate. Chain shall be stainless steel.
8. Locate instruments as shown on the electrical drawings and primary elements as shown on the electrical or plant process drawings.
9. Remove all shipping tags, lifting rings, from enclosures. Plug all non-used holes in enclosures.
10. The placing and location of system components, their connections to the process equipment panels, cabinets and devices, shall be coordinated with the Engineer's acceptance.
11. Magmeters shall be installed with flange adapters to facilitate installation and removal.

### **3.02 STARTUP SERVICES**

- A. After equipment and materials have been shipped to the job site, the Contractor shall furnish the services of a factory-trained service technician or engineer to assist and advise the Contractor during installation and to provide calibration/adjustment at initial startup.

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- B. Following installation, checkout, and final adjustment of all panels, instruments, meters, monitoring, and control devices, the Contractor shall schedule a performance test in the presence of the Engineer on all equipment. The Contractor shall furnish the services of servicemen, all special tools, calibration equipment, and labor to perform the tests.
- C. Meters shall be tested at 0 percent, 25 percent, 50 percent, 75 percent, and 100 percent of scale, if possible. All status and alarm switches as well as all monitoring and control functions shall also be checked. Testing shall be done from the signal source to the final element or device including all field wiring.
- D. If, during running of the tests, one or more points appear to be out by more than the system accuracy statement, the Contractor shall make such adjustments or alterations as are necessary to bring equipment up to specification performance. Following such adjustment, the tests shall be repeated for all specified points to ensure compliance.

**END OF SECTION**

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**SECTION 17200**  
**SCADA RTU CABINET**

**PART 1 GENERAL**

1.01 SCOPE OF WORK

- A. The CONTRACTOR shall furnish and install a SCADA remote telemetry unit (RTU) cabinet, as shown and specified and as required to install a complete and functional supervisory control and data acquisition (SCADA) system as indicated on the Drawings and as described herein. See the required list of I/O points on the Drawings.
- B. Provide surge protection as indicated and as specified herein.
- C. Additional requirements are specified in Section 17010.

1.02 RELATED WORK

- A. Installation of all electrical equipment, conductors, and related items shall be in accordance with all applicable sections of Division 16 of these specifications.
- B. General Requirements are included in Division 1.
- C. Section 17010 - General Instrumentation and SCADA requirements.
- D. Section 17400-SCADA Software
- E. Section 17500-Radio Telemetry

1.03 SUBMITTALS

- A. Shop drawing approval is required before the CONTRACTOR purchases or installs any equipment. Submit in accordance with Section 17010.
- B. Operation and Maintenance Manuals shall be submitted in accordance with Section 17010.

1.04 QUALITY ASSURANCE

- A. See Section 17010 for requirements.

1.05 WARRANTY AND SERVICE

- A. See Section 17010 for requirements.

1.06 SPARE PARTS

- A. Five fuses of each size/type in the system.
- B. Five Lamps of each type used in the system.

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C. Furnish one spare surge arrestor for each type installed.

#### 1.07 TRAINING

A. Not required for this section.

#### 1.08 TERMINOLOGY

A. RTU-Remote Telemetry Unit: A panel with a programmable controller, inputs, outputs, cellular modem, and other miscellaneous accessories used to communicate with the master telemetry unit or other remote telemetry units and transmit pump station status.

### **PART 2 PRODUCTS**

#### 2.01 GENERAL

- A. Microcomm, Inc. is the acceptable manufacturer.
- B. All equipment must be able to reset after a power outage without having to be manually reset.

#### 2.02 SCADA RTU CABINET

- A. General: The RTU cabinet shall be provided with the following features:
  - 1. Enclosure: Sized for 15 percent spare panel space with a single 3-point roller latch. Screw clamps are unacceptable. NEMA rating shall be NEMA 12 minimum. Components installed in the exterior of the enclosure shall maintain the NEMA rating of the enclosure. All enclosures shall have a padlock hasp.
  - 2. Rotary IEC style lockable main disconnect with main circuit breaker and transient voltage surge suppression with alarm contact.
  - 3. Provide either an uninterruptible power supply (UPS) with alarm contact, or a battery. A power relay shall be provided and wired such that, if the UPS fails the relay shall drop out and the panel shall be powered from utility power. If a battery is used in lieu of a UPS, a low voltage signal is required to generate an alarm when the battery is failing.
  - 4. Provide 24VDC power supply, miscellaneous breakers, fuses, terminal blocks, wiring duct, and other panel components
  - 5. Provide prewired with all field wiring landed on terminal blocks for field installation
  - 6. Programmable controller, with all required inputs and outputs and communications modules as required to meet the requirements of the Contract drawings and these Specifications. 20 percent spare I-O of each type shall be included and wired to terminal blocks. Chassis shall be expandable for future I/O modules

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7. Provide radio modem, antenna, antenna cable, and surge protector compliant with Section 17500.

## 2.03 SURGE SUPPRESSION

### A. Cabinet Power Supply Surge Protective Device (SPD)

1. The power supply SPD shall be a Din-Rail-Mounted device and shall be installed to protect the equipment in the cabinet from harmful surges and voltage spikes.
2. The SPD shall have nominal ratings of 120VAC and 26A minimum. Temperature range shall be -40°C to 80°C.
3. The device shall have a surge handling capacity of 10kA (8/20microsecond) minimum. It shall have hybrid technology for “fine” voltage clamping and “coarse” surge current handling. The clamping voltage shall be less than or equal to 500V. The response time shall be less than or equal to 25 nanoseconds.
4. The device shall be a Phoenix Contact “Mains-Plugtrab PT Series,” or equal.

## 2.04 POWER SUPPLIES

### A. DC Power Supplies

1. DC power supplies shall be switched mode and Din-rail mountable.
2. Input power range shall be from 85-264 VAC.
3. Output voltage range shall be as needed with a tolerance of 1 percent. Output voltage shall be adjustable up and down at least 10 percent from the nominal value.
4. The power supply shall include an internal input fuse.
5. Power supply shall have a “DC Ok” signaling LED.
6. Operating temperature rating shall be -25 C to +70 C and up to 95 percent relative humidity.
7. Output power shall be buffered for full output power ridethrough for 20 milliseconds in the event of a power outage.
8. The power supply shall be able to supply 150 percent of its continuous capacity for short periods of time.
9. The power supply shall have internal short circuit protection with automatic recovery.
10. The power supply shall be Phoenix Contact, Sola, Allen-Bradley, or equal.

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## 2.05 OVERCURRENT PROTECTION

- A. Main Single-Phase Breakers–Shall be Din-rail mountable with clear “on,” “off,” and “tripped” positions, Square D QOU or equal. Where a substantial number of breakers are used, provide a panelboard mounting base.
- B. Supplementary Protectors–Shall be Din-rail mountable UL489 listed. Trip rating shall match load served.

## 2.06 MISCELLANEOUS PANEL COMPONENTS

- A. Terminal Blocks, #10 conductor size and smaller.
  - 1. Terminal blocks shall be Din-rail mountable IEC style with minimum width of 6.2 mm. They shall be rated for conductors from #10 to #24 AWG. Current rating shall be 30A, minimum. Terminal blocks shall be finger-safe. Double level terminal blocks may be utilized where necessary to conserve space.
  - 2. Screw clamp terminal blocks are required. Terminal blocks that rely upon spring pressure only for conductor termination are not acceptable.
  - 3. Provide cross connection bridges, partition plates, end anchors, zack strip labels, and all other components necessary for a complete installation. Each block shall be labeled with a machine-printed label. No more than 2 conductors may be landed under on single terminal block terminal screw.
  - 4. Utilize the following terminal block colors:
    - a. 120V Power–Black
    - b. 120V Control–Red
    - c. 120V Neutral–White
    - d. Equipment Grounding–Green or Green/Yellow
    - e. DC Positive–Blue
    - f. DC Negative/Grounded–Gray
    - g. Conductor energized from remote source: Yellow
  - 5. Terminal blocks shall be manufactured by Phoenix Contact, Allen-Bradley, or equal.
- B. Fuse blocks (control circuits)–Fuse blocks shall be finger safe and shall have LED indication when the fuse is blown. Fuses may be used only where indicated on the Drawings; otherwise use circuit breakers.
- C. Conductor Labels–Shall be the heat-shrink type, machine printed. Brady, or equal.
- D. Component nameplates–Shall be engraved, rigid, laminated plastic with adhesive back and letter height of 3/16” minimum. Nameplates shall be white with black letters.

## **PART 3 EXECUTION**

### **3.01 EQUIPMENT INSTALLATION**

- A. Install all equipment in accordance with the manufacturer's installation and maintenance information.
- B. Provide and install all necessary mounting equipment, brackets, required for mounting of equipment.
- C. Place duct seal around the wires in each conduit entering the cabinet.
- D. All equipment shall be left free from shipping burrs, paint overspray, grease, etc. All scratches shall be touched up with manufacturer's matching paint.
- E. Provide SPD on the power supply circuit to the SCADA cabinet.
- F. Remove all shipping tags, lifting rings, etc. from enclosures. Plug all non-used holes in enclosures.
- G. The placing and location of system components, their connections to the process equipment panels, cabinets and devices, shall be coordinated with the ENGINEER's acceptance.
- H. Provide labels for all conductors and components.

### **3.02 STARTUP SERVICES**

- A. Following installation, checkout, and final adjustment of all hardware, the CONTRACTOR shall schedule a performance test in the presence of the ENGINEER on all equipment. This test shall be concurrent with the SCADA software test.

### **3.03 CONTROL SEQUENCE REQUIREMENTS**

#### **A. Radio Transmission Requirements**

- 1. Siloam tank level must be transmitted from the existing RTU to the new McUpton Booster station RTU.
- 2. Cerulean Pump Station pump running status (for each pump) must be transmitted from the existing RTU to the new McUpton Booster station RTU.

#### **B. Siloam Control Valve Sequence**

- 1. Provide manual and automatic modes of operation with a software switch. Under manual mode, operator shall be able to open or close the position of the valve remotely via the SCADA software.

2. Under the automatic mode of operation, the valve shall be controlled by the Siloam tank level. Provide adjustable "Open" and "Close" level setpoints. Provide radio transmission of Siloam tank level from that existing RTU to the new McUpton booster station RTU.

### C. Pump Control Sequence

1. The booster pump system will be providing water to 3 different pressure zones in the distribution system. Demand in the 3 different pressure zones consist of the Siloam storage tank, the Cerulean booster pump station, and a distribution system in the nearby vicinity of the new McUpton booster pump station. Any one or all 3 of the pressure zones may demand water from the new booster pump system at a time.
2. Provide manual and automatic modes of control for each pump with a software switch. In manual mode, each pump shall be able to be started by the operator remotely via SCADA screen switch. In automatic mode, the pumps shall operate as described below. A maximum of 2 large pumps shall be allowed to run simultaneously.
3. Provide adjustable minimum, target, and maximum pressure setpoints for the McUpton booster station discharge pressure. These setpoints shall be adjustable remotely from the SCADA software.
4. The small pump (Pump #1) shall operate continuously in automatic mode unless one of the large pumps turns on. The small pump shall not be run simultaneous with a large pump. The small pump shall NOT be turned off due to discharge pressure or tank levels. If suction pressure falls low, a hardwired pressure switch is required to shut off all pumps. The speed of the small pump shall be controlled by a PID loop using the new McUpton booster pump system discharge pressure as the feedback. Provide an adjustable target pressure setpoint and provide PID loop tuning to ensure stable, accurate control with fast response time.
5. Provide an alternation sequence such that the large pumps #2-#4 can either be alternated or locked into position such that a specific pump is the lead pump. The alternation controls shall be adjustable from the SCADA software.
6. If the small pump is unable to maintain the target discharge pressure setpoint (at max speed) and the pressure falls to the minimum setpoint, then a large pump shall be started and the small pump shall be turned off. The large pump's speed shall be modulated to maintain the target discharge pressure and if it is unable to slow down enough (at minimum speed) and the pressure rises to the maximum setpoint then the large pump shall be turned off and the small pump shall be started.
7. If a large pump is running and is unable to maintain the target discharge pressure and the pressure falls to the minimum setpoint (at max pump speed) then the lag large pump shall be started. Pumps in parallel shall be operated at the same speed and modulated to maintain the target



discharge pressure. Only 2 large pumps shall be allowed to run simultaneously. If 2 large pumps are running and the pressure rises to the maximum setpoint (at minimum pump speed) then the lag pump shall be turned off.

8. If a Cerulean pump turns on at the existing Cerulean pump station, then a large pump shall be turned on. This pump shall remain on until the Cerulean pump is turned off. The pump speed shall be modulated via PID loop to maintain the target discharge pressure.
9. If the Siloam control valve is opened, then a large pump shall be turned on. This pump shall remain on until the Siloam control valve is closed and the pump speed shall be modulated via PID loop to maintain the target discharge pressure.
10. If both a Cerulean pump is on and the Siloam control valve is opened, then 2 McUpton large pumps shall run simultaneous.
11. A pressure override shall be included such that, if the McUpton discharge pressure transmitter reaches an adjustable hi-hi level setpoint for an adjustable time period, then the large pumps shall be shut off as this would indicate that flow is blocked for some reason.

**END OF SECTION**

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**SECTION 17400**  
**SCADA SOFTWARE**

**PART 1 GENERAL**

1.01 SCOPE OF WORK

- A. The CONTRACTOR shall provide SCADA software, software development, testing, commissioning, debugging, and maintenance services as specified herein. Provide all materials, labor, software, and services as required to implement a complete and functional system. The new pump station shall be integrated into the District's existing SCADA software.
- B. Integrate each I/O point indicated on the Contract Drawings into the SCADA software.
- C. Provide software operation and development training services.

1.02 RELATED WORK

- A. General requirements are located in Division 1.
- B. Section 17010 - General Instrumentation/SCADA Requirements
- C. Section 17200 - SCADA RTU Cabinet

1.03 SUBMITTALS

- A. Software submittals shall be submitted in accordance with Section 17010.
- B. Operation and Maintenance manuals shall be submitted in accordance with Section 17010.

1.04 QUALITY ASSURANCE

- A. See Section 17010 for requirements.

1.05 WARRANTY & SERVICE

- A. See Section 17010 for requirements.

1.06 TRAINING

- A. Software training shall be conducted concurrent with the other Division 17 training required by Section 17010. Ensure OWNER's personnel is familiar with all new software features and can operate the system.

**PART 2 PRODUCTS**

2.01 MANUFACTURERS

- A. The approved software manufacturer is Microcomm.

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## 2.02 SOFTWARE

- A. The booster station shall be integrated into the OWNER's existing SCADA software application. Any software updates, license updates, computer software/hardware updates, etc. must be provided as necessary to integrate the new booster pump station as specified. Costs for this shall be included in the CONTRACTOR's lump sum bid.

## PART 3 EXECUTION

### 3.01 SOFTWARE SERVICES

- A. General: Software services shall include program development, testing, documentation, and work necessary to implement a complete and fully operating system as shown on Drawings and as specified. Employ a "watchdog" timer for the booster station RTU and poll that RTU if no message has been received in a reasonable amount of time. Provide a communication failure alarm for the RTU.
- B. SCADA Interface Screens: Provide graphic representation of pump station operation. Provide integration into the following screens as a minimum:
  - 1. Main Menu/Map View
  - 2. Pump Station Detail View
  - 3. Active Alarm Detail
  - 4. Historical Alarm Detail
  - 5. Trending
  - 6. Elapsed Run Time Reports
  - 7. Flow Total Reports
- C. SCADA software required application features:
  - 1. Video displays shall be fully windowed and shall use a mouse for control. Use colors, function keys, and navigational controls consistently.
  - 2. Alarm Management: For each process or system event classed as an alarm provide facilities for displaying and logging in database, acknowledgment, and purging of stale messages. Alarm events are derived from discrete inputs, analog trip values, logic combinations and computations as needed. Log and display both alarm events and returns to normal. Provide date/time stamps for events, descriptive message, and event type code. Use color combinations to distinguish following alarm states: Alarm-Unacknowledged, Alarm-Acknowledged, Normal-Unacknowledged, and Normal-Acknowledged.
    - a. For each piece of equipment that is called to run by a controller and has a status feedback signal, provide a "Failure to Start" alarm that triggers 5 seconds after the equipment is called to run if it is not confirmed to be running by the feedback signal.

- b. For each 4-20mA instrument, provide a “Transmitter Failure” alarm that triggers if the signal falls below 3.8 mA or exceeds 20.2 mA. This alarm shall not be triggered if a power outage occurs.
3. Graphic Displays
  - a. Provide process-oriented displays showing current process status and accepting operator input for setpoint and status changes.
  - b. For each display, show process elements such as pumps, pipe lines, etc., with their current operational status. Emphasis shall be placed on depicting the pump stations in a “P&ID” format that allows easy conceptualization of process flow rather than depicting equipment in actual physical location or scale.
  - c. Not running state: graphic shall be natural color with no motion.
  - d. Running state: Graphic shall be green color and shall rotate or show other type of motion as appropriate. Both color and motion shall be depicted.
  - e. Red color shall be reserved for alarm graphics.
  - f. Indicators shall use an appropriate number of significant digits and dead band to produce steady values.
4. Trending: Provide on-screen trending displays that are user definable that operate from either previously collected historical trend groups (named file) or from a group of real-time variables. Provide facilities for user selection of colors, time (horizontal), and measurement (vertical) scales. Accommodate real-time sampling intervals as short as 1 second. Real-time trends shall show alarm setpoints. Historical trend displays shall have time-scale panning controls. All trends must have an adjustable cursor that indicates both Y and X axis values at the user-selected location.
  - a. For each analog input on the Contract Drawings, provide a pre-configured trend that shows both real-time and historical values. Certain tags may be added to the same trend where appropriate as long as they are uniquely identified via color and label.
  - b. Provide a custom trend screen whereby the operator has the ability to trend any tag in the database, including digital inputs.
5. Reports
  - a. Reporting requirements shall consist of both live HMI screens that dynamically update the values for “today” and also published historical reports. The published reports shall be accessible via web browser across the internet with appropriate security.

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- b. Daily totals shall be published and reset to zero at midnight. Monthly totals shall be published on the last day of the month and reset at midnight.
- c. Totalization time slices shall not exceed 5 seconds.
- d. The following parameters shall be reported:
  - (1) Motor and Equipment Run times: For each pump, report "Run Time Today" and "Run Time Yesterday."
  - (2) Flow Totals: For each flow meter, report "Flow Total Today," "Flow Total Yesterday," "Flow Total This Month," and "Flow Total Last Month."
- e. Export the data to Excel or CSV files daily.

### 3.02 PERFORMANCE TEST

- A. Following installation, checkout, and final adjustment of software, the CONTRACTOR shall schedule a performance test in the presence of the ENGINEER and the OWNER.
- B. Demonstrate to the ENGINEER and OWNER that each I/O point scheduled on the Contract Drawings has been integrated and is functioning properly. Demonstrate trending, reporting, and alarm messaging has been configured properly and is operational.
- C. Software development shall not be accepted until the SCADA system functions for at least one week with no nuisance alarms. Nuisance alarms shall be as defined by the ENGINEER.

**END OF SECTION**

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## SECTION 17500

### RADIO TELEMETRY SYSTEM

#### 1.01 SCOPE OF WORK

- A. Provide a radio-frequency (RF) data transmission/telemetry system for communication between the supervisory control and data acquisition system (SCADA) central station equipment and the new booster pump station remote telemetry unit (RTU). The radio system is also required to transmit information from existing RTUs at other remote sites to the new Booster pump station as described in Section 17200.
- B. Provide FCC licensing for the new station on behalf of the OWNER.

#### 1.02 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Divisions 0 and 1 Specification Sections, apply to this Section.
- B. Electrical work is specified in Division 16.
- C. Section 17010: General Instrumentation/SCADA requirements.
- D. Section 17400: SCADA Software

#### 1.03 REFERENCES

- A. Code of Federal Regulations (CFR): 47 CFR 15 Radio Frequency Devices
- B. IEEE C62.41 Surge Voltages in Low-Voltage AC Power Circuits
- C. NFPA 780 Installation of Lightning Protection Systems

#### 1.04 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Provide the following information in a single submittal for ENGINEER approval:
  - 1. System Drawing
    - a. Data transmission system block diagram.
    - b. Radio system installation and wiring diagrams.
    - c. Radio system physical layout and schematics.
    - d. Details of connections to power sources and grounding.

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- e. Details of surge protection device installations.
- f. Details of cable splicing and connector installation.
- 2. Equipment Data
  - a. A complete data package shall be delivered for all materials, including field and system equipment.
- 3. Data Transmission System Descriptions and Analyses
  - a. The submittal shall include complete system descriptions, analyses, and calculations used in sizing equipment required by these specifications. Descriptions and calculations shall show how the equipment will operate as a system to meet the performance of this specification.
  - b. The data package shall include a software-generated radio path study. The path study shall include path profiles indicating the topography between each link along with correction for earth curvature and 60% Fresnel zone. The study shall take into account the specific characteristics of the radios, antennas, tower heights, distances, and other items that may impact link reliability. The path study shall include the effects of signal dissipation from trees.
- 4. System Overall Reliability Calculations
  - a. The data package shall include manufacturers' reliability data and calculations required to show compliance with the reliability specified herein.
- 5. Certifications
  - a. All specified manufacturer's certifications shall be included with the data package.

#### 1.05 OPERATION AND MAINTENANCE MANUALS

- A. O&M manuals with complete as-built information and operation/maintenance instructions are required to be submitted in accordance with Section 17010.
- B. As-built bit error rate and fade margin test results shall be included in the O&M manual.

#### 1.06 WARRANTY

- A. Equipment supplied under this section shall be warranted for a period of two years dating from final completion. Warranty shall include all parts, labor, and expenses as required to repair the system and restore it to full operational status.

## 1.07 GENERAL REQUIREMENTS

### A. Environmental Requirements

1. Equipment to be utilized indoors shall be rated for continuous operation under ambient environmental conditions of 2.1 to 48.9 degrees C (35 to 120 degrees F) dry bulb and 10 to 95 percent relative humidity, noncondensing. All other equipment shall be rated for continuous operation under the ambient environmental temperature, pressure, humidity, and vibration conditions specified or normally encountered for the installed location.

### B. Electrical Requirements

1. The equipment shall operate from a voltage source as shown, plus or minus 10 percent, and 60 Hz, plus or minus 2 percent.

### C. Power Line Surge Protection

1. Equipment connected to ac circuits shall be protected from power line surges. Equipment shall meet the requirements of IEEE C62.41. Fuses shall not be used for surge protection.

### D. Communications Links Surge Protection

1. All communications equipment shall be protected against surges induced on any communications link. Cables and conductors which serve as communications links between the central station equipment and RTUs shall have surge protection circuits installed at each end at the communication equipment.

### E. Communications Links Overvoltage Protection

1. All communications equipment such as modems, repeaters, and transceivers shall be protected against overvoltage on any communications links. Cables and conductors which serve as communications links shall have overvoltage protection for voltages up to 480 Vac rms, 60 Hz installed. Instrument fuses or fusible resistors are acceptable for this application.

## 1.08 RF SYSTEM REQUIREMENTS

### A. Minimum Signal

1. A minimum signal voltage of 3.1 microvolts into 50-ohm load shall be maintained during signal transmission at any point within the system.

### B. Error Rate

1. An error rate of less than 5 errors per 100,000 commands shall be maintained.



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C. Adequate Fade Margin

1. The individual links shall each be designed for 30dB fade margin, minimum. Actual as-built measurements shall yield a minimum of 20dB fade margin in order to be accepted.

D. Reliability

1. The system shall be designed for 99.999% reliability.

1.09 SPARES

A. The following is a list of spare parts required within this Contract:

1. One radio modem for each unique type installed.
2. One lightning arrestor for each unique type installed.

**PART 2 PRODUCTS**

2.01 ACCEPTABLE MANUFACTURERS

- A. Microcomm, Inc.

2.02 RADIO MODEMS

- A. The radio shall be a single, integrated unit. It shall be rated for operation with the unit transmitting continuously. The radio shall be programmable to operate on a frequency to match OWNER's existing frequency.

- B. Transmitter power shall be selected to be consistent with paragraph RF System Requirements above.

C. Additional Requirements

1. Frequency stability: 0.00025% minimum over the operating temperature range.
2. Transmitter Output Impedance: 50 Ohm
3. Harmonic and spurious content of the output signal level shall be at least 55 dB below the carrier portion of the output signal level.
4. Frequency deviation shall be equal to or less than 5 kHz.
5. Receiver Input impedance: 50-ohm
6. Receiver modulation acceptance bandwidth: 25 kHz.
7. Receiver sensitivity: -101dBm @ 12 dB SINAD or better.
8. RF Data Rate: 56 kbps or better

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### 2.03 ANTENNA SYSTEM

- A. Antenna system shall be selected to be consistent with the paragraph RF System Requirements above. The antenna system shall utilize vertical polarization antennas, communication links between transmitters and antennas, and matching networks as needed for the proper coverage. The antenna system shall be a yagi type with gain as needed per the path study design. The antennas shall be capable of withstanding the environmental conditions of 70 mph wind and ½ inch radial ice without failure. The antenna system shall be selected by the CONTRACTOR to meet the requirements as determined from the topography. Lightning protection shall comply with NFPA 780.
- B. Antenna grounding conductors shall be minimum No. 12 AWG copper.
- C. Ground rods shall be as specified in Division 16.
- D. Transmission line between the transmitter and the antenna shall be 50-ohm impedance rated for the transmitter output power. Minimum requirement shall be cable that exhibits an attenuation not exceeding 1.1 dB per 30.5 m (100 feet) at 200 MHz.
- E. The CONTRACTOR shall be responsible for providing all mounting as required to support the antennas at the elevations and orientations required by the radio path survey within the FCC regulations. Masts and poles shall be suitable for out-door environmental conditions, provide adequate support and protection for transmission lines and be provided complete with all necessary mounting accessories.

### 2.04 WOOD POLE FOR ANTENNA MOUNTING

- A. Provide a wood pole machine trimmed by turning of type Douglas Fir, Lodgepole Pine, or Southern Yellow Pine conforming to ATIS ANSI O5.1 and RUS Bull 345-67. The pole shall be a minimum of 35' in length, but longer if required by the path study. Gain, bore and roof the pole before treatment. If additional gains are required subsequent to treatment, provide metal gain plates. Pressure treat poles with pentachlorophenol or ammoniacal copper arsenate (ACA). Ensure the quality of each pole with "WQC" (wood quality control) brand on each piece, or by an approved inspection agency report.

### 2.05 CONDUIT

- A. Conduit shall be as specified in Division 16.

### 2.06 ENCLOSURES

- A. Enclosures shall be as specified in Section 17200.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. All system components and appurtenances shall be installed in accordance with the manufacturer's instructions and as shown. All necessary interconnections, services, and adjustments required for a complete and operable data transmission system shall be provided.
- B. Antenna: All tubular radiator elements shall be plugged to prevent wind vibration fatigue. All vertical tubular elements shall have drain holes near the bottom. All outside connectors shall be snug, filled with silicone grease, and properly taped over with plastic tape suitable for cold weather.
- C. Interior Work: All interior electrical work shall be installed as specified in Division 16 and as shown.
- D. Exterior Work
  - 1. Underground: Except as otherwise specified, underground electrical work shall be installed as specified in Division 16 and as shown.
  - 2. Splices in the antenna cable are not acceptable.
  - 3. Enclosure Penetrations: Enclosure penetrations shall be from the bottom and shall be sealed with duct seal.
- E. Wood Pole Installation
  - 1. Pole shall be set in ground a minimum of 6' for 35' height. Add an additional 0.5' of setting depth for each additional 5' in height.
  - 2. Thoroughly tamp pole backfill for full depth of the hole and mound excess fill around the pole.
  - 3. Provide lightning protection per NFPA-780.

### **3.02 TESTING**

- A. General: The CONTRACTOR shall provide all personnel, equipment, instrumentation, and supplies necessary to perform all testing.
- B. CONTRACTOR's Field Test: The CONTRACTOR shall verify the complete operation of the radio telemetry system during the Field Testing. The CONTRACTOR's Field Test shall include an error rate test. The CONTRACTOR shall perform the test by sending 100,000 commands and measuring the error rate. The error rate shall be not greater than 5 out of 100,000. The CONTRACTOR shall also publish screen shots indicating the as-built fade margin of each link, which is required to be 20dB minimum. The CONTRACTOR shall prepare a report containing results of the field test.

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- C. Verification Test: The radio telemetry system shall be tested as a part of the completed SCADA system during the Performance Verification Test as specified in Section 17010.

### 3.03 TRAINING

- A. Provide radio training during the required SCADA training session as per Section 17010 requirements.

**END OF SECTION**

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