



Meade County Water District

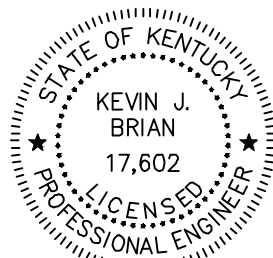
2023 Water System Improvements

Project Manual

Issued for Bid

January 2026

HDR Project No. 10361994



Kevin J. Brian
11/21/26



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ADVERTISEMENT FOR BIDS

Meade County Water District-Meade County, KY
2023 Water System Improvements

General Notice

Meade County Water District (Owner) is requesting Bids for the construction of the following Project:
2023 Water System Improvements

Bids for the construction of the Project will be received at the Meade County Water District located at 1003 Armory Place, Brandenburg, KY 40108, until Wednesday, February 18, 2026, at 11:00 AM local time. At that time the Bids received will be publicly opened and read.

The Project includes the following Work:

- Construction of approximately 18,500 LF of 16-inch watermain and related appurtenances along KY 313 (Joe Prather Highway) and KY 1238 (Garrett Road).
- Modifications to the existing Flaherty Pump Station which includes the installation of two (2) 125 HP VFD controlled pumps, larger electrical service, new generator and transfer switch, and by-pass pumping.
- Installation of new Package Pump Station with two (2) 20 HP VFD controlled pumps along KY 144 in Payneville; water filling station, generator, site work, and yard piping and two (2) electric motor actuated control valves and vault in the area.
- Rehabilitation of the 300,000 gallon elevated water storage Garrett Tank.
- Rehabilitation of the 300,000 gallon elevated water storage Payneville Tank, including the installation of a separate 8" fill line within the riser and passive mixing system.
- Miscellaneous SCADA improvements at various system facilities.

The Project has an expected construction duration of 300 days for the transmission main and pump stations. Tank rehab duration is limited to the period of April 1st through November 1st.

Obtaining the Bidding Documents

Information and Bidding Documents for the Project can be obtained at the following designated website: lynnimaging.com

Bidding Documents may be downloaded from the designated website. Prospective Bidders are urged to register with the designated website as a Bidding Documents holder, even if Bidding Documents are obtained from a third-party plan room or source other than the designated website in either electronic or paper format. The designated website will be updated periodically with Addenda, lists of registered Bidding Documents holders, reports on the Site, and other information relevant to submitting a Bid for the Project. All official notifications, Addenda, and other Bidding Documents will be offered only through the designated website. Neither Owner nor Engineer will be responsible for Bidding Documents, including Addenda, if any, obtained from sources other than the designated website.

The Issuing Office for the Bidding Documents is:

Lynn Imaging
11460 Bluegrass Parkway, Louisville, Kentucky 40299

Prospective Bidders may obtain or examine the Bidding Documents at the Issuing Office on Monday through Friday between the hours of 8:00am-5:00pm local time and may obtain copies of the Bidding Documents from the Issuing Office as described below. Partial sets of Bidding Documents will not be

available from the Issuing Office. Neither Owner nor Engineer will be responsible for full or partial sets of Bidding Documents, including Addenda, if any, obtained from sources other than the Issuing Office.

Bidding Documents may be purchased from the Issuing Office during the hours indicated above. Cost does not include shipping charges. Upon Issuing Office's receipt of payment, paper Bidding Documents or electronic documents on compact disk will be sent via the prospective Bidder's delivery service. The shipping charge amount will depend on the shipping method chosen. Bidding Documents are available for purchase in the following formats:

Format	Cost
Bidding Documents (including full-size Drawings)	\$500
Electronic download of Bidding Documents from lynnimaging.com	\$300

Pre-bid Conference

A pre-bid conference for the Project will be held on Tuesday, February 3rd, 2026, at 10:00am at Meade County Water District, 1003 Armory Place, Brandenburg, KY, 40108. Attendance at the pre-bid conference is encouraged but not required.

Instructions to Bidders.

For all further requirements regarding bid submittal, qualifications, procedures, and contract award, refer to the Instructions to Bidders that are included in the Bidding Documents.

No BIDDER may withdrawal his/her Bid within the sixty (60) calendar days after the actual date of the opening thereof.

Domestic Preference

This project is funded by a USDA Rural Development loan and is subject to the Build America, Buy America Act (BABAA) requirements under Title IX of the Infrastructure Investment and Jobs Act (IIJA), Pub. L. 117-58, §§ 70901-70953. Absent an approved waiver, all iron, steel, manufactured products, and construction materials used in this project must be produced in the United States.

The following waivers apply to this Contract:

BABAA De Minimis, Small Grants, and Minor Components

This Advertisement is issued by:

Owner: Meade County Water District

By: Brett Pyles

Title: General Manager

Date: January 21, 2026

The Meade County Water District reserves the right to reject any or all bids to waive any formalities. The DISTRICT is an Equal Opportunity Employer and invites participation from any qualified bidder.

INSTRUCTIONS TO BIDDERS

FOR CONSTRUCTION CONTRACT

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ARTICLE 1—DEFINED TERMS

- 1.01 Terms used in these Instructions to Bidders have the meanings indicated in the General Conditions and Supplementary Conditions. Additional terms used in these Instructions to Bidders have the meanings indicated below:
- A. *Issuing Office*—The office from which the Bidding Documents are to be issued, and which registers plan holders.
 - B. *Domestic Preference* – The Build America, Buy America Act (BABAA) requirements under Title IX of the Infrastructure Investment and Jobs Act (IIJA), Pub. L. 117-58. §§ 70901-70953.

ARTICLE 2—BIDDING DOCUMENTS

- 2.01 Bidder shall obtain a complete set of Bidding Requirements and proposed Contract Documents (together, the Bidding Documents). See the Agreement for a list of the Contract Documents. It is Bidder's responsibility to determine that it is using a complete set of documents in the preparation of a Bid. Bidder assumes sole responsibility for errors or misinterpretations resulting from the use of incomplete documents, by Bidder itself or by its prospective Subcontractors and Suppliers.
- 2.02 Bidding Documents are made available for the sole purpose of obtaining Bids for completion of the Project and permission to download or distribution of the Bidding Documents does not confer a license or grant permission or authorization for any other use, nor does it grant or confer ownership or any property interest in the Bidding Documents and other documents distributed for the Project. Authorization to download documents, or other distribution, includes the right for Bidding Documents holders to print documents solely for their use, and the use of their prospective Subcontractors and Suppliers, provided the Bidding Documents holder pays all costs associated with printing or reproduction. Paper or other types of printed documents may not be re-sold under any circumstances.
- 2.03 Owner has established a Bidding Documents Website as indicated in the Advertisement or invitation to bid. Owner recommends that Bidder register as a Bidding Documents holder with the Issuing Office at such website, and obtain a complete set of the Bidding Documents from such website. Bidders may rely that sets of Bidding Documents obtained from the Bidding Documents Website are complete, unless an omission is blatant. Registered Bidding Documents holders will receive Addenda issued by Owner or Issuing Office.
- 2.04 Bidder may register as a Bidding Documents holder and obtain complete sets of Bidding Documents, in the format stated in the Advertisement or invitation to bid, from the Issuing Office. Bidders may rely that sets of Bidding Documents obtained from the Issuing Office are complete, unless an omission is blatant. Registered Bidding Documents holders will receive Addenda issued by Owner or Issuing Office.
- 2.05 Plan rooms (including construction information subscription services, and electronic and virtual plan rooms) may distribute the Bidding Documents, or make them available for examination. Those prospective bidders that obtain an electronic (digital) copy of the Bidding Documents from a plan room are encouraged to register as Bidding Documents holders from the Bidding Documents Website or Issuing Office. Owner is not responsible for omissions in Bidding

Documents or other documents obtained from plan rooms or other such sources (such as other prospective bidders), or for a Bidder's failure to obtain Addenda from a plan room.

2.06 *Electronic Documents*

- A. When the Bidding Requirements indicate that electronic (digital) copies of the Bidding Documents are available, such documents will be made available to prospective Bidders as Electronic Documents in the manner specified.
 - 1. Bidding Documents will be provided in Adobe PDF (Portable Document Format) (.pdf) that is readable by Adobe Acrobat Reader Version 10 or later. It is the intent of the Engineer and Owner that such Electronic Documents are to be exactly representative of the paper copies of the documents. However, because the Owner and Engineer cannot totally control the transmission and receipt of Electronic Documents nor any bidder's or the Contractor's means of reproduction of such documents, the Owner and Engineer cannot and do not guarantee that Electronic Documents and reproductions prepared from those versions are identical in every manner to the paper copies.
- B. Unless otherwise stated in the Bidding Documents, the Bidder may use and rely upon complete sets of Electronic Documents of the Bidding Documents, described in Paragraph 2.06.A above. However, Bidder assumes all risks associated with differences arising from transmission/receipt of Electronic Documents versions of Bidding Documents and reproductions prepared from those versions and, further, assumes all risks, costs, and responsibility associated with use of the Electronic Documents versions to derive information that is not explicitly contained in paper versions of the documents, and for Bidder's reliance upon such derived information.
- C. After the Contract is awarded, the Owner will provide or direct the Engineer to provide for the use of the Contractor certain documents that were developed by Engineer as part of the Project design process, as Electronic Documents in native file formats as originally prepared by Engineer.
 - 1. Electronic Documents that are available in native file format include:
 - a. AutoCAD Drawing Files
 - 2. Release of such documents will be solely for the convenience of the Contractor and subject to additional requirements, if any. No such document is a Contract Document.
 - 3. Unless the Contract Documents explicitly identify that such information will be available to the Successful Bidder (Contractor), nothing herein will create an obligation on the part of the Owner or Engineer to provide or create such information, and the Contractor is not entitled to rely on the availability of such information in the preparation of its Bid or pricing of the Work. In all cases, the Contractor shall take appropriate measures to verify that electronic/digital information provided in Electronic Documents is appropriate and adequate for Contractor's specific purposes.
 - 4. In no case will Contractor be entitled to additional compensation or time for completion due to any differences between the actual Contract Documents and any related document in native file format.

ARTICLE 3—QUALIFICATIONS OF BIDDERS

- 3.01 Deleted
- 3.02 Deleted
- 3.03 Bidder is to submit the following information with its Bid to demonstrate Bidder's qualifications to perform the Work:
 - A. Written evidence establishing its qualifications such as financial data, previous experience, and present commitments.
 - B. A written statement that Bidder is authorized to do business in the state where the Project is located, or a written certification that Bidder will obtain such authority prior to the Effective Date of the Contract.
 - C. Bidder's state (or other) contractor license number, if applicable.
 - D. Subcontractor and Supplier qualification information.
 - E. Other required information regarding qualifications.
- 3.04 A Bidder's failure to submit required qualification information within the times indicated may disqualify Bidder from receiving an award of the Contract.
- 3.05 No requirement in this Article 3 to submit information will prejudice the right of Owner to seek additional pertinent information regarding Bidder's qualifications.
- 3.06 Bidders shall be experienced in the kind of Work to be performed, shall have the or be able to obtain construction equipment necessary for the Work, and shall possess sufficient capital to properly perform the Work within the time allowed. Bids received from Bidders who have previously failed to complete work within the time required, or who have previously performed similar work in an unsatisfactory manner, may be rejected. A Bid may be rejected if Bidder cannot show and document to Owner's satisfaction that Bidder has the necessary ability, facilities, equipment, and resources to commence the Work at the time prescribed and thereafter to prosecute and complete the Work at the rate or within the times specified. A Bid may be rejected if Bidder is already obligated for the performance of other work which would delay the commencement, prosecution or completion of the Work.

ARTICLE 4—PRE-BID CONFERENCE

- 4.01 A non-mandatory pre-bid conference will be held at the time and location indicated in the Advertisement or invitation to bid. Representatives of Owner and Engineer will be present to discuss the Project. Bidders are encouraged to attend and participate in the conference; however, attendance at this conference is not required to submit a Bid.
- 4.02 Information presented at the pre-bid conference does not alter the Bidding Documents. Owner or Issuing Office will issue Addenda to make any changes to the Bidding Documents that result

from discussions at the pre-bid conference. Information presented, and statements made at the pre-bid conference will not be binding or legally effective unless incorporated in an Addendum.

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

5.01 *Site and Other Areas*

- A. The Site is identified in the Bidding Documents, including in Specifications Section 01 11 00 – Summary of Work. By definition, the Site includes rights-of-way, easements, and other lands furnished by Owner for the use of the Contractor. Any additional lands required for temporary construction facilities, construction equipment, or storage of materials and equipment, and any access needed for such additional lands, are to be obtained and paid for by Contractor.

5.02 *Existing Site Conditions*

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

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

- B. *Underground Facilities:* Underground Facilities are shown or indicated on the Drawings, pursuant to Paragraph 5.05 of the General Conditions, and not in the drawings referred to in Paragraph 5.02.A of these Instructions to Bidders. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data.

5.03 *Other Site-Related Documents*

- A. No other Site-related documents are available.

5.04 *Site Visit and Testing by Bidders*

- A. Bidder is required to visit the Site and conduct a thorough visual examination of the Site and adjacent areas. During the visit the Bidder must not disturb any ongoing operations at the Site.
- B. A Site visit is scheduled following the pre-bid conference. Maps, directions, or GPS coordinates to the Site, when the Site is remote from the pre-bid conference location, will be available at the pre-bid conference.
- C. Bidders visiting the Site are required to: (1) arrange their own transportation to the Site; and (2) each Bidder visiting the Site is responsible for providing and using its own personal protective equipment appropriate for the Site and conditions, and in accordance with posted requirements, if any. Comply with Paragraph 5.05 of these Instructions to Bidders.
- D. All access to the Site, other than during a regularly scheduled Site visit, must be coordinated through the Owner for visiting the Site. Bidder must conduct the required Site visit during normal working hours, Mondays through Fridays.
- E. Bidder is not required to conduct any subsurface testing, or exhaustive investigations of Site conditions.
- F. On request, and to the extent Owner has control over the Site, and schedule permitting, the Owner will provide Bidder general access to the Site to conduct such additional examinations, investigations, explorations, tests, and studies as Bidder deems necessary for preparing and submitting a successful Bid. Owner will not have any obligation to grant such access if doing so is not practical because of existing operations, security or safety concerns, or restraints on Owner's authority regarding the Site. Bidder is responsible for establishing access needed to reach specific selected test sites.
- G. Bidder must comply with Laws and Regulations regarding excavation and location of utilities, obtain necessary 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.
- H. Bidder must fill all holes and clean up and restore the Site to its former condition upon completion of such explorations, investigations, tests, and studies.

5.05 *Owner's Safety Program*

- A. Site visits and work at the Site may be governed by an Owner safety program. If an Owner safety program exists, it will be indicated in the Supplementary Conditions. Where the Bidding Documents indicate an Owner's safety program, visitors to the Site during the bidding phase and at other times shall comply with Owner's safety programs.

5.06 *Other Work at the Site*

- A. Reference is made to Specifications Section 01 11 00 – Summary of Work, 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 potentially confidential matters), if any.

ARTICLE 6—BIDDER’S REPRESENTATIONS AND CERTIFICATIONS

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

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

ARTICLE 7—INTERPRETATIONS AND ADDENDA

- 7.01 Owner on its own initiative may issue Addenda to clarify, correct, supplement, or change the Bidding Documents.
- 7.02 Bidder shall submit all questions about the meaning or intent of the Bidding Documents to Engineer in writing. Contact information and submittal procedures for such questions are as follows:
 - A. Engineer: Kevin Brian
 - B. Kevin.brian@hdrinc.com
 - C. (502) 909-3241
- 7.03 Interpretations or clarifications considered necessary by Engineer in response to such questions will be issued by Addenda delivered to all Bidding Documents holders registered with the Issuing Office. Questions received less than seven days prior to the date for opening of Bids may not be answered.
- 7.04 Only responses set forth in an Addendum will be binding. Oral and other interpretations or clarifications will be without legal effect. Responses to questions are not part of the Contract Documents unless set forth in an Addendum that expressly modifies or supplements the Bidding Documents.
- 7.05 Addenda that engineer judges to have a material or significant effect on Bidders’ preparation of pricing and other requirement element of the Bid will be transmitted via Addendum for Bidders’ receipt not less than three days prior to the scheduled date for receipt of the Bids. Clarifications or modifications that Engineer deems will not have a material or substantial effect on the

preparation of Bids may be transmitted for Bidders' receipt later, for receipt prior to the deadline for receipt of Bids.

ARTICLE 8—BID SECURITY

8.01 *Required Form and Amount of Bid Security*

- A. A Bid must be accompanied by bid security made payable to Owner in an amount of 5 percent of Bidder's maximum Bid price (determined by adding the base bid and all alternates) and in the form of a bid bond issued by a surety meeting the requirements of Paragraph 6.01 of the General Conditions. Bid security must be at least 5% of the Bidder's maximum Bid price.
- B. Such bid bond will be issued in the form included in the Bidding Documents.

8.02 *Bid Security of Successful Bidder*

- A. The Bid security of the apparent Successful Bidder will be retained until Owner awards the Contract to such Bidder, and such Bidder has signed the Contract, furnished the required Contract security, and met the other conditions of the Notice of Award, whereupon the Successful Bidder's bid security will be released.
- B. If the Successful Bidder fails to sign and deliver the Contract and furnish the required Contract security within the number of days, indicated in Paragraph 20.01 of these Instructions to Bidders, 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.
- C. Upon Successful Bidder's default:
 - 1. When the bid security is a penal sum bid bond, the entire penal sum amount of the bid bond will be forfeit and due Owner.
 - 2. When the bid security is a damages form of bid bond, to the extent of Owner's damages will be forfeit and due Owner.
 - 3. If a type of bid security other than a bid bond is allowed and is furnished, the amount that will be forfeit and due Owner will be the same as for the form of bid bond included in the Bidding Documents. Owner will so notify the defaulting Bidder in writing of the annulment and the amount of the forfeiture, with documentation of the amount forfeited.
- D. Such forfeiture will be Owner's exclusive remedy if Bidder defaults.

8.03 *Bid Security of Bidders other than the Successful Bidder*

- A. The bid security of other Bidders that Owner believes to have a reasonable chance of receiving the award may be retained by Owner until the earlier of seven days after the Effective Date of the Contract or 91 days after the Bid opening, whereupon bid security furnished by such Bidders will be released.
- B. 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.
- C. Release of Bid Security: Owner may release any Bidder's bid security by returning such bid security to the associated Bidder. When bid security is in the form of a bid bond, Owner may dispose of or destroy the bid bond and so advise the associated Bidder in writing that the bid bond has been released.

ARTICLE 9—CONTRACT TIMES

- 9.01 The number of days within which, or the dates by which, the Work is to be (a) substantially completed and (b) ready for final payment, and (c) Milestones (if any), are to be achieved are set forth in the Agreement.
- 9.02 Deleted
- 9.03 Provisions for liquidated and special damages, if any, for failure to timely attain a Milestone, Substantial Completion, or completion of the Work in readiness for final payment, are set forth in the Agreement.

ARTICLE 10—SUBSTITUTE AND “OR EQUAL” ITEMS

- 10.01 Deleted
- 10.02 The Contract for the Work, as awarded, will be on the basis of materials, equipment, and procedures specified or described in the Bidding Documents, and those “or-equal” or substitute or materials and equipment subsequently approved by Engineer prior to the submittal of Bids and identified by Addendum. No item of material or equipment or alternative procedure will be considered by Engineer as an “or-equal” or substitute unless written request for approval has been submitted by Bidder and has been received by Engineer within 15 days of the issuance of the Advertisement or invitation to bid. Each such request must comply with the requirements of (1) Paragraphs 7.05 and 7.06 of the General Conditions, and (2) the Division 01 Specifications governing substitutes and “or-equals”, as applicable, and the review of the request will be governed by the principles in those provisions of the Bidding Documents. Each such request shall include the Manufacturers’ Certification for Compliance with Domestic Preference requirements. Refer to the suggested Manufacturer’s Certification provided in these construction Contract Documents. The burden of proof of the merit of the proposed item or procedure is upon Bidder. Engineer’s decision of approval or disapproval of a proposed item or procedure will be final. If Engineer approves any such proposed item or procedure, such approval will be set forth in an Addendum issued in accordance with Article 7 of these Instructions to Bidders. Bidders cannot rely upon approvals made in any other manner. Substitutes and “or-equal” materials and equipment may be proposed by Contractor in accordance with Paragraphs 7.05 and 7.06 of the General Conditions after the Effective Date of the Contract. Each such request shall include Manufacturer’s Certification letter to document compliance with Domestic Preference requirements. Refer to Manufacturer’s Certification Letter provided in these Contract Documents.
- 10.03 All prices that Bidder sets forth in its Bid will be based on the presumption that the Contractor will furnish the materials and equipment specified or described in the Bidding Documents, and will perform the Work in accordance with procedures indicated in the Bidding Documents, as supplemented by Addenda, if any. Assumptions regarding the possibility of post-bid approvals of “or-equal” or substitution requests are made at Bidder’s sole risk.

ARTICLE 11—SUBCONTRACTORS, SUPPLIERS, AND OTHERS

- 11.01 Deleted
- 11.02 If required by the bid documents, the apparent Successful Bidder, and any other Bidder so requested by Owner or Engineer, must submit to Owner (with a copy to Engineer) a list of the

Subcontractors and Suppliers proposed for the following portions of the Work within five days after the bid opening:

- A. Pipe suppliers, boring and jacking, gate valve suppliers, concrete paving, asphalt paving.
- 11.03 If requested by Owner or Engineer, such list must be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor or Supplier. If Owner or Engineer, after due investigation, has reasonable objection to any proposed Subcontractor or Supplier, Owner may, before the Notice of Award is given, request apparent Successful Bidder to submit an acceptable substitute, in which case apparent Successful Bidder will submit a substitute, Bidder's Bid price will be increased (or decreased) by the difference in cost occasioned by such substitution, and Owner may consider such price adjustment in evaluating Bids and awarding the Contract.
- 11.04 If apparent Successful Bidder declines to make a requested substitution, Owner may award the Contract to another Bidder, consistent with the basis for evaluating the Bids for award as set forth in these Instructions to Bidders, that proposes to use acceptable Subcontractors and Suppliers. Declining to make requested substitutions will constitute grounds for forfeiture of the bid security of any Bidder. Any Subcontractor or Supplier, so listed and against which Owner or Engineer makes no written objection prior to issuance of the Notice of Award will be deemed acceptable to Owner and Engineer subject to subsequent revocation of such acceptance as provided in Paragraph 7.07 of the General Conditions.
- 11.05 The Contractor shall not award work to Subcontractor(s) in excess of the limits stated in SC 7.07A.

ARTICLE 12—PREPARATION OF BID

- 12.01 The Bid Form is included with the Bidding Documents.
- A. All blanks on the Bid Form must be completed in ink and the Bid Form signed in ink. Erasures or alterations must be initialed in ink by the person signing the Bid Form. A Bid price must be indicated for each section, Bid item, alternate, adjustment unit price item, and unit price item listed therein.
 - B. If the Bid Form expressly indicates that submitting pricing on a specific alternate item is optional, and Bidder elects to not furnish pricing for such optional alternate item, then Bidder may enter the words "No Bid" or "Not Applicable."
- 12.02 If Bidder has obtained the Bidding Documents as Electronic Documents, then Bidder shall prepare its Bid on a paper copy of the Bid Form printed from the Electronic Documents version of the Bidding Documents. The printed copy of the Bid Form must be clearly legible, printed on 8.5inch by 11-inch paper and as closely identical in appearance to the Electronic Document version of the Bid Form as may be practical. The Owner reserves the right to accept Bid Forms which nominally vary in appearance from the original paper version of the Bid Form, providing that all required information and submittals are included with the Bid.
- 12.03 A Bid by a corporation must be signed in the corporate name by a corporate officer (whose title must appear under the signature), accompanied by evidence of authority to sign. The corporate address and state of incorporation must be shown.
- 12.04 A Bid by a partnership must be executed in the partnership name and signed by a partner (whose title must appear under the signature), accompanied by evidence of authority to sign. The official address of the partnership must be shown.

- 12.05 A Bid by a limited liability company must be signed in the name of the firm by a member or other authorized person and accompanied by evidence of authority to sign. The state of formation of the firm and the official address of the firm must be shown.
- 12.06 A Bid by an individual must show the Bidder's name and official address.
- 12.07 A Bid by a joint venture must be signed by an authorized representative of each joint venturer in the manner indicated on the Bid Form. The joint venture must have been formally established prior to submittal of a Bid, and the official address of the joint venture must be shown.
- 12.08 All names must be printed in ink below the signatures.
- 12.09 The Bid must contain an acknowledgment of receipt of all Addenda, the numbers of which must be filled in on the Bid Form.
- 12.10 Postal and e-mail addresses and telephone number for communications regarding the Bid must be indicated on the Bid Form.
- 12.11 The Bid must contain evidence of Bidder's authority to do business in the state where the Project is located, or Bidder must certify in writing that it will obtain such authority within the time for acceptance of Bids and attach such certification to the Bid.
- 12.12 If Bidder is required to be licensed to submit a Bid or perform the Work in the state where the Project is located, the Bid must contain evidence of Bidder's licensure, or Bidder must certify in writing that it will obtain such licensure within the time for acceptance of Bids and attach such certification to the Bid. Bidder's state contractor license number, if any, must also be shown on the Bid Form.

ARTICLE 13—BASIS OF BID

13.01 *Lump Sum*

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

13.02 *Base Bid with Alternates*

- A. Bidders must submit a Bid on a lump sum basis for the base Bid and include a separate price for each alternate item described in the Bidding Documents and as provided for in the Bid Form. The price for each alternate will be the amount added to or deleted from the base Bid if Owner selects the alternate.
- B. In the comparison of Bids, alternates will be applied in the same order of priority as listed in the Bid Form.

13.03 Deleted

13.04 Deleted

13.05 *Unit Price*

- A. Bidders must submit a Bid on a unit price basis for each item of Work listed in the unit price section of the Bid Form.
- B. The "Bid Price" (sometimes referred to as the extended price) for each item of Unit Price Work 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 final Contract Price will be determined in accordance with Paragraph 13.03 of the General Conditions.

- C. Discrepancies between the multiplication of units of Work and unit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum.

13.06 *Cash Allowances*

- A. For cash allowances the bid price (for items other than cash allowances) must include such amounts as Bidder deems proper for Contractor's overhead, handling and installation 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.

13.07 Deleted

ARTICLE 14—SUBMITTAL OF BID

- 14.01 The Bidding Documents include one separate, unbound copy of the Bid Form, and, where required, the Bid Bond Form and other supplements to the Bid Form. The unbound copy of the Bid Form and supplements (if any) is to be completed and submitted with the Bid security and the other documents required with the Bid by Article 2 of the Bid Form.
- 14.02 A Bid must be received no later than the date and time prescribed and at the place indicated in the Advertisement or invitation to bid and must be enclosed in a plainly marked package with the Project title, and, if applicable, the designated portion of the Project for which the Bid is submitted, and the name and address of Bidder, and must be accompanied by the Bid security and other required documents. If a Bid is sent by mail or other delivery method, the sealed envelope containing the Bid must be enclosed in a separate package plainly marked on the outside with the notation "BID ENCLOSED." A mailed Bid must be addressed to the location designated in the Advertisement or invitation to bid. Meade County Water District 1003 Armory Place, Brandenburg, KY 40108.
- 14.03 Bids received after the date and time prescribed for the opening of Bids, or not submitted at the correct location or in the designated manner, will not be accepted and will be returned to the Bidder unopened. Owner accepts no responsibility for delays in returning Bids submitted or delivered to the incorrect location.

ARTICLE 15—MODIFICATION AND WITHDRAWAL OF BID

- 15.01 An unopened Bid may be withdrawn by an appropriate document duly signed in the same manner that a Bid must be signed and delivered to the place where Bids are to be submitted, prior to the date and time established in the Bidding Documents for the receipt of Bids. Upon receipt of such notice, the unopened Bid will be returned to the Bidder.
- 15.02 If a Bidder wishes to modify its Bid prior to Bid opening, Bidder must withdraw its initial Bid in the manner specified in Paragraph 15.01 of this Article and submit a new Bid prior to the date and time for established in the Bidding Documents the receipt of Bids.
- 15.03 If, within 24 hours after Bids are opened, any Bidder files a duly signed, written notice with Owner and promptly thereafter demonstrates to the reasonable satisfaction of Owner that there was a

material and substantial mistake in the preparation of its Bid, the Bidder may withdraw its Bid, and the bid security will be returned.

ARTICLE 16—OPENING OF BIDS

- 16.01 Bids will be opened at the time and place indicated in the Advertisement or invitation to bid and, unless obviously non-responsive, will be read aloud publicly. An abstract of the amounts of the base Bids and additive alternates will be made available to Bidders after the opening of Bids.
- 16.02 An abstract of the amounts of the base Bids and major alternates, if any, will be furnished by Owner or Engineer.

ARTICLE 17—BIDS TO REMAIN SUBJECT TO ACCEPTANCE

- 17.01 All Bids will remain subject to acceptance for 60 days, but Owner may, in its sole discretion, release any Bid and return the Bid security prior to the end of this period.

ARTICLE 18—EVALUATION OF BIDS AND AWARD OF CONTRACT

- 18.01 Owner reserves the right to reject any or all Bids, including without limitation, nonconforming, nonresponsive, unbalanced, or conditional Bids. Owner also reserves the right to waive all minor Bid informalities not involving price, time, or changes in the Work.
- 18.02 Owner will reject the Bid of any Bidder that Owner finds, after reasonable inquiry and evaluation, to not be responsible. Owner may reject the Bid of any Bidder that fails to demonstrate appropriate qualifications, experience, and resources for the Work, in accordance with Article 3 of these Instructions to Bidders.
- 18.03 If Bidder purports to add terms or conditions to its Bid, takes exception to any provision of the Bidding Documents, or attempts to alter the contents of the Contract Documents for purposes of the Bid, whether in the Bid itself or in a separate communication to Owner or Engineer, then Owner will reject the Bid as nonresponsive.
- 18.04 *Basis for Award of Contract*
 - A. If Owner awards the contract for the Work, such award will be to the responsible Bidder submitting the lowest-priced, responsive Base Bid plus Additive Alternate(s), that are within the Owner's available budget, that has not otherwise been disqualified.
- 18.05 *Evaluation of Bids*
 - A. In evaluating Bids, Owner will consider whether the Bids comply with the prescribed requirements, and such alternates, unit prices, and other data, as may be requested in the Bid Form or elsewhere in the Bidding Documents, or prior to the Notice of Award.
 - B. *Base Bid with Alternates:* In the comparison of Bids, alternates will be applied in the same order of priority as listed in the Bid Form. To determine the Bid prices for purposes of comparison, Owner will announce to all Bidders, present at the opening of Bids, a "Base Bid plus alternates" budget after receiving all Bids, but prior to opening the Bids; Bidders not present for the opening of Bids may obtain the announced budget amount from Owner or Engineer. For comparison purposes, alternates will be accepted, following the order of priority established in the Bid Form, until doing so would cause the budget to be exceeded. After determination of the Successful Bidder based on this comparative process and on the

responsiveness, responsibility, and other factors set forth in these Instructions to Bidders, the award may be made to said Successful Bidder on its base Bid and any combination of its additive alternate bid prices for which Owner determines funds will be available at the time of award.

- C. *Unit Price Work*: For the determination of the apparent low-price Bid 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 amount(s) of lump sum items.
 - D. Deleted
 - E. Deleted
- 18.06 In evaluating whether a Bidder is responsible, Owner will consider the qualifications, experience, and resources of the Bidder and may consider the qualifications, experience, and resources of Subcontractors and Suppliers proposed for those portions of the Work for which the identity of Subcontractors and Suppliers must be submitted as provided in the Bidding Documents.
- 18.07 Owner, with or without Engineer's assistance, may conduct such investigations as Owner deems necessary to establish the responsibility, qualifications, and financial ability of Bidders and any proposed Subcontractors or Suppliers.
- 18.08 The contract will be awarded based on the lowest responsive bid or lowest combination of base bids, plus any additive/deductive alternates that are within the Owner's available funds for the project, by a qualified Bidder for each bid package.

ARTICLE 19—BONDS AND INSURANCE

- 19.01 Paragraph 2.01 and Article 6 of the General Conditions, as may be modified by the Supplementary Conditions, set forth Owner's requirements as to performance and payment bonds, other required bonds (if any), and insurance. When the Successful Bidder delivers the signed Agreement to Owner (or Owner's representative), it must be accompanied by required bonds and insurance documentation.
- 19.02 Article 8 ("Bid Security") of these Instructions to Bidders addresses any requirements for providing bid bonds as part of the bidding process.

ARTICLE 20—SIGNING OF AGREEMENT

- 20.01 When Owner issues a Notice of Award to the Successful Bidder, it will be accompanied by the unsigned counterparts of the Agreement, along with the other Contract Documents as identified in the Agreement. Within 15 days thereafter, Successful Bidder must execute and deliver the required number of counterparts of the Agreement and required bonds and insurance documentation (as required by the Contract Documents) to Owner. Within 10 days thereafter, Owner will deliver one fully signed counterpart of the Agreement to Successful Bidder, together with printed and electronic copies of the Contract Documents as stated in Paragraph 2.02 of the General Conditions.

ARTICLE 21—SALES AND USE TAXES

- 21.01 Deleted

ARTICLE 22—CONTRACTS TO BE ASSIGNED

ARTICLE 23 – FEDERAL REQUIREMENTS

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

23.02 Federal requirements at Article 19 of the Supplementary Conditions apply to this Contract.

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BID FORM

FOR CONSTRUCTION CONTRACT

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

ARTICLE 1—OWNER AND BIDDER

- 1.01 This Bid is submitted to: Meade County Water District, 1003 Armory Place, Brandenburg, KY 40108.
- 1.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

ARTICLE 2—ATTACHMENTS TO THIS BID

- 2.01 The following documents are submitted with and made a condition of this Bid:
 - A. Required Bid security;
 - B. List of Proposed Subcontractors;
 - C. List of Proposed Suppliers;
 - D. Evidence of authority to do business in the state of the Project; or a written covenant to obtain such authority within the time for acceptance of Bids;
 - E. Contractor's license number as evidence of Bidder's State Contractor's License or a covenant by Bidder to obtain said license within the time for acceptance of Bids;
 - F. Required Bidder Qualification Statement with supporting data;
 - G. If Bid amount exceeds \$10,000, signed Compliance Statement (RD 400-6). Refer to specific equal opportunity requirements set forth in the Supplementary Conditions of the Construction Contract (EJCDC C-800);
 - H. If Bid amount exceeds \$25,000, signed Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion – Lower Tier Covered Transactions (AD-1048);
 - I. If Bid amount exceeds \$100,000, signed RD Instruction 1940-Q Exhibit A-1, Certification for Contracts, Grants, and Loans.

ARTICLE 3—BASIS OF BID—LUMP SUM BID AND UNIT PRICES

- 3.01 *Unit Price Bids*
 - A. Bidder will perform the following Work at the indicated unit prices:

BASE BID 1 – Flaherty Transmission Main

Item No.	Description	Unit	Estimated Quantity	Bid Unit Price	Bid Amount
1	Mobilization	LS	1		
2	General Conditions	LS	1		
3	Bonds and Insurance	LS	1		
4	Erosion Prevention and Sediment Control	LS	1		
5	Traffic Control	LS	1		
6	6" SDR17 PVC Water Line	LF	110		
7	8" SDR17 PVC Water Line	LF	65		
8	10" SDR17 PVC Water Line	LF	45		
9	10" CL 350 Ductile Iron Water Line	LF	60		
10	12" SDR17 PVC Water Line	LF	30		
11	16" CL 250 Ductile Iron Water Line	LF	17,060		
12	16" CL 250 Ductile Iron Restrained Water Line	LF	375		
13	24" Steel Encasement Pipe - Bore and Jack	LF	865		
14	Freebore Driveway	EA	5		
15	6" Gate Valve	EA	2		
16	8" Gate Valve	EA	2		
17	16" Butterfly Valve	EA	20		
18	Connect to Ex. 6" Water Main (Cut-in)	EA	2		
19	Connect to Ex. 8" Water Main (Cut-in)	EA	1		
20	8" Tapping Sleeve and Valve	EA	1		
21	10" Tapping Sleeve and Valve	EA	2		
22	12" Tapping Sleeve and Valve	EA	1		
23	6" Fire Hydrant Assembly	EA	6		
24	Air Release Valve Assembly	EA	7		
25	Transfer Existing Water Service	EA	5		
26	Install New Water Service	EA	3		
27	Meter Relocate	EA	2		
28	Reconfigure 8" Water Main	LS	1		
29	Walnut Grove Road Reconnect	LS	1		
30	Concrete Paving Restoration	SY	25		
31	Asphalt Driveway Restoration	SY	200		
32	Demobilization	LS	1		

TOTAL AMOUNT OF BASE BID 1 (Items 1 through 32):

Dollars (\$_____)

BASE BID 2 – Pump Stations, Control Valves, and SCADA Improvements

Item No.	Description	Unit	Estimated Quantity	Bid Unit Price	Bid Amount
1	Mobilization	LS	1		
2	Erosion Prevention & Sediment Control	LS	1		
3	Traffic Control	LS	1		
4	Flaherty Pump Station Upgrade	LS	1		
5	Payneville Package Pump Station	LS	1		
6	New Highland Church Road Control Valve	LS	1		
7	Midway-Sirocco Road Control Valve	LS	1		
8	System Wide SCADA Improvements	LS	1		
9	Electrical Allowance (SCADA Support)	LS	\$50,000		

TOTAL AMOUNT OF BASE BID 2 (Items 1 through 9):

Dollars (\$_____)

TOTAL AMOUNT OF BASE BID (Base Bid 1 + Base Bid 2)

Dollars (\$_____)

ALTERNATIVES

All Bidders are required to submit amounts for the additive alternatives described below.

Additive Alternative 1 – Garrett Tank Rehabilitation

Item No.	Description	Unit	Estimated Quantity	Bid Unit Price	Bid Amount
1	Mobilization	LS	1		
2	New Tank Interior and Exterior Coating System	LS	1		
3	Coatings Inspection Allowance	LS	1	\$15,000	
4	Tank Repair Allowance	LS	1	\$10,000	
5	Demobilization	LS	1		

TOTAL AMOUNT OF ADDITIVE ALTERNATIVE 1 (Items 1 through 5):

Dollars (\$_____)

Additive Alternative 2 – Payneville Tank Rehabilitation

Item No.	Description	Unit	Estimated Quantity	Bid Unit Price	Bid Amount
1	Mobilization	LS	1		
2	New Interior and Exterior Coating System	LS	1		
3	Coatings Inspection Allowance	LS	1	\$15,000	
4	Tank Inlet Riser Pipe	LS	1		
5	Tank Repair Allowance	LS	1	\$10,000	
6	Demobilization	LS	1		

TOTAL AMOUNT OF ADDITIVE ALTERNATIVE 2 (Items 1 through 6):

Dollars (\$_____)

SUPPLEMENTAL UNIT PRICE – TANK REPAIRS:

Bidder shall provide unit price for each type of tank repair listed below.

Item No.	Description	Unit	Quantity	Bid Unit Price
1	Interior Bowl Ladder Rung Replacement	EA	-	
2	Interior Bowl Ladder Replacement	EA	-	
3	Support Cables for Inlet Pipe	EA	-	
4	Welding Repairs	EA	-	
5	Pit Welding Repairs	EA	-	
6	Pit Filler – Tnemec 215	GAL	-	
7	4" x 4" Welding Plates	EA	-	

Bidder acknowledges that:

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

3.02 Total Base Bid Price (Lump Sum and Unit Prices)

Base Bid 1: Flaherty Transmission Main	\$
Base Bid Pump Stations, Control Valves, and SCADA Improvements	\$
Total Base Bid Price (Total of all Lump Sum and Unit Price Bids)	\$

ARTICLE 4—DELETED

ARTICLE 5—DELETED

ARTICLE 6—TIME OF COMPLETION

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

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

7.01 *Bid Acceptance Period*

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

7.02 *Instructions to Bidders*

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

7.03 *Receipt of Addenda*

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

Addendum Number	Addendum Date

ARTICLE 8—BIDDER’S REPRESENTATIONS AND CERTIFICATIONS

8.01 *Bidder’s Representations*

- A. In submitting this Bid, Bidder represents the following:
1. Bidder has examined and carefully studied the Bidding Documents, including Addenda.
 2. Bidder has visited the Site, conducted a thorough visual examination of the Site and adjacent areas, and become familiar with the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
 3. Bidder is familiar with all Laws and Regulations that may affect cost, progress, and performance of the Work including all Domestic Preference Requirements.
 4. Bidder has carefully studied the reports of explorations and tests of subsurface conditions at or adjacent to the Site and the drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, with respect to the Technical Data in such reports and drawings.
 5. Bidder has carefully studied the reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, with respect to Technical Data in such reports and drawings.
 6. Bidder has considered the information known to Bidder itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Technical Data identified in the Supplementary Conditions or by definition, with respect to the effect of such information, observations, and Technical Data on (a) the cost, progress, and

performance of the Work; (b) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, if selected as Contractor; and (c) Bidder's (Contractor's) safety precautions and programs.

7. Based on the information and observations referred to in the preceding paragraph, Bidder agrees that no further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract.
8. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.
9. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and of discrepancies between Site conditions and the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.
10. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.
11. The submission of this Bid constitutes an incontrovertible representation by Bidder that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

8.02 *Bidder's Certifications*

A. The Bidder certifies the following:

1. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation.
2. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid.
3. Bidder has not solicited or induced any individual or entity to refrain from bidding.
4. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 8.02.A:
 - a. Corrupt practice means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process.
 - b. Fraudulent practice means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Owner, (b) to establish bid prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition.
 - c. Collusive practice means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish bid prices at artificial, non-competitive levels.
 - d. Coercive practice means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

BIDDER hereby submits this Bid as set forth above:

Bidder:

(typed or printed name of organization)

By:

(individual's signature)

Name:

(typed or printed)

Title:

(typed or printed)

Date:

(typed or printed)

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

Attest:

(individual's signature)

Name:

(typed or printed)

Title:

(typed or printed)

Date:

(typed or printed)

Bidder's Address for giving notices:

Bidder's Contact Person:

Name:

(typed or printed)

Title:

(typed or printed)

Phone:

Email:

Address:

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

BID BOND (PENAL SUM FORM)

Bidder Name: Address <i>(principal place of business)</i> :	Surety Name: Address <i>(principal place of business)</i> :
Owner Name: Meade County Water District Address <i>(principal place of business)</i> : 1003 Armory Place Brandenburg, KY 40108	Bid Project <i>(name and location)</i> : Bid Due Date:
Bond Penal Sum: Date of Bond:	
Surety and Bidder, intending to be legally bound hereby, subject to the terms set forth in this Bid Bond, do each cause this Bid Bond to be duly executed by an authorized officer, agent, or representative.	
Bidder	Surety
<i>(Full formal name of Bidder)</i>	<i>(Full formal name of Surety) (corporate seal)</i>
By: _____ <i>(Signature)</i>	By: _____ <i>(Signature) (Attach Power of Attorney)</i>
Name: _____ <i>(Printed or typed)</i>	Name: _____ <i>(Printed or typed)</i>
Title: _____	Title: _____
Attest: _____ <i>(Signature)</i>	Attest: _____ <i>(Signature)</i>
Name: _____ <i>(Printed or typed)</i>	Name: _____ <i>(Printed or typed)</i>
Title: _____	Title: _____
<i>Notes: (1) Note: Addresses are to be used for giving any required notice. (2) Provide execution by any additional parties, such as joint venturers, if necessary.</i>	

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

QUALIFICATIONS STATEMENT

ARTICLE 1—GENERAL INFORMATION

1.01 Provide contact information for the Business:

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

1.02 Provide information on the Business's organizational structure:

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

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

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

Name of business:		Affiliation:	
Address:			

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

Name:		Title:	
Authorized to sign contracts:	☐ Yes ☐ No	Limit of Authority:	\$
Name:		Title:	
Authorized to sign contracts:	☐ Yes ☐ No	Limit of Authority:	\$
Name:		Title:	
Authorized to sign contracts:	☐ Yes ☐ No	Limit of Authority:	\$
Name:		Title:	

ARTICLE 2—LICENSING

2.01 Provide information regarding licensure for Business:

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

ARTICLE 3—DIVERSE BUSINESS CERTIFICATIONS

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

Certification	Certifying Agency	Certification Date
☐ Disadvantaged Business Enterprise		
☐ Minority Business Enterprise		
☐ Woman-Owned Business Enterprise		
☐ Small Business Enterprise		
☐ Disabled Business Enterprise		
☐ Veteran-Owned Business Enterprise		
☐ Service-Disabled Veteran-Owned Business		
☐ HUBZone Business (Historically Underutilized) Business		

☐ Other			
☐ None			

ARTICLE 4—SAFETY

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

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

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

Year									
Company	EMR	TRFR	MH	EMR	TRFR	MH	EMR	TRFR	MH

ARTICLE 5—FINANCIAL

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

Financial Institution:			
Business address:			
Date of Business's most recent financial statement:		☐ Attached	
Date of Business's most recent audited financial statement:		☐ Attached	
Financial indicators from the most recent financial statement			
Contractor's Current Ratio (Current Assets ÷ Current Liabilities)			
Contractor's Quick Ratio ((Cash and Cash Equivalents + Accounts Receivable + Short Term Investments) ÷ Current Liabilities)			

ARTICLE 6—SURETY INFORMATION

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

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

ARTICLE 7—INSURANCE

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

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

Phone (main):		Phone (claims):	

ARTICLE 8—CONSTRUCTION EXPERIENCE

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

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

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

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

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

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

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

ARTICLE 9—REQUIRED ATTACHMENTS

9.01 Provide the following information with the Statement of Qualifications:

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

- D. Financial statements as required by Paragraph 5.01.
- E. Attachments providing additional information as required by Paragraph 8.02.
- F. Schedule A (Current Projects) as required by Paragraph 8.03.
- G. Schedule B (Previous Experience with Similar Projects) as required by Paragraph 8.04.
- H. Schedule C (Key Individuals) and resumes for the key individuals listed, as required by Paragraph 8.05.
- I. Additional items as pertinent.

This Statement of Qualifications is offered by:

Business:

(typed or printed name of organization)

By:

(individual's signature)

Name:

(typed or printed)

Title:

(typed or printed)

Date:

(date signed)

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

Attest:

(individual's signature)

Name:

(typed or printed)

Title:

(typed or printed)

Address for giving notices:

Designated Representative:

Name:

(typed or printed)

Title:

(typed or printed)

Address:

Phone:

Email:

Schedule A—Current Projects

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

Schedule B—Previous Experience with Similar Projects

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

Schedule B—Previous Experience with Similar Projects

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

Schedule C—Key Individuals

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

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

NOTICE OF AWARD

Date of Issuance:

Owner:

Owner's Project No.:

Engineer: HDR Engineering, Inc.

Engineer's Project No.: 10361994

Project: 2023 Water System Improvements

Contract Name:

Bidder:

Bidder's Address:

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

This Project consists of the construction of approximately 18,500 LF of 16-inch watermain and related appurtenances along KY 313 (Joe Prather Highway) and KY 1238 (Garrett Road). Additionally, this Project includes modifications to the existing Flaherty Pump Station including the installation of two (2) new 125 HP VFD controlled pumps. Also, a new Package Pump Station with two (2) 20 HP VFD controlled pumps will be installed along KY 144 in Payneville with two (2) control valves in the area. Lastly, two (2) aboveground storage tanks, Payneville Tank and Garrett Tank, will be spot repaired and recoated. The Payneville Tank will have an 8-inch steel inlet pipe installed within the wet riser.

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

One (1) unexecuted counterparts of the Agreement accompany this Notice of Award, and one copy of the Contract Documents accompanies this Notice of Award, or has been transmitted or made available to Bidder electronically.

☐ Drawings will be delivered separately from the other Contract Documents.

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

1. Deliver to Owner two (2) counterparts of the Agreement, signed by Bidder (as Contractor).
2. Deliver with the signed Agreement(s) the Contract security (such as required performance and payment bonds) and insurance documentation, as specified in the Instructions to Bidders and in the General Conditions, Articles 2 and 6.
3. Other conditions precedent (if any): None.

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

Within 10 days after you comply with the above conditions, Owner will return to you one fully signed counterpart of the Agreement, together with any additional copies of the Contract Documents as indicated in Paragraph 2.02 of the General Conditions.

Meade County Water District

Owner:

By (signature):

Name (printed):

Title:

Copy: Engineer

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AGREEMENT

BETWEEN OWNER AND CONTRACTOR
FOR CONSTRUCTION CONTRACT (STIPULATED PRICE)

This Agreement is by and between Meade County Water District (“Owner”) and [name of contracting entity] (“Contractor”).

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

Owner and Contractor hereby agree as follows:

ARTICLE 1—WORK

- 1.01 Contractor shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows: construction of a 16-inch water main, new package pump station, performing pump station upgrades, and rehabbing two elevated water storage tanks.

ARTICLE 2—THE PROJECT

- 2.01 The Project, of which the Work under the Contract Documents is a part, is generally described as follows:
1. Construction of approximately 18,500 linear feet of 16-inch water main along Joe Prather Highway (KY 313) and Garrett Road (KY 1238) starting at the Flaherty Tank and ending at the Garrett Tank.
 2. Upgrades to the Flaherty Pump Station with two (2) new 125 HP VFD-controlled pumps. Additional improvements include electrical upgrades, generator replacement, and minor site improvements.
 3. Construction of a new packaged pump station site along KY-144 near Payneville. Features at the site include a 20 HP VFD-controlled package pump station, water filling station, and related site improvements.
 4. Improvements to the existing SCADA system including upgraded RTU cabinets and replacing PLCs, terminal boards, relays, servers, workstations, and related hardware at various facilities.

ARTICLE 3—ENGINEER

- 3.01 The Owner has retained HDR Engineering, Inc. (“Engineer”) to act as Owner’s representative, assume all duties and responsibilities of Engineer, and have the rights and authority assigned to Engineer in the Contract.
- 3.02 The part of the Project that pertains to the Work has been designed by Engineer.

ARTICLE 4—CONTRACT TIMES

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

4.02 *Contract Times: Dates*

- A. Deleted

4.03 *Contract Times: Days*

- A. The Base Bid Work will be substantially complete within 300 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 330 days after the date when the Contract Times commence to run.
- B. The Additive Alternate Work will be substantially complete within 480 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 510 days after the date when the Contract Times commence to run.

4.04 *Milestones*

- A. Parts of the Work must be substantially completed on or before the following Milestone(s): 16-inch water main shall be completed within 180 days after the date the Contract Times commence to run. The remaining balance of the Base Bid shall be completed within the time allowed by Section 4.03.A.

4.05 *Liquidated Damages*

- A. Contractor and Owner recognize that time is of the essence as stated in Paragraph 4.01 above and that Owner will suffer financial and other losses if the Work is not completed and Milestones not achieved within the Contract Times, as duly modified. The parties also recognize the delays, expense, and difficulties involved in proving, in a legal or arbitration proceeding, the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty):
 - 1. *Substantial Completion:* Contractor shall pay Owner \$500 for each day that expires after the time (as duly adjusted pursuant to the Contract) specified above for Substantial Completion, until the Work is substantially complete.
 - 2. *Completion of Remaining Work:* After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Times (as duly adjusted pursuant to the Contract) for completion and readiness for final payment, Contractor shall pay Owner \$500 for each day that expires after such time until the Work is completed and ready for final payment.
 - 3. Deleted.
 - 4. Liquidated damages for failing to timely attain Milestones, Substantial Completion, and final completion are not additive, and will not be imposed concurrently.
- B. If Owner recovers liquidated damages for a delay in completion by Contractor, then such liquidated damages are Owner's sole and exclusive remedy for such delay, and Owner is precluded from recovering any other damages, whether actual, direct, excess, or consequential, for such delay, except for special damages (if any) specified in this Agreement.

C. Deleted

4.06 *Special Damages*

- A. Contractor shall reimburse Owner (1) for fines and penalties (if any) imposed on Owner as a direct result of Contractor's failure to attain Substantial Completion according to the Contract Times, (2) for fines and penalties (if any) imposed on Owner by an authority having jurisdiction for actions or inaction of Contractor arising from Contractor's performance of the Work (regardless of whether such event was connected with any delay in compliance with the Contract Times), and (3) for the actual costs reasonably incurred by Owner for engineering, construction observation, inspection, and administrative services needed after the time specified in Paragraph 4.02 for Substantial Completion (as duly adjusted pursuant to the Contract), until the Work is substantially complete.
- B. After Contractor achieves Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Times, Contractor shall reimburse Owner for the actual costs reasonably incurred by Owner for engineering, construction observation, inspection, and administrative services needed after the time specified in Paragraph 4.02 for Work to be completed and ready for final payment (as duly adjusted pursuant to the Contract), until the Work is completed and ready for final payment.
- C. The special damages imposed in this paragraph are supplemental to any liquidated damages for delayed completion established in this Agreement.

4.07 Owner reserves the right to withhold from payments due Contractor under the Contract amounts for liquidated damages (if any), special damages (if any), and performance damages (if any) in accordance with the Contract.

ARTICLE 5—CONTRACT PRICE

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

- A. For all Work other than Unit Price Work, a lump sum of \$[number].

All specific cash allowances are included in the above price in accordance with Paragraph 13.02 of the General Conditions.

- B. For all Unit Price Work, an amount equal to the sum of the extended prices (established for each separately identified item of Unit Price Work by multiplying the unit price times the actual quantity of that item).

BASE BID 1 – Flaherty Transmission Main

Item No.	Description	Unit	Estimated Quantity	Bid Unit Price	Bid Amount
1	Mobilization	LS	1		
2	General Conditions	LS	1		
3	Bonds and Insurance	LS	1		
4	Erosion Prevention and Sediment Control	LS	1		
5	Traffic Control	LS	1		
6	6" SDR17 PVC Water Line	LF	110		

7	8" SDR17 PVC Water Line	LF	65		
8	10" SDR17 PVC Water Line	LF	45		
9	10" CL 350 Ductile Iron Water Line	LF	60		
10	12" SDR17 PVC Water Line	LF	30		
11	16" DR18 PVC Water Line	LF	16,800		
12	16" CL 250 Ductile Iron Water Line	LF	1,260		
13	16" CL 250 Ductile Iron Restrained Water Line	LF	375		
14	24" Steel Encasement Pipe - Bore and Jack	LF	865		
15	Freebore Driveway	EA	5		
16	6" Gate Valve	EA	2		
17	8" Gate Valve	EA	2		
18	16" Butterfly Valve	EA	20		
19	Connect to Ex. 6" Water Main (Cut-in)	EA	2		
20	Connect to Ex. 8" Water Main (Cut-in)	EA	1		
21	8" Tapping Sleeve and Valve	EA	1		
22	10" Tapping Sleeve and Valve	EA	2		
23	12" Tapping Sleeve and Valve	EA	1		
24	6" Fire Hydrant Assembly	EA	6		
25	Air Release Valve Assembly	EA	7		
26	Transfer Existing Water Service	EA	5		
27	Install New Water Service	EA	3		
28	Meter Relocate	EA	2		
29	Reconfigure 8" Water Main	LS	1		
30	Walnut Grove Road Reconnect	LS	1		
31	Concrete Paving Restoration	SY	10		
32	Asphalt Driveway Restoration	SY	100		
33	Demobilization	LS	1		

TOTAL AMOUNT OF BASE BID 1 (Items 1 through 33):

Dollars (\$_____)

BASE BID 2 – Pump Stations, Control Valves, and SCADA Improvements

Item No.	Description	Unit	Estimated Quantity	Bid Unit Price	Bid Amount
1	Mobilization	LS	1		
2	Erosion Prevention & Sediment Control	LS	1		
3	Traffic Control	LS	1		
4	Flaherty Pump Station Upgrade	LS	1		
5	Payneville Package Pump Station	LS	1		
6	New Highland Church Road Control Valve	LS	1		

7	Midway-Sirocco Road Control Valve	LS	1		
8	System Wide SCADA Improvements	LS	1		
9	Electrical Allowance (SCADA Support)	LS	\$50,000		

TOTAL AMOUNT OF BASE BID 2 (Items 1 through 9):

Dollars (\$_____)

TOTAL AMOUNT OF BASE BID (Base Bid 1 + Base Bid 2)

Dollars (\$_____)

The extended prices for Unit Price Work set forth as of the Effective Date of the Contract are based on estimated quantities. As provided in Paragraph 13.03 of the General Conditions, estimated quantities are not guaranteed, and determinations of actual quantities and classifications are to be made by Engineer.

- C. Total of Lump Sum Amount and Unit Price Work (subject to final Unit Price adjustment) \$[amount].
- D. For all Work, at the prices stated in Contractor's Bid, attached hereto as an exhibit.

ARTICLE 6—PAYMENT PROCEDURES

6.01 *Submittal and Processing of Payments*

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

6.02 *Progress Payments; Retainage*

- A. Owner shall make progress payments on the basis of Contractor's Applications for Payment on or about the [ordinal number, such as 5th] day of each month during performance of the Work as provided in Paragraph 6.02.A.1 below, provided that such Applications for Payment have been submitted in a timely manner and otherwise meet the requirements of the Contract. All such payments will be measured by the Schedule of Values established as provided in the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no Schedule of Values, as provided elsewhere in the Contract.

1. Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below but, in each case, less the aggregate of payments previously made and less such amounts as Owner may withhold, including but not limited to liquidated damages, in accordance with the Contract.
 - a. 95 percent of the value of the Work completed (with the balance being retainage).
 - 1) Deleted
 - b. 95 percent of cost of materials and equipment not incorporated in the Work (with the balance being retainage).
 - B. Upon Substantial Completion of the entire construction to be provided under the construction Contract Documents, Owner shall pay an amount sufficient to increase total payments to Contractor to 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 200 percent of Engineer's estimate of the value of Work to be completed or corrected as shown on the punch list of items to be completed or corrected prior to final payment.
- 6.03 *Final Payment*
- A. Upon final completion and acceptance of the Work, Owner shall pay the remainder of the Contract Price in accordance with Paragraph 15.06 of the General Conditions.
- 6.04 *Consent of Surety*
- A. Owner will not make final payment, or return or release retainage at Substantial Completion or any other time, unless Contractor submits written consent of the surety to such payment, return, or release.
- 6.05 *Interest*
- A. All amounts not paid when due will bear interest at the rate of 4 percent per annum.

ARTICLE 7—CONTRACT DOCUMENTS

7.01 *Contents*

- A. The Contract Documents consist of all of the following:
 1. This Agreement.
 2. Bonds:
 - a. Performance bond (together with power of attorney).
 - b. Payment bond (together with power of attorney).
 3. General Conditions.
 4. Supplementary Conditions.
 7. Specifications as listed in the table of contents of the project manual (copy of list attached).
 8. Drawings (not attached but incorporated by reference) consisting of 44 sheets with each sheet bearing the following general title:
 - a. Cover Sheet

- b. General Notes, Utility Information, and Legend
- c. Project Overview Map
- d. Flaherty Transmission Main Plan Index Sheet
- e. Line A -KY-313 Plan and Profile Sta. 10+00 to Sta. 24+00
- f. Line A -KY-313 Plan and Profile Sta. 24+00 to Sta. 39+00
- g. Line A -KY-313 Plan and Profile Sta. 39+00 to Sta. 54+50
- h. Line A -KY-313 Plan and Profile Sta. 54+50 to Sta. 70+00
- i. Line A -KY-313 Plan and Profile Sta. 70+00 to Sta. 86+00
- j. Line A -KY-313 Plan and Profile Sta. 86+00 to Sta. 100+50
- k. Line A -KY-313 Plan and Profile Sta. 100+50 to Sta. 116+00
- l. Line A -KY-313 Plan and Profile Sta. 116+00 to Sta. 131+00
- m. Line A -KY-313 Plan and Profile Sta. 131+00 to Sta. 145+50
- n. Line A -KY-313 Plan and Profile Sta. 145+50 to Sta. 161+00
- o. Line A -KY-1238 Plan and Profile Sta. 161+00 to Sta. 174+00
- p. Line A -KY-1238 Plan and Profile Sta. 174+00 to Sta. 187+00
- q. Line A -KY-1238 Plan and Profile Sta. 87+00 to Sta. 194+86
- r. KY 313 Water Services (South of US60)
- s. KY313 Water Services (North of US60)
- t. Flaherty Pump Station – Existing Conditions & Demo Plan
- u. Flaherty Pump Station – Proposed Site Plan and Temporary Bypass Pumping
- v. Flaherty Pump Station – Proposed Grading & EPSC Plan
- w. Flaherty Pump Station – Process Demolition Plan and Sections
- x. Flaherty Pump Station – Modification Plan and Sections
- y. Payneville Pump Station – Site Layout
- z. Payneville Pump Station – Grading Plan
- aa. Payneville Pump Station – Process Plan & Section
- bb. Payneville Pump Station – Bulk Water Filling Station Plan & Section
- cc. Control Valve Vault Site Plans
- dd. Payneville Storage Tank Inlet Pipe Detail
- ee. Civil Standard Details (1 of 2)
- ff. Civil Standard Details (2 of 2)
- gg. Civil EPSC Notes and Details
- hh. Electrical Legend and Details (1 of 2)

- ii. Electrical Legend and Details (2 of 2)
 - jj. Flaherty Pump Station One Line Diagrams
 - kk. Flaherty Pump Station Site Plans
 - ll. Flaherty Pump Station Power Plans
 - mm. Payneville Pump Station One Line Diagram
 - nn. Panyeville Pump Station Electrical Site Plan
 - oo. Control Valve Vault Power Plans
 - pp. Schedules
 - qq. Electrical Details 1 of 2
 - rr. Electrical Details 2 of 2
10. Addenda (numbers [number] to [number], inclusive).
11. Exhibits to this Agreement (enumerated as follows):
- a. [list exhibits]
12. The following which may be delivered or issued on or after the Effective Date of the Contract and are not attached hereto:
- a. Notice to Proceed.
 - b. Work Change Directives.
 - c. Change Orders.
 - d. Field Orders.
 - e. Warranty Bond, if any.
- B. The Contract Documents listed in Paragraph 7.01.A are attached to this Agreement (except as expressly noted otherwise above).
- C. There are no Contract Documents other than those listed above in this Article 7.
- D. The Contract Documents may only be amended, modified, or supplemented as provided in the Contract.

ARTICLE 8—REPRESENTATIONS, CERTIFICATIONS, AND STIPULATIONS

8.01 Contractor's Representations

- A. In order to induce Owner to enter into this Contract, Contractor makes the following representations:
- 1. Contractor has examined and carefully studied the Contract Documents, including Addenda.
 - 2. Contractor has visited the Site, conducted a thorough visual examination of the Site and adjacent areas, and become familiar with the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

3. Contractor is familiar with all Laws and Regulations that may affect cost, progress, and performance of the Work.
4. Contractor has carefully studied the reports of explorations and tests of subsurface conditions at or adjacent to the Site and the drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, with respect to the Technical Data in such reports and drawings.
5. Contractor has carefully studied the reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, with respect to Technical Data in such reports and drawings.
6. Contractor has considered the information known to Contractor itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Contract Documents; and the Technical Data identified in the Supplementary Conditions or by definition, with respect to the effect of such information, observations, and Technical Data on (a) the cost, progress, and performance of the Work; (b) the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor; and (c) Contractor's safety precautions and programs.
7. Based on the information and observations referred to in the preceding paragraph, Contractor agrees that no further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract.
8. Contractor is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Contract Documents.
9. Contractor has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and of discrepancies between Site conditions and the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.
10. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.
11. Contractor's entry into this Contract constitutes an incontrovertible representation by Contractor that without exception all prices in the Agreement are premised upon performing and furnishing the Work required by the Contract Documents.

8.02 *Contractor's Certifications*

- A. Contractor certifies that it has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Contract. For the purposes of this Paragraph 8.02:
 1. "corrupt practice" means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process or in the Contract execution;

2. “fraudulent practice” means an intentional misrepresentation of facts made (a) to influence the bidding process or the execution of the Contract to the detriment of Owner, (b) to establish Bid or Contract prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;
3. “collusive practice” means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish Bid prices at artificial, non-competitive levels; and
4. “coercive practice” means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

8.03 *Standard General Conditions*

- A. Owner stipulates that if the General Conditions that are made a part of this Contract are EJCDC® C-700, Standard General Conditions for the Construction Contract (2018), published by the Engineers Joint Contract Documents Committee, and if Owner is the party that has furnished said General Conditions, then Owner has plainly shown all modifications to the standard wording of such published document to the Contractor, through a process such as highlighting or “track changes” (redline/strikeout), or in the Supplementary Conditions.

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

This Agreement will be effective on [indicate date on which Contract becomes effective] (which is the Effective Date of the Contract).

Contractor:

(typed or printed name of organization)

By: _____
(individual's signature)

Date: _____
(date signed)

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Attest: _____
(individual's signature)

Title: _____
(typed or printed)

Address for giving notices:

Designated Representative:

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Address:

Phone: _____

Email: _____

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

(typed or printed name of organization)

By: _____
(individual's signature)

Date: _____
(date signed)

Name: _____
(typed or printed)

Title: _____
(typed or printed)

(If [Type of Entity] is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.)

Attest: _____
(individual's signature)

Title: _____
(typed or printed)

Address for giving notices:

Designated Representative:

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Address:

Phone: _____

Email: _____

License No.: _____
(where applicable)

State: _____

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

CERTIFICATE OF OWNER'S ATTORNEY

PROJECT NAME:

CONTRACTOR NAME AND CONTRACT NUMBER:

I, the undersigned, _____, the duly authorized and
acting legal representative of

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

Name

Date

AGENCY CONCURRENCE

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

Agency Representative

Date

Name

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NOTICE TO PROCEED

Owner: _____ Owner's Project No.: _____
Engineer: HDR Engineering, Inc. Engineer's Project No.: _____
Contractor: _____ Contractor's Project No.: _____
Project: 2023 Water System Improvements
Contract Name: _____
Effective Date of Contract: _____

Owner hereby notifies Contractor that the Contract Times under the above Contract will commence to run on [date Contract Times are to start] pursuant to Paragraph 4.01 of the General Conditions.

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

In accordance with the Agreement:

The number of days to achieve Substantial Completion is [number of days, from Agreement] from the date stated above for the commencement of the Contract Times, resulting in a date for Substantial Completion of [date, calculated from commencement date above]; and the number of days to achieve readiness for final payment is [number of days, from Agreement] from the commencement date of the Contract Times, resulting in a date for readiness for final payment of [date, calculated from commencement date above].

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

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

Owner: Meade County Water District
By (*signature*): _____
Name (*printed*): _____
Title: _____
Date Issued: _____
Copy: Engineer

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PERFORMANCE BOND

Contractor Name: _____ Address <i>(principal place of business)</i> : _____ 	Surety Name: _____ [Full formal name of Surety] Address <i>(principal place of business)</i> : _____
Owner Name: Meade County Water District Mailing address <i>(principal place of business)</i> : 1003 Armory Place Brandenburg, KY 40108	Contract Description <i>(name and location)</i> : Contract Price: Effective Date of Contract:
Bond Bond Amount: _____ [Amount] Date of Bond: _____ [Date] <i>(Date of Bond cannot be earlier than Effective Date of Contract)</i> Modifications to this Bond form: ☐ None ☐ See Paragraph 16	
Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth in this Performance Bond, do each cause this Performance Bond to be duly executed by an authorized officer, agent, or representative.	
Contractor as Principal	Surety
_____	_____
<i>(Full formal name of Contractor)</i>	<i>(Full formal name of Surety) (corporate seal)</i>
By: _____	By: _____
<i>(Signature)</i>	<i>(Signature)(Attach Power of Attorney)</i>
Name: _____	Name: _____
<i>(Printed or typed)</i>	<i>(Printed or typed)</i>
Title: _____	Title: _____
Attest: _____	Attest: _____
<i>(Signature)</i>	<i>(Signature)</i>
Name: _____	Name: _____
<i>(Printed or typed)</i>	<i>(Printed or typed)</i>
Title: _____	Title: _____
<i>Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party is considered plural where applicable.</i>	

1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.
2. If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Paragraph 3.
3. If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond will arise after:
 - 3.1. The Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice may indicate whether the Owner is requesting a conference among the Owner, Contractor, and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Paragraph 3.1 will be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor, and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement does not waive the Owner's right, if any, subsequently to declare a Contractor Default;
 - 3.2. The Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and
 - 3.3. The Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.
4. Failure on the part of the Owner to comply with the notice requirement in Paragraph 3.1 does not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.
5. When the Owner has satisfied the conditions of Paragraph 3, the Surety shall promptly and at the Surety's expense take one of the following actions:
 - 5.1. Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;
 - 5.2. Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;
 - 5.3. Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owners concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Paragraph 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or
 - 5.4. Waive its right to perform and complete, arrange for completion, or obtain a new contractor, and with reasonable promptness under the circumstances:

- 5.4.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or
 - 5.4.2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.
- 6. If the Surety does not proceed as provided in Paragraph 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Paragraph 5.4, and the Owner refuses the payment, or the Surety has denied liability, in whole or in part, without further notice, the Owner shall be entitled to enforce any remedy available to the Owner.
- 7. If the Surety elects to act under Paragraph 5.1, 5.2, or 5.3, then the responsibilities of the Surety to the Owner will not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety will not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication for:
 - 7.1. the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;
 - 7.2. additional legal, design professional, and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Paragraph 5; and
 - 7.3. liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.
- 8. If the Surety elects to act under Paragraph 5.1, 5.3, or 5.4, the Surety's liability is limited to the amount of this Bond.
- 9. The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price will not be reduced or set off on account of any such unrelated obligations. No right of action will accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors, and assigns.
- 10. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.
- 11. Any proceeding, legal or equitable, under this Bond must be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and must be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this paragraph are void or prohibited by law, the minimum periods of limitations available to sureties as a defense in the jurisdiction of the suit will be applicable.
- 12. Notice to the Surety, the Owner, or the Contractor must be mailed or delivered to the address shown on the page on which their signature appears.
- 13. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement will be deemed deleted therefrom and provisions conforming to such

statutory or other legal requirement will be deemed incorporated herein. When so furnished, the intent is that this Bond will be construed as a statutory bond and not as a common law bond.

14. Definitions

- 14.1. *Balance of the Contract Price*—The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made including allowance for the Contractor for any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.
 - 14.2. *Construction Contract*—The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.
 - 14.3. *Contractor Default*—Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.
 - 14.4. *Owner Default*—Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.
 - 14.5. *Contract Documents*—All the documents that comprise the agreement between the Owner and Contractor.
15. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond will be deemed to be Subcontractor and the term Owner will be deemed to be Contractor.
16. Modifications to this Bond are as follows: None

PAYMENT BOND

Contractor Name: _____ Address <i>(principal place of business)</i> : _____	Surety Name: _____ [Full formal name of Surety] Address <i>(principal place of business)</i> : _____
Owner Name: Meade County Water District Mailing address <i>(principal place of business)</i> : 1003 Armory Place Brandenburg, KY 40107	Contract Description <i>(name and location)</i> : _____ Contract Price: _____ Effective Date of Contract: _____
Bond Bond Amount: [Amount] Date of Bond: [Date] <i>(Date of Bond cannot be earlier than Effective Date of Contract)</i> Modifications to this Bond form: ☐ None ☐ See Paragraph 18	
Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth in this Payment Bond, do each cause this Payment Bond to be duly executed by an authorized officer, agent, or representative.	
Contractor as Principal	Surety
_____ <i>(Full formal name of Contractor)</i>	_____ <i>(Full formal name of Surety) (corporate seal)</i>
By: _____ <i>(Signature)</i>	By: _____ <i>(Signature)(Attach Power of Attorney)</i>
Name: _____ <i>(Printed or typed)</i>	Name: _____ <i>(Printed or typed)</i>
Title: _____	Title: _____
Attest: _____ <i>(Signature)</i>	Attest: _____ <i>(Signature)</i>
Name: _____ <i>(Printed or typed)</i>	Name: _____ <i>(Printed or typed)</i>
Title: _____	Title: _____
<i>Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party is considered plural where applicable.</i>	

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

8. The Surety's total obligation will not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Paragraph 7.3, and the amount of this Bond will be credited for any payments made in good faith by the Surety.
9. Amounts owed by the Owner to the Contractor under the Construction Contract will be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfying obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.
10. The Surety shall not be liable to the Owner, Claimants, or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to or give notice on behalf of Claimants, or otherwise have any obligations to Claimants under this Bond.
11. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.
12. No suit or action will be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Paragraph 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit will be applicable.
13. Notice and Claims to the Surety, the Owner, or the Contractor must be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, will be sufficient compliance as of the date received.
14. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement will be deemed deleted here from and provisions conforming to such statutory or other legal requirement will be deemed incorporated herein. When so furnished, the intent is that this Bond will be construed as a statutory bond and not as a common law bond.
15. Upon requests by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.
16. Definitions
 - 16.1. *Claim*—A written statement by the Claimant including at a minimum:
 - 16.1.1. The name of the Claimant;
 - 16.1.2. The name of the person for whom the labor was done, or materials or equipment furnished;
 - 16.1.3. A copy of the agreement or purchase order pursuant to which labor, materials, or equipment was furnished for use in the performance of the Construction Contract;
 - 16.1.4. A brief description of the labor, materials, or equipment furnished;

- 16.1.5. The date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
 - 16.1.6. The total amount earned by the Claimant for labor, materials, or equipment furnished as of the date of the Claim;
 - 16.1.7. The total amount of previous payments received by the Claimant; and
 - 16.1.8. The total amount due and unpaid to the Claimant for labor, materials, or equipment furnished as of the date of the Claim.
- 16.2. *Claimant*—An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials, or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond is to include without limitation in the terms of "labor, materials, or equipment" that part of the water, gas, power, light, heat, oil, gasoline, telephone service, or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials, or equipment were furnished.
- 16.3. *Construction Contract*—The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.
- 16.4. *Owner Default*—Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.
- 16.5. *Contract Documents*—All the documents that comprise the agreement between the Owner and Contractor.
17. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond will be deemed to be Subcontractor and the term Owner will be deemed to be Contractor.
18. Modifications to this Bond are as follows: None.

Contractor's Application for Payment

Owner: <u>Meade County Water District</u>	Owner's Project No.: _____
Engineer: <u>HDR Engineering, Inc.</u>	Engineer's Project No.: <u>10361994</u>
Contractor: _____	Contractor's Project No.: _____
Project: <u>2023 Water System Improvements</u>	
Contract: _____	
Application No.: _____	Application Date: _____
Application Period: From _____ to _____	

1. Original Contract Price	\$	-
2. Net change by Change Orders	\$	-
3. Current Contract Price (Line 1 + Line 2)	\$	-
4. Total Work completed and materials stored to date (Sum of Column G Lump Sum Total and Column J Unit Price Total)	\$	-
5. Retainage		
a. _____ X \$ - Work Completed =	\$	-
b. _____ X \$ - Stored Materials =	\$	-
c. Total Retainage (Line 5.a + Line 5.b)	\$	-
6. Amount eligible to date (Line 4 - Line 5.c)	\$	-
7. Less previous payments (Line 6 from prior application)		
8. Amount due this application	\$	-
9. Balance to finish, including retainage (Line 3 - Line 4 + Line 5.c)	\$	-

Contractor's Certification

The undersigned Contractor certifies, to the best of its knowledge, the following:

(1) All previous progress payments received from Owner on account of Work done under the Contract have been applied on account to discharge Contractor's legitimate obligations incurred in connection with the Work covered by prior Applications for Payment;

(2) Title to all Work, materials and equipment incorporated in said Work, or otherwise listed in or covered by this Application for Payment, will pass to Owner at time of payment free and clear of all liens, security interests, and encumbrances (except such as are covered by a bond acceptable to Owner indemnifying Owner against any such liens, security interest, or encumbrances); and

(3) All the Work covered by this Application for Payment is in accordance with the Contract Documents and is not defective.

Contractor: _____	
Signature: _____	Date: _____

Recommended by Engineer	Approved by Owner
By: _____	By: _____
Title: _____	Title: _____
Date: _____	Date: _____
Approved by Funding Agency	
By: _____	By: _____
Title: _____	Title: _____
Date: _____	Date: _____

Progress Estimate - Lump Sum Work

Contractor's Application for Payment

Owner: Meade County Water District		Owner's Project No.:	
Engineer: HDR Engineering, Inc.		Engineer's Project No.: 10361994	
Contractor:		Contractor's Project No.:	
Project: 2023 Water System Improvements			
Contract:			

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

A	B	C	D	E	F	G	H	I
Item No.	Description	Scheduled Value (\$)	Work Completed		Materials Currently Stored (not in D or E) (\$)	Work Completed and Materials Stored to Date (D + E + F) (\$)	% of Scheduled Value (G / C) (%)	Balance to Finish (C - G) (\$)
			(D + E) From Previous Application (\$)	This Period (\$)				
Original Contract								
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Original Contract Totals		\$ -	\$ -	\$ -	\$ -	\$ -		\$ -

Progress Estimate - Lump Sum Work

Contractor's Application for Payment

Owner: Meade County Water District		Owner's Project No.:	
Engineer: HDR Engineering, Inc.		Engineer's Project No.: 10361994	
Contractor:		Contractor's Project No.:	
Project: 2023 Water System Improvements			
Contract:			

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

A	B	C	D	E	F	G	H	I
Item No.	Description	Scheduled Value (\$)	Work Completed		Materials Currently Stored (not in D or E) (\$)	Work Completed and Materials Stored to Date (D + E + F) (\$)	% of Scheduled Value (G / C) (%)	Balance to Finish (C - G) (\$)
			(D + E) From Previous Application (\$)	This Period (\$)				
Change Orders								
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Change Order Totals		\$ -	\$ -	\$ -	\$ -	\$ -		\$ -
Original Contract and Change Orders								
Project Totals		\$ -	\$ -	\$ -	\$ -	\$ -		\$ -

Progress Estimate - Unit Price Work

Contractor's Application for Payment

Owner:	Meade County Water District	Owner's Project No.:	
Engineer:	HDR Engineering, Inc.	Engineer's Project No.:	10361994
Contractor:		Contractor's Project No.:	
Project:	2023 Water System Improvements		
Contract:			

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

Contractor's Application for Payment

Owner:	Meade County Water District	Owner's Project No.:	
Engineer:	HDR Engineering, Inc.	Engineer's Project No.:	10361994
Contractor:		Contractor's Project No.:	
Project:	2023 Water System Improvements		
Contract:			

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

Contractor's Application for Payment

Owner: Meade County Water District						Owner's Project No.:							
Engineer: HDR Engineering, Inc.						Engineer's Project No.: 10361994							
Contractor:						Contractor's Project No.:							
Project: 2023 Water System Improvements													
Contract:													
Application No.:		Application Period: From		to		Application Date:							
A	B	C	D	E	F	G	H	I	J	K	L	M	
Item No. (Lump Sum Tab) or Bid Item No. (Unit Price Tab)	Supplier Invoice No.	Submittal No. (with Specification Section No.)	Description of Materials or Equipment Stored	Storage Location	Application No. When Materials Placed in Storage	Materials Stored			Incorporated in Work			Materials Remaining in Storage (I-L) (\$)	
						Previous Amount Stored (\$)	Amount Stored this Period (\$)	Amount Stored to Date (G+H) (\$)	Amount Previously Incorporated in the Work (\$)	Amount Incorporated in the Work this Period (\$)	Total Amount Incorporated in the Work (J+K) (\$)		
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Totals						\$	-	\$	-	\$	-	\$	-

- A. HDR's ENG MSS team has already removed the cover page and made the Guidelines for Use hidden text.

FIELD ORDER NO.: [Number of Field Order]

Owner:		Owner's Project No.:	
Engineer:	HDR Engineering, Inc.	Engineer's Project No.:	10361994
Contractor:		Contractor's Project No.:	
Project:	2023 Water System Improvements		
Contract Name:			
Date Issued:		Effective Date of Field Order:	

Contractor is hereby directed to promptly perform the Work described in this Field Order, issued in accordance with Paragraph 11.04 of the General Conditions, for minor changes in the Work without changes in Contract Price or Contract Times. If Contractor considers that a change in Contract Price or Contract Times is required, submit a Change Proposal before proceeding with this Work.

Reference:

Specification Section(s):

Drawing(s) / Details (s):

Description:

[Description of the change to the Work]

Attachments:

[List documents supporting change]

Issued by Engineer

By: _____
Title: _____
Date: _____

This page intentionally left blank.

WORK CHANGE DIRECTIVE NO.: [Number of Work Change Directive]

Owner: _____ Owner's Project No.: _____
Engineer: _____ Engineer's Project No.: 10361994
Contractor: _____ Contractor's Project No.: _____
Project: 2023 Water System Improvements
Contract Name: _____
Date Issued: _____ Effective Date of Work Change Directive: _____

Contractor is directed to proceed promptly with the following change(s):

Description:

[Description of the change to the Work]

Attachments:

[List documents related to the change to the Work]

Purpose for the Work Change Directive:

[Describe the purpose for the change to the Work]

Directive to proceed promptly with the Work described herein, prior to agreeing to change in Contract Price and Contract Time, is issued due to:

☐ Non-agreement on pricing of proposed change. ☐ Necessity to proceed for schedule or other reasons.

Estimated Change in Contract Price and Contract Times (non-binding, preliminary):

Contract Price: \$ _____ [increase] [decrease] [not yet estimated].

Contract Time: _____ days [increase] [decrease] [not yet estimated].

Basis of estimated change in Contract Price:

☐ Lump Sum ☐ Unit Price ☐ Cost of the Work ☐ Other

Recommended by Engineer

Authorized by Owner

By:

Title:

Date:

This page intentionally left blank.

CHANGE ORDER NO.: [Number of Change Order]

Owner:
 Engineer: HDR Engineering, Inc.
 Contractor:
 Project: 2023 Water System Improvements
 Contract Name:

Owner's Project No.:
 Engineer's Project No.: 10361994
 Contractor's Project No.:

Date Issued: Effective Date of Change Order:

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

Description:

[Description of the change]

Attachments:

[List documents related to the change]

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

Recommended by Engineer (if required)
 By: _____
 Title: _____
 Date: _____

Authorized by Owner
 By: _____
 Title: _____
 Date: _____

Accepted by Contractor

Approved by Funding Agency (if applicable)

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SAMPLE LANGUAGE FOR CONTRACTOR'S CERTIFICATION OF COMPLIANCE

Notes to User:

1. *This attachment provides sample language that the Contractor can use to certify compliance with the Build America Buy America Act (BABAA) requirements. The language can be modified.*
Modification Example: If the project is subject to AIS, the BABAA reference should be replaced with language such as "American Iron and Steel (AIS) requirements mandated by Section 746 of Title VII of the Consolidated Appropriations Act of 2017 and subsequent annual appropriations for WWD programs."
2. *The certification should be on letterhead and should be signed and dated by an authorized company representative.*
3. *A certification is to be provided by Contractor to Engineer for delivery to the Owner and Agency prior to final payment.*

Project Name

Owner / Applicant

Contract Number

I hereby certify, that to the best of my knowledge and belief, all Iron and Steel products, Manufactured Products, and Construction Materials 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 the Build America, Buy America Act (BABAA) requirements under Title IX of the Infrastructure Investment and Jobs Act (IIJA), Pub. L. 117-58, §§ 70901-70953 or are the subject of a waiver approved by the Secretary of Agriculture or designee.

Name of Contractor Authorized Representative

Date

Contractor Company Name

Contractor Address

SAMPLE LANGUAGE FOR MANUFACTURER'S CERTIFICATION OF COMPLIANCE

Notes to User:

- 1. This attachment provides sample language for the Manufacturer's Certification of Compliance with Domestic Preference requirements.*
- 2. Contractor should ensure that Engineer has an approved Manufacturers' Certification prior to any domestic preference item being delivered to the project site.*
- 3. The Manufacturer's Certification must be on letterhead and should indicate the specific item being certified, reference which domestic preference requirement is being certified, and be signed by an authorized company representative.*
- 4. The Manufacturer's Certification may include multiple domestic preference requirements. It is important for the governing domestic preference requirement (whether AIS, BABAA or other) to be clearly included within the certification.*

Date:

Company Name:

Company
Address:

Subject: Domestic Preference Requirement Certification for {*Owner's Name* and *Project Name (City, State)*}, and Contract Number

I hereby certify that the following product(s) and / or material(s) shipped or provided for the subject project are in full compliance with the Build America, Buy America Act (BABAA) requirements under Title IX of the Infrastructure Investment and Jobs Act (IIJA), Pub. L. 117-58, §§ 70901-70953.

[List common name of items, products and/or materials]

These products and/or materials were manufactured in [Provide location(s) of manufacturing]

[Include signature of authorized representative]

CERTIFICATE OF SUBSTANTIAL COMPLETION

Owner:
Engineer: HDR Engineering, Inc.
Contractor:
Project: 2023 Water system Improvements
Contract Name:

Owner's Project No.:
Engineer's Project No.: 10361994
Contractor's Project No.:

This ☐ Preliminary ☐ Final Certificate of Substantial Completion applies to:

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

[Describe the portion of the work for which Certificate of Substantial Completion is issued]

Date of Substantial Completion: [Enter date, as determined by Engineer]

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

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

Amendments of contractual responsibilities recorded in this Certificate should be the product of mutual agreement of Owner and Contractor; see Paragraph 15.03.D of the General Conditions.

The responsibilities between Owner and Contractor for security, operation, safety, maintenance, heat, utilities, insurance, and warranties upon Owner's use or occupancy of the Work must be as provided in the Contract, except as amended as follows:

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

[List amendments to Owner's Responsibilities]

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

[List amendments to Contractor's Responsibilities]

The following documents are attached to and made a part of this Certificate:

[List attachments such as punch list; other documents]

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

Engineer

By (*signature*):

Name (*printed*):

Title:

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NOTICE OF ACCEPTABILITY OF WORK

Owner:		Owner's Project No.:	
Engineer:		Engineer's Project No.:	10361994
Contractor:		Contractor's Project No.:	
Project:	2023 Water System Improvements		
Contract Name:			
Notice Date:		Effective Date of the Construction Contract:	

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

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

Engineer

By (signature): _____
Name (printed): _____
Title: _____

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STANDARD GENERAL CONDITIONS

OF THE CONSTRUCTION CONTRACT

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STANDARD GENERAL CONDITIONS

OF THE CONSTRUCTION CONTRACT

ARTICLE 1—DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

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

requirements of the Contract Documents or the acceptability of Work under the Contract Documents; contesting Engineer's decision regarding a Change Proposal; seeking resolution of a contractual issue that Engineer has declined to address; or seeking other relief with respect to the terms of the Contract.

- b. A demand or assertion by Contractor directly to Owner, duly submitted in compliance with the procedural requirements set forth herein, contesting Engineer's decision regarding a Change Proposal, or seeking resolution of a contractual issue that Engineer has declined to address.
 - c. A demand or assertion by Owner or Contractor, duly submitted in compliance with the procedural requirements set forth herein, made pursuant to Paragraph 12.01.A.4, concerning disputes arising after Engineer has issued a recommendation of final payment.
 - d. A demand for money or services by a third party is not a Claim.
11. *Constituent of Concern*—Asbestos, petroleum, radioactive materials, polychlorinated biphenyls (PCBs), lead-based paint (as defined by the HUD/EPA standard), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to Laws and Regulations regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.
12. *Contract*—The entire and integrated written contract between Owner and Contractor concerning the Work.
13. *Contract Documents*—Those items so designated in the Agreement, and which together comprise the Contract.
14. *Contract Price*—The money that Owner has agreed to pay Contractor for completion of the Work in accordance with the Contract Documents.
15. *Contract Times*—The number of days or the dates by which Contractor shall: (a) achieve Milestones, if any; (b) achieve Substantial Completion; and (c) complete the Work.
16. *Contractor*—The individual or entity with which Owner has contracted for performance of the Work.
17. *Cost of the Work*—See Paragraph 13.01 for definition.
18. *Drawings*—The part of the Contract that graphically shows the scope, extent, and character of the Work to be performed by Contractor.
19. *Effective Date of the Contract*—The date, indicated in the Agreement, on which the Contract becomes effective.
20. *Electronic Document*—Any Project-related correspondence, attachments to correspondence, data, documents, drawings, information, or graphics, including but not limited to Shop Drawings and other Submittals, that are in an electronic or digital format.
21. *Electronic Means*—Electronic mail (email), upload/download from a secure Project website, or other communications methods that allow: (a) the transmission or communication of Electronic Documents; (b) the documentation of transmissions, including sending and receipt; (c) printing of the transmitted Electronic Document by the

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

22. *Engineer*—The individual or entity named as such in the Agreement.
23. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but does not change the Contract Price or the Contract Times.
24. *Hazardous Environmental Condition*—The presence at the Site of Constituents of Concern in such quantities or circumstances that may present a danger to persons or property exposed thereto.
 - a. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated into the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, is not a Hazardous Environmental Condition.
 - b. The presence of Constituents of Concern that are to be removed or remediated as part of the Work is not a Hazardous Environmental Condition.
 - c. The presence of Constituents of Concern as part of the routine, anticipated, and obvious working conditions at the Site, is not a Hazardous Environmental Condition.
25. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and binding decrees, resolutions, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
26. *Liens*—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.
27. *Milestone*—A principal event in the performance of the Work that the Contract requires Contractor to achieve by an intermediate completion date, or by a time prior to Substantial Completion of all the Work.
28. *Notice of Award*—The written notice by Owner to a Bidder of Owner's acceptance of the Bid.
29. *Notice to Proceed*—A written notice by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work.
30. *Owner*—The individual or entity with which Contractor has contracted regarding the Work, and which has agreed to pay Contractor for the performance of the Work, pursuant to the terms of the Contract.
31. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising Contractor's plan to accomplish the Work within the Contract Times.
32. *Project*—The total undertaking to be accomplished for Owner by engineers, contractors, and others, including planning, study, design, construction, testing, commissioning, and start-up, and of which the Work to be performed under the Contract Documents is a part.

33. *Resident Project Representative*—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative (RPR) includes any assistants or field staff of Resident Project Representative.
34. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and that establish the standards by which such portion of the Work will be judged.
35. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements for Engineer’s review of the submittals.
36. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor’s Applications for Payment.
37. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information that are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work. Shop Drawings, whether approved or not, are not Drawings and are not Contract Documents.
38. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements, and such other lands or areas furnished by Owner which are designated for the use of Contractor.
39. *Specifications*—The part of the Contract that consists of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable to the Work.
40. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work.
41. *Submittal*—A written or graphic document, prepared by or for Contractor, which the Contract Documents require Contractor to submit to Engineer, or that is indicated as a Submittal in the Schedule of Submittals accepted by Engineer. Submittals may include Shop Drawings and Samples; schedules; product data; Owner-delegated designs; sustainable design information; information on special procedures; testing plans; results of tests and evaluations, source quality-control testing and inspections, and field or Site quality-control testing and inspections; warranties and certifications; Suppliers’ instructions and reports; records of delivery of spare parts and tools; operations and maintenance data; Project photographic documentation; record documents; and other such documents required by the Contract Documents. Submittals, whether or not approved or accepted by Engineer, are not Contract Documents. Change Proposals, Change Orders, Claims, notices, Applications for Payment, and requests for interpretation or clarification are not Submittals.
42. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms “substantially complete” and “substantially completed” as applied to all or part of the Work refer to Substantial Completion of such Work.

43. *Successful Bidder*—The Bidder to which the Owner makes an award of contract.
44. *Supplementary Conditions*—The part of the Contract that amends or supplements these General Conditions.
45. *Supplier*—A manufacturer, fabricator, supplier, distributor, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or a Subcontractor.
46. *Technical Data*
- a. Those items expressly identified as Technical Data in the Supplementary Conditions, with respect to either (1) existing subsurface conditions at or adjacent to the Site, or existing physical conditions at or adjacent to the Site including existing surface or subsurface structures (except Underground Facilities) or (2) Hazardous Environmental Conditions at the Site.
 - b. If no such express identifications of Technical Data have been made with respect to conditions at the Site, then Technical Data is defined, with respect to conditions at the Site under Paragraphs 5.03, 5.04, and 5.06, as the data contained in boring logs, recorded measurements of subsurface water levels, assessments of the condition of subsurface facilities, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical, environmental, or other Site or facilities conditions report prepared for the Project and made available to Contractor.
 - c. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data, and instead Underground Facilities are shown or indicated on the Drawings.
47. *Underground Facilities*—All active or not-in-service underground lines, pipelines, conduits, ducts, encasements, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or systems at the Site, including but not limited to those facilities or systems that produce, transmit, distribute, or convey telephone or other communications, cable television, fiber optic transmissions, power, electricity, light, heat, gases, oil, crude oil products, liquid petroleum products, water, steam, waste, wastewater, storm water, other liquids or chemicals, or traffic or other control systems. An abandoned facility or system is not an Underground Facility.
48. *Unit Price Work*—Work to be paid for on the basis of unit prices.
49. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction; furnishing, installing, and incorporating all materials and equipment into such construction; and may include related services such as testing, start-up, and commissioning, all as required by the Contract Documents.
50. *Work Change Directive*—A written directive to Contractor issued on or after the Effective Date of the Contract, signed by Owner and recommended by Engineer, ordering an addition, deletion, or revision in the Work.

1.02 Terminology

- A. The words and terms discussed in Paragraphs 1.02.B, C, D, and E are not defined terms that require initial capital letters, but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.
- B. *Intent of Certain Terms or Adjectives:* The Contract Documents include the terms “as allowed,” “as approved,” “as ordered,” “as directed” or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” “satisfactory,” or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Article 10 or any other provision of the Contract Documents.
- C. *Day:* The word “day” means a calendar day of 24 hours measured from midnight to the next midnight.
- D. *Defective:* The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:
 - 1. does not conform to the Contract Documents;
 - 2. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or
 - 3. has been damaged prior to Engineer’s recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 15.03 or Paragraph 15.04).
- E. *Furnish, Install, Perform, Provide*
 - 1. The word “furnish,” when used in connection with services, materials, or equipment, means to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.
 - 2. The word “install,” when used in connection with services, materials, or equipment, means to put into use or place in final position said services, materials, or equipment complete and ready for intended use.
 - 3. The words “perform” or “provide,” when used in connection with services, materials, or equipment, means to furnish and install said services, materials, or equipment complete and ready for intended use.
 - 4. If the Contract Documents establish an obligation of Contractor with respect to specific services, materials, or equipment, but do not expressly use any of the four words “furnish,” “install,” “perform,” or “provide,” then Contractor shall furnish and install said services, materials, or equipment complete and ready for intended use.

- F. *Contract Price or Contract Times*: References to a change in “Contract Price or Contract Times” or “Contract Times or Contract Price” or similar, indicate that such change applies to (1) Contract Price, (2) Contract Times, or (3) both Contract Price and Contract Times, as warranted, even if the term “or both” is not expressed.
- G. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2—PRELIMINARY MATTERS

2.01 *Delivery of Performance and Payment Bonds; Evidence of Insurance*

- A. *Performance and Payment Bonds*: When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner the performance bond and payment bond (if the Contract requires Contractor to furnish such bonds).
- B. *Evidence of Contractor’s Insurance*: When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each additional insured (as identified in the Contract), the certificates, endorsements, and other evidence of insurance required to be provided by Contractor in accordance with Article 6, except to the extent the Supplementary Conditions expressly establish other dates for delivery of specific insurance policies.
- C. *Evidence of Owner’s Insurance*: After receipt of the signed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor, with copies to each additional insured (as identified in the Contract), the certificates and other evidence of insurance required to be provided by Owner under Article 6.

2.02 *Copies of Documents*

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

2.03 *Before Starting Construction*

- A. *Preliminary Schedules*: Within 10 days after the Effective Date of the Contract (or as otherwise required by the Contract Documents), Contractor shall submit to Engineer for timely review:
 - 1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract;
 - 2. a preliminary Schedule of Submittals; and
 - 3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work

into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.04 *Preconstruction Conference; Designation of Authorized Representatives*

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

2.05 *Acceptance of Schedules*

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

2.06 *Electronic Transmittals*

- A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may send, and shall accept, Electronic Documents transmitted by Electronic Means.
- B. If the Contract does not establish protocols for Electronic Means, then Owner, Engineer, and Contractor shall jointly develop such protocols.
- C. Subject to any governing protocols for Electronic Means, when transmitting Electronic Documents by Electronic Means, the transmitting party makes no representations as to long-term compatibility, usability, or readability of the Electronic Documents resulting from the recipient's use of software application packages, operating systems, or computer hardware differing from those used in the drafting or transmittal of the Electronic Documents.

ARTICLE 3—CONTRACT DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 *Intent*

- A. The Contract Documents are complementary; what is required by one Contract Document is as binding as if required by all.
- B. It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents.
- C. Unless otherwise stated in the Contract Documents, if there is a discrepancy between the electronic versions of the Contract Documents (including any printed copies derived from such electronic versions) and the printed record version, the printed record version will govern.
- D. The Contract supersedes prior negotiations, representations, and agreements, whether written or oral.
- E. Engineer will issue clarifications and interpretations of the Contract Documents as provided herein.
- F. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation will be deemed stricken, and all remaining provisions will continue to be valid and binding upon Owner and Contractor, which agree that the Contract Documents will be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.
- G. Nothing in the Contract Documents creates:
 - 1. any contractual relationship between Owner or Engineer and any Subcontractor, Supplier, or other individual or entity performing or furnishing any of the Work, for the benefit of such Subcontractor, Supplier, or other individual or entity; or
 - 2. any obligation on the part of Owner or Engineer to pay or to see to the payment of any money due any such Subcontractor, Supplier, or other individual or entity, except as may otherwise be required by Laws and Regulations.

3.02 *Reference Standards*

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

inconsistent with the provisions of the part of the Contract Documents prepared by or for Engineer.

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies*

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

B. *Resolving Discrepancies*

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

3.04 *Requirements of the Contract Documents*

- A. During the performance of the Work and until final payment, Contractor and Owner shall submit to the Engineer in writing all matters in question concerning the requirements of the Contract Documents (sometimes referred to as requests for information or interpretation—RFIs), or relating to the acceptability of the Work under the Contract Documents, as soon as possible after such matters arise. Engineer will be the initial interpreter of the requirements of the Contract Documents, and judge of the acceptability of the Work.

- B. Engineer will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract Documents. Engineer's written clarification, interpretation, or decision will be final and binding on Contractor, unless it appeals by submitting a Change Proposal, and on Owner, unless it appeals by filing a Claim.
- C. If a submitted matter in question concerns terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work under the Contract Documents, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, then Engineer will promptly notify Owner and Contractor in writing that Engineer is unable to provide a decision or interpretation. If Owner and Contractor are unable to agree on resolution of such a matter in question, either party may pursue resolution as provided in Article 12.

3.05 *Reuse of Documents*

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

ARTICLE 4—COMMENCEMENT AND PROGRESS OF THE WORK

4.01 *Commencement of Contract Times; Notice to Proceed*

- A. The Contract Times will commence to run on the 30th day after the Effective Date of the Contract or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Contract. In no event will the Contract Times commence to run later than the 60th day after the day of Bid opening or the 30th day after the Effective Date of the Contract, whichever date is earlier.

4.02 *Starting the Work*

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

4.03 *Reference Points*

- A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the

established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.04 *Progress Schedule*

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

4.05 *Delays in Contractor's Progress*

- A. If Owner, Engineer, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times.
- B. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delay, disruption, or interference caused by or within the control of Contractor. Delay, disruption, and interference attributable to and within the control of a Subcontractor or Supplier shall be deemed to be within the control of Contractor.
- C. If Contractor's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault of and beyond the control of Owner, Contractor, and those for which they are responsible, then Contractor shall be entitled to an equitable adjustment in Contract Times. Such an adjustment will be Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this paragraph. Causes of delay, disruption, or interference that may give rise to an adjustment in Contract Times under this paragraph include but are not limited to the following:
 - 1. Severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;
 - 2. Abnormal weather conditions;
 - 3. Acts or failures to act of third-party utility owners or other third-party entities (other than those third-party utility owners or other third-party entities performing other work at or adjacent to the Site as arranged by or under contract with Owner, as contemplated in Article 8); and
 - 4. Acts of war or terrorism.

- D. Contractor's entitlement to an adjustment of Contract Times or Contract Price is limited as follows:
1. Contractor's entitlement to an adjustment of the Contract Times is conditioned on the delay, disruption, or interference adversely affecting an activity on the critical path to completion of the Work, as of the time of the delay, disruption, or interference.
 2. Contractor shall not be entitled to an adjustment in Contract Price for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of Contractor. Such a concurrent delay by Contractor shall not preclude an adjustment of Contract Times to which Contractor is otherwise entitled.
 3. Adjustments of Contract Times or Contract Price are subject to the provisions of Article 11.
- E. Each Contractor request or Change Proposal seeking an increase in Contract Times or Contract Price must be supplemented by supporting data that sets forth in detail the following:
1. The circumstances that form the basis for the requested adjustment;
 2. The date upon which each cause of delay, disruption, or interference began to affect the progress of the Work;
 3. The date upon which each cause of delay, disruption, or interference ceased to affect the progress of the Work;
 4. The number of days' increase in Contract Times claimed as a consequence of each such cause of delay, disruption, or interference; and
 5. The impact on Contract Price, in accordance with the provisions of Paragraph 11.07.
- Contractor shall also furnish such additional supporting documentation as Owner or Engineer may require including, where appropriate, a revised progress schedule indicating all the activities affected by the delay, disruption, or interference, and an explanation of the effect of the delay, disruption, or interference on the critical path to completion of the Work.
- F. Delays, disruption, and interference to the performance or progress of the Work resulting from the existence of a differing subsurface or physical condition, an Underground Facility that was not shown or indicated by the Contract Documents, or not shown or indicated with reasonable accuracy, and those resulting from Hazardous Environmental Conditions, are governed by Article 5, together with the provisions of Paragraphs 4.05.D and 4.05.E.
- G. Paragraph 8.03 addresses delays, disruption, and interference to the performance or progress of the Work resulting from the performance of certain other work at or adjacent to the Site.

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

5.01 *Availability of Lands*

- A. Owner shall furnish the Site. Owner shall notify Contractor in writing of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work.

- B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which permanent improvements are to be made and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.
- C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

5.02 *Use of Site and Other Areas*

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

1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for (a) damage to the Site; (b) damage to any such other adjacent areas used for Contractor's operations; (c) damage to any other adjacent land or areas, or to improvements, structures, utilities, or similar facilities located at such adjacent lands or areas; and (d) for injuries and losses sustained by the owners or occupants of any such land or areas; provided that such damage or injuries result from the performance of the Work or from other actions or conduct of the Contractor or those for which Contractor is responsible.
 2. If a damage or injury claim is made by the owner or occupant of any such land or area because of the performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 7.13, or otherwise; (b) promptly attempt to settle the claim as to all parties through negotiations with such owner or occupant, or otherwise resolve the claim by arbitration or other dispute resolution proceeding, or in a court of competent jurisdiction; and (c) to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from and against any such claim, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused directly or indirectly, in whole or in part by, or based upon, Contractor's performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible.
- B. *Removal of Debris During Performance of the Work:* During the progress of the Work the Contractor shall keep the Site and other adjacent areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris will conform to applicable Laws and Regulations.
 - C. *Cleaning:* Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site and adjacent areas all tools, appliances, construction equipment

and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

- D. *Loading of Structures:* Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent structures or land to stresses or pressures that will endanger them.

5.03 *Subsurface and Physical Conditions*

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

1. Those reports of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data;
2. Those drawings of existing physical conditions at or adjacent to the Site, including those drawings depicting existing surface or subsurface structures at or adjacent to the Site (except Underground Facilities), that contain Technical Data; and
3. Technical Data contained in such reports and drawings.

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

- C. *Reliance by Contractor on Technical Data:* Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely upon the accuracy of the Technical Data as defined in Paragraph 1.01.A.46.b.

- D. *Limitations of Other Data and Documents:* Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:
1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto;
 2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings;
 3. the contents of other Site-related documents made available to Contractor, such as record drawings from other projects at or adjacent to the Site, or Owner's archival documents concerning the Site; or
 4. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions, or information.

5.04 *Differing Subsurface or Physical Conditions*

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

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

- B. *Engineer's Review:* After receipt of written notice as required by the preceding paragraph, Engineer will promptly review the subsurface or physical condition in question; determine whether it is necessary for Owner to obtain additional exploration or tests with respect to the condition; conclude whether the condition falls within any one or more of the differing site condition categories in Paragraph 5.04.A; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the subsurface or physical condition in question and the need for any change in the Drawings or Specifications; and advise Owner in writing of Engineer's findings, conclusions, and recommendations.
- C. *Owner's Statement to Contractor Regarding Site Condition:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the subsurface or physical condition in question, addressing the resumption of Work in connection with such condition, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations, in whole or in part.
- D. *Early Resumption of Work:* If at any time Engineer determines that Work in connection with the subsurface or physical condition in question may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the condition in question has been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.
- E. *Possible Price and Times Adjustments*
1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, causes an increase or decrease in

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

- a. Such condition must fall within any one or more of the categories described in Paragraph 5.04.A;
 - b. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03; and,
 - c. Contractor's entitlement to an adjustment of the Contract Times is subject to the provisions of Paragraphs 4.05.D and 4.05.E.
2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:
 - a. Contractor knew of the existence of such condition at the time Contractor made a commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract, or otherwise;
 - b. The existence of such condition reasonably could have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas expressly required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such commitment; or
 - c. Contractor failed to give the written notice required by Paragraph 5.04.A.
 3. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, then any such adjustment will be set forth in a Change Order.
 4. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the subsurface or physical condition in question.
- F. *Underground Facilities; Hazardous Environmental Conditions:* Paragraph 5.05 governs rights and responsibilities regarding the presence or location of Underground Facilities. Paragraph 5.06 governs rights and responsibilities regarding Hazardous Environmental Conditions. The provisions of Paragraphs 5.03 and 5.04 are not applicable to the presence or location of Underground Facilities, or to Hazardous Environmental Conditions.

5.05 *Underground Facilities*

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

3. verifying the actual location of those Underground Facilities shown or indicated in the Contract Documents as being within the area affected by the Work, by exposing such Underground Facilities during the course of construction;
 4. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and
 5. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.
- B. *Notice by Contractor:* If Contractor believes that an Underground Facility that is uncovered or revealed at the Site was not shown or indicated on the Drawings, or was not shown or indicated on the Drawings with reasonable accuracy, then Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing regarding such Underground Facility.
- C. *Engineer's Review:* Engineer will:
1. promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated on the Drawings, or was not shown or indicated with reasonable accuracy;
 2. identify and communicate with the owner of the Underground Facility; prepare recommendations to Owner (and if necessary issue any preliminary instructions to Contractor) regarding the Contractor's resumption of Work in connection with the Underground Facility in question;
 3. obtain any pertinent cost or schedule information from Contractor; determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Underground Facility; and
 4. advise Owner in writing of Engineer's findings, conclusions, and recommendations.
- During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.
- D. *Owner's Statement to Contractor Regarding Underground Facility:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the Underground Facility in question addressing the resumption of Work in connection with such Underground Facility, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations in whole or in part.
- E. *Early Resumption of Work:* If at any time Engineer determines that Work in connection with the Underground Facility may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the Underground Facility in question and conditions affected by its presence have been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.
- F. *Possible Price and Times Adjustments*
1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, to the extent that any existing Underground Facility at the Site that was not shown

or indicated on the Drawings, or was not shown or indicated with reasonable accuracy, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

- a. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03;
 - b. Contractor's entitlement to an adjustment of the Contract Times is subject to the provisions of Paragraphs 4.05.D and 4.05.E; and
 - c. Contractor gave the notice required in Paragraph 5.05.B.
2. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, then any such adjustment will be set forth in a Change Order.
 3. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.
 4. The information and data shown or indicated on the Drawings with respect to existing Underground Facilities at the Site is based on information and data (a) furnished by the owners of such Underground Facilities, or by others, (b) obtained from available records, or (c) gathered in an investigation conducted in accordance with the current edition of ASCE 38, Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data, by the American Society of Civil Engineers. If such information or data is incorrect or incomplete, Contractor's remedies are limited to those set forth in this Paragraph 5.05.F.

5.06 *Hazardous Environmental Conditions at Site*

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

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

B. *Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely on the accuracy of the Technical Data as defined in Paragraph 1.01.A.46.b. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures

- of construction to be employed by Contractor, and safety precautions and programs incident thereto;
2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
 3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions or information.
- C. Contractor shall not be responsible for removing or remediating any Hazardous Environmental Condition encountered, uncovered, or revealed at the Site unless such removal or remediation is expressly identified in the Contract Documents to be within the scope of the Work.
- D. Contractor shall be responsible for controlling, containing, and duly removing all Constituents of Concern brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible, and for any associated costs; and for the costs of removing and remediating any Hazardous Environmental Condition created by the presence of any such Constituents of Concern.
- E. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 7.15); and (3) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 5.06.F. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous Environmental Condition, and impose a set-off against payments to account for the associated costs.
- F. Contractor shall not resume Work in connection with such Hazardous Environmental Condition or in any affected area until after Owner has obtained any required permits related thereto, and delivered written notice to Contractor either (1) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (2) specifying any special conditions under which such Work may be resumed safely.
- G. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, as a result of such Work stoppage, such special conditions under which Work is agreed to be resumed by Contractor, or any costs or expenses incurred in response to the Hazardous Environmental Condition, then within 30 days of Owner's written notice regarding the resumption of Work, Contractor may submit a Change Proposal, or Owner may impose a set-off. Entitlement to any such adjustment is subject to the provisions of Paragraphs 4.05.D, 4.05.E, 11.07, and 11.08.
- H. If, after receipt of such written notice, Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special

conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work, following the contractual change procedures in Article 11. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 8.

- I. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court, arbitration, or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition (1) was not shown or indicated in the Drawings, Specifications, or other Contract Documents, identified as Technical Data entitled to limited reliance pursuant to Paragraph 5.06.B, or identified in the Contract Documents to be included within the scope of the Work, and (2) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.I obligates Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- J. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the failure to control, contain, or remove a Constituent of Concern brought to the Site by Contractor or by anyone for whom Contractor is responsible, or to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.J obligates Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- K. The provisions of Paragraphs 5.03, 5.04, and 5.05 do not apply to the presence of Constituents of Concern or to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 6—BONDS AND INSURANCE

6.01 *Performance, Payment, and Other Bonds*

- A. Contractor shall furnish a performance bond and a payment bond, each in an amount at least equal to the Contract Price, as security for the faithful performance and payment of Contractor's obligations under the Contract. These bonds must remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 15.08, whichever is later, except as provided otherwise by Laws or Regulations, the terms of a prescribed bond form, the Supplementary Conditions, or other provisions of the Contract.
- B. Contractor shall also furnish such other bonds (if any) as are required by the Supplementary Conditions or other provisions of the Contract.
- C. All bonds must be in the form included in the Bidding Documents or otherwise specified by Owner prior to execution of the Contract, except as provided otherwise by Laws or

Regulations, and must be issued and signed by a surety named in “Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies” as published in Department Circular 570 (as amended and supplemented) by the Bureau of the Fiscal Service, U.S. Department of the Treasury. A bond signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual’s authority to bind the surety. The evidence of authority must show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.

- D. Contractor shall obtain the required bonds from surety companies that are duly licensed or authorized, in the state or jurisdiction in which the Project is located, to issue bonds in the required amounts.
- E. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or the surety ceases to meet the requirements above, then Contractor shall promptly notify Owner and Engineer in writing and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which must comply with the bond and surety requirements above.
- F. If Contractor has failed to obtain a required bond, Owner may exclude the Contractor from the Site and exercise Owner’s termination rights under Article 16.
- G. Upon request to Owner from any Subcontractor, Supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of the Work, Owner shall provide a copy of the payment bond to such person or entity.
- H. Upon request to Contractor from any Subcontractor, Supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of the Work, Contractor shall provide a copy of the payment bond to such person or entity.

6.02 *Insurance—General Provisions*

- A. Owner and Contractor shall obtain and maintain insurance as required in this article and in the Supplementary Conditions.
- B. All insurance required by the Contract to be purchased and maintained by Owner or Contractor shall be obtained from insurance companies that are duly licensed or authorized in the state or jurisdiction in which the Project is located to issue insurance policies for the required limits and coverages. Unless a different standard is indicated in the Supplementary Conditions, all companies that provide insurance policies required under this Contract shall have an A.M. Best rating of A-VII or better.
- C. Alternative forms of insurance coverage, including but not limited to self-insurance and “Occupational Accident and Excess Employer’s Indemnity Policies,” are not sufficient to meet the insurance requirements of this Contract, unless expressly allowed in the Supplementary Conditions.
- D. Contractor shall deliver to Owner, with copies to each additional insured identified in the Contract, certificates of insurance and endorsements establishing that Contractor has obtained and is maintaining the policies and coverages required by the Contract. Upon request by Owner or any other insured, Contractor shall also furnish other evidence of such required insurance, including but not limited to copies of policies, documentation of applicable self-insured retentions (if allowed) and deductibles, full disclosure of all relevant exclusions, and evidence of insurance required to be purchased and maintained by

Subcontractors or Suppliers. In any documentation furnished under this provision, Contractor, Subcontractors, and Suppliers may block out (redact) (1) any confidential premium or pricing information and (2) any wording specific to a project or jurisdiction other than those applicable to this Contract.

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

- L. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor or Contractor's interests. Contractor is responsible for determining whether such coverage and limits are adequate to protect its interests, and for obtaining and maintaining any additional insurance that Contractor deems necessary.
- M. The insurance and insurance limits required herein will not be deemed as a limitation on Contractor's liability, or that of its Subcontractors or Suppliers, under the indemnities granted to Owner and other individuals and entities in the Contract or otherwise.
- N. All the policies of insurance required to be purchased and maintained under this Contract will contain a provision or endorsement that the coverage afforded will not be canceled, or renewal refused, until at least 10 days prior written notice has been given to the purchasing policyholder. Within three days of receipt of any such written notice, the purchasing policyholder shall provide a copy of the notice to each other insured and Engineer.

6.03 *Contractor's Insurance*

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

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

6.04 *Builder's Risk and Other Property Insurance*

- A. *Builder's Risk*: Unless otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain builder's risk insurance upon the Work on a completed value basis, in the amount of the Work's full insurable replacement cost (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). The specific requirements applicable to the builder's risk insurance are set forth in the Supplementary Conditions.
- B. *Property Insurance for Facilities of Owner Where Work Will Occur*: Owner is responsible for obtaining and maintaining property insurance covering each existing structure, building, or facility in which any part of the Work will occur, or to which any part of the Work will attach or be adjoined. Such property insurance will be written on a special perils (all-risk) form, on a replacement cost basis, providing coverage consistent with that required for the builder's risk insurance, and will be maintained until the Work is complete, as set forth in Paragraph 15.06.D.
- C. *Property Insurance for Substantially Complete Facilities*: Promptly after Substantial Completion, and before actual occupancy or use of the substantially completed Work, Owner will obtain property insurance for such substantially completed Work, and maintain such property insurance at least until the Work is complete, as set forth in Paragraph 15.06.D. Such property insurance will be written on a special perils (all-risk) form, on a replacement cost basis, and provide coverage consistent with that required for the builder's risk insurance. The builder's risk insurance may terminate upon written confirmation of Owner's procurement of such property insurance.
- D. *Partial Occupancy or Use by Owner*: If Owner will occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work, as provided in Paragraph 15.04, then Owner (directly, if it is the purchaser of the builder's risk policy, or through Contractor) will provide advance notice of such occupancy or use to the builder's risk insurer, and obtain an endorsement consenting to the continuation of coverage prior to commencing such partial occupancy or use.
- E. *Insurance of Other Property; Additional Insurance*: If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, then the entity or individual owning such property item will be responsible for insuring it. If Contractor elects to obtain other special insurance to be included in or supplement the builder's risk or property insurance policies provided under this Paragraph 6.04, it may do so at Contractor's expense.

6.05 *Property Losses; Subrogation*

- A. The builder's risk insurance policy purchased and maintained in accordance with Paragraph 6.04 (or an installation floater policy if authorized by the Supplementary Conditions), will contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any insureds thereunder, or against

Engineer or its consultants, or their officers, directors, members, partners, employees, agents, consultants, or subcontractors.

1. Owner and Contractor waive all rights against each other and the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from any of the perils, risks, or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Engineer, its consultants, all individuals or entities identified in the Supplementary Conditions as builder's risk or installation floater insureds, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, under such policies for losses and damages so caused.
 2. None of the above waivers extends to the rights that any party making such waiver may have to the proceeds of insurance held by Owner or Contractor as trustee or fiduciary, or otherwise payable under any policy so issued.
- B. Any property insurance policy maintained by Owner covering any loss, damage, or consequential loss to Owner's existing structures, buildings, or facilities in which any part of the Work will occur, or to which any part of the Work will attach or adjoin; to adjacent structures, buildings, or facilities of Owner; or to part or all of the completed or substantially completed Work, during partial occupancy or use pursuant to Paragraph 15.04, after Substantial Completion pursuant to Paragraph 15.03, or after final payment pursuant to Paragraph 15.06, will contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any insureds thereunder, or against Contractor, Subcontractors, or Engineer, or the officers, directors, members, partners, employees, agents, consultants, or subcontractors of each and any of them, and that the insured is allowed to waive the insurer's rights of subrogation in a written contract executed prior to the loss, damage, or consequential loss.
1. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from fire or any of the perils, risks, or causes of loss covered by such policies.
- C. The waivers in this Paragraph 6.05 include the waiver of rights due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other insured peril, risk, or cause of loss.
- D. Contractor shall be responsible for assuring that each Subcontract contains provisions whereby the Subcontractor waives all rights against Owner, Contractor, all individuals or entities identified in the Supplementary Conditions as insureds, the Engineer and its consultants, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, relating to, or resulting from fire or other peril, risk, or cause of loss covered by builder's risk insurance, installation floater, and any other property insurance applicable to the Work.

6.06 *Receipt and Application of Property Insurance Proceeds*

- A. Any insured loss under the builder's risk and other policies of property insurance required by Paragraph 6.04 will be adjusted and settled with the named insured that purchased the policy. Such named insured shall act as fiduciary for the other insureds, and give notice to such other insureds that adjustment and settlement of a claim is in progress. Any other insured may state its position regarding a claim for insured loss in writing within 15 days after notice of such claim.
- B. Proceeds for such insured losses may be made payable by the insurer either jointly to multiple insureds, or to the named insured that purchased the policy in its own right and as fiduciary for other insureds, subject to the requirements of any applicable mortgage clause. A named insured receiving insurance proceeds under the builder's risk and other policies of insurance required by Paragraph 6.04 shall maintain such proceeds in a segregated account, and distribute such proceeds in accordance with such agreement as the parties in interest may reach, or as otherwise required under the dispute resolution provisions of this Contract or applicable Laws and Regulations.
- C. If no other special agreement is reached, Contractor shall repair or replace the damaged Work, using allocated insurance proceeds.

ARTICLE 7—CONTRACTOR'S RESPONSIBILITIES

7.01 *Contractor's Means and Methods of Construction*

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

7.02 *Supervision and Superintendence*

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

7.03 *Labor; Working Hours*

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

- B. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of Contractor's employees; of Suppliers and Subcontractors, and their employees; and of any other individuals or entities performing or furnishing any of the Work, just as Contractor is responsible for Contractor's own acts and omissions.
- C. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site will be performed during regular working hours, Monday through Friday. Contractor will not perform Work on a Saturday, Sunday, or any legal holiday. Contractor may perform Work outside regular working hours or on Saturdays, Sundays, or legal holidays only with Owner's written consent, which will not be unreasonably withheld.

7.04 *Services, Materials, and Equipment*

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

7.05 *"Or Equals"*

- A. *Contractor's Request; Governing Criteria:* Whenever an item of equipment or material is specified or described in the Contract Documents by using the names of one or more proprietary items or specific Suppliers, the Contract Price has been based upon Contractor furnishing such item as specified. The specification or description of such an item is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or equal" item is permitted, Contractor may request that Engineer authorize the use of other items of equipment or material, or items from other proposed Suppliers, under the circumstances described below.
 - 1. If Engineer in its sole discretion determines that an item of equipment or material proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, Engineer will deem it an "or equal" item. For the purposes of this paragraph, a proposed item of equipment or material will be considered functionally equal to an item so named if:
 - a. in the exercise of reasonable judgment Engineer determines that the proposed item:
 - 1) is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;

- 2) will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;
 - 3) has a proven record of performance and availability of responsive service; and
 - 4) is not objectionable to Owner.
- b. Contractor certifies that, if the proposed item is approved and incorporated into the Work:
- 1) there will be no increase in cost to the Owner or increase in Contract Times; and
 - 2) the item will conform substantially to the detailed requirements of the item named in the Contract Documents.
- B. *Contractor's Expense*: Contractor shall provide all data in support of any proposed "or equal" item at Contractor's expense.
- C. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each "or-equal" request. Engineer may require Contractor to furnish additional data about the proposed "or-equal" item. Engineer will be the sole judge of acceptability. No "or-equal" item will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an "or-equal," which will be evidenced by an approved Shop Drawing or other written communication. Engineer will advise Contractor in writing of any negative determination.
- D. *Effect of Engineer's Determination*: Neither approval nor denial of an "or-equal" request will result in any change in Contract Price. The Engineer's denial of an "or-equal" request will be final and binding, and may not be reversed through an appeal under any provision of the Contract.
- E. *Treatment as a Substitution Request*: If Engineer determines that an item of equipment or material proposed by Contractor does not qualify as an "or-equal" item, Contractor may request that Engineer consider the item a proposed substitute pursuant to Paragraph 7.06.

7.06 Substitutes

- A. *Contractor's Request; Governing Criteria*: Unless the specification or description of an item of equipment or material required to be furnished under the Contract Documents contains or is followed by words reading that no substitution is permitted, Contractor may request that Engineer authorize the use of other items of equipment or material under the circumstances described below. To the extent possible such requests must be made before commencement of related construction at the Site.
1. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is functionally equivalent to that named and an acceptable substitute therefor. Engineer will not accept requests for review of proposed substitute items of equipment or material from anyone other than Contractor.
 2. The requirements for review by Engineer will be as set forth in Paragraph 7.06.B, as supplemented by the Specifications, and as Engineer may decide is appropriate under the circumstances.

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

- E. *Contractor's Expense*: Contractor shall provide all data in support of any proposed substitute at Contractor's expense.
- F. *Effect of Engineer's Determination*: If Engineer approves the substitution request, Contractor shall execute the proposed Change Order and proceed with the substitution. The Engineer's denial of a substitution request will be final and binding, and may not be reversed through an appeal under any provision of the Contract. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.06.D, by timely submittal of a Change Proposal.

7.07 *Concerning Subcontractors and Suppliers*

- A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner. The Contractor's retention of a Subcontractor or Supplier for the performance of parts of the Work will not relieve Contractor's obligation to Owner to perform and complete the Work in accordance with the Contract Documents.
- B. Contractor shall retain specific Subcontractors and Suppliers for the performance of designated parts of the Work if required by the Contract to do so.
- C. Subsequent to the submittal of Contractor's Bid or final negotiation of the terms of the Contract, Owner may not require Contractor to retain any Subcontractor or Supplier to furnish or perform any of the Work against which Contractor has reasonable objection.
- D. Prior to entry into any binding subcontract or purchase order, Contractor shall submit to Owner the identity of the proposed Subcontractor or Supplier (unless Owner has already deemed such proposed Subcontractor or Supplier acceptable during the bidding process or otherwise). Such proposed Subcontractor or Supplier shall be deemed acceptable to Owner unless Owner raises a substantive, reasonable objection within 5 days.
- E. Owner may require the replacement of any Subcontractor or Supplier. Owner also may require Contractor to retain specific replacements; provided, however, that Owner may not require a replacement to which Contractor has a reasonable objection. If Contractor has submitted the identity of certain Subcontractors or Suppliers for acceptance by Owner, and Owner has accepted it (either in writing or by failing to make written objection thereto), then Owner may subsequently revoke the acceptance of any such Subcontractor or Supplier so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor or Supplier.
- F. If Owner requires the replacement of any Subcontractor or Supplier retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, with respect to the replacement; and Contractor shall initiate a Change Proposal for such adjustment within 30 days of Owner's requirement of replacement.
- G. No acceptance by Owner of any such Subcontractor or Supplier, whether initially or as a replacement, will constitute a waiver of the right of Owner to the completion of the Work in accordance with the Contract Documents.

- H. On a monthly basis, Contractor shall submit to Engineer a complete list of all Subcontractors and Suppliers having a direct contract with Contractor, and of all other Subcontractors and Suppliers known to Contractor at the time of submittal.
- I. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors and Suppliers.
- J. The divisions and sections of the Specifications and the identifications of any Drawings do not control Contractor in dividing the Work among Subcontractors or Suppliers, or in delineating the Work to be performed by any specific trade.
- K. All Work performed for Contractor by a Subcontractor or Supplier must be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract for the benefit of Owner and Engineer.
- L. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor for Work performed for Contractor by the Subcontractor or Supplier.
- M. Contractor shall restrict all Subcontractors and Suppliers from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed in this Contract.

7.08 *Patent Fees and Royalties*

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

7.09 *Permits*

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

7.10 *Taxes*

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

7.11 *Laws and Regulations*

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

7.12 *Record Documents*

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

7.13 *Safety and Protection*

- A. Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations.
- B. Contractor shall designate a qualified and experienced safety representative whose duties and responsibilities are the prevention of Work-related accidents and the maintenance and supervision of safety precautions and programs.
- C. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury, or loss to:
 - 1. all persons on the Site or who may be affected by the Work;
 - 2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
 - 3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, other work in progress, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.
- D. All damage, injury, or loss to any property referred to in Paragraph 7.13.C.2 or 7.13.C.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor at its expense (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).
- E. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection.
- F. Contractor shall notify Owner; the owners of adjacent property; the owners of Underground Facilities and other utilities (if the identity of such owners is known to Contractor); and other contractors and utility owners performing work at or adjacent to the Site, in writing, when Contractor knows that prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property or work in progress.
- G. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. Any Owner's safety programs that are applicable to the Work are identified or included in the Supplementary Conditions or Specifications.
- H. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.

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

7.14 *Hazard Communication Programs*

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

7.15 *Emergencies*

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

7.16 *Submittals*

A. *Shop Drawing and Sample Requirements*

- 1. Before submitting a Shop Drawing or Sample, Contractor shall:
 - a. review and coordinate the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
 - b. determine and verify:
 - 1) all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect to the Submittal;
 - 2) the suitability of all materials and equipment offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
 - 3) all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto;
 - c. confirm that the Submittal is complete with respect to all related data included in the Submittal.
- 2. Each Shop Drawing or Sample must bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review of that Submittal, and that Contractor approves the Submittal.

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

document any such approved variation from the requirements of the Contract Documents in a Field Order or other appropriate Contract modification.

5. Engineer's review and approval of a Shop Drawing or Sample will not relieve Contractor from responsibility for complying with the requirements of Paragraphs 7.16.A and B.
6. Engineer's review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Contract Documents, will not, under any circumstances, change the Contract Times or Contract Price, unless such changes are included in a Change Order.
7. Neither Engineer's receipt, review, acceptance, or approval of a Shop Drawing or Sample will result in such item becoming a Contract Document.
8. Contractor shall perform the Work in compliance with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 7.16.C.4.

D. Resubmittal Procedures for Shop Drawings and Samples

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

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

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

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

7.17 Contractor's General Warranty and Guarantee

- A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer is entitled to rely on Contractor's warranty and guarantee.
- B. Owner's rights under this warranty and guarantee are in addition to, and are not limited by, Owner's rights under the correction period provisions of Paragraph 15.08. The time in which Owner may enforce its warranty and guarantee rights under this Paragraph 7.17 is limited only by applicable Laws and Regulations restricting actions to enforce such rights; provided, however, that after the end of the correction period under Paragraph 15.08:
 - 1. Owner shall give Contractor written notice of any defective Work within 60 days of the discovery that such Work is defective; and
 - 2. Such notice will be deemed the start of an event giving rise to a Claim under Paragraph 12.01.B, such that any related Claim must be brought within 30 days of the notice.
- C. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:
 - 1. abuse, or improper modification, maintenance, or operation, by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
 - 2. normal wear and tear under normal usage.
- D. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents is absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents, a release of Contractor's obligation to perform the Work in accordance with the Contract Documents, or a release of Owner's warranty and guarantee rights under this Paragraph 7.17:
 - 1. Observations by Engineer;
 - 2. Recommendation by Engineer or payment by Owner of any progress or final payment;
 - 3. The issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;
 - 4. Use or occupancy of the Work or any part thereof by Owner;
 - 5. Any review and approval of a Shop Drawing or Sample submittal;
 - 6. The issuance of a notice of acceptability by Engineer;
 - 7. The end of the correction period established in Paragraph 15.08;
 - 8. Any inspection, test, or approval by others; or

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

7.18 Indemnification

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

7.19 Delegation of Professional Design Services

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

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

ARTICLE 8—OTHER WORK AT THE SITE

8.01 *Other Work*

- A. In addition to and apart from the Work under the Contract Documents, the Owner may perform other work at or adjacent to the Site. Such other work may be performed by Owner's employees, or through contracts between the Owner and third parties. Owner may also arrange to have third-party utility owners perform work on their utilities and facilities at or adjacent to the Site.
- B. If Owner performs other work at or adjacent to the Site with Owner's employees, or through contracts for such other work, then Owner shall give Contractor written notice thereof prior to starting any such other work. If Owner has advance information regarding the start of any third-party utility work that Owner has arranged to take place at or adjacent to the Site, Owner shall provide such information to Contractor.
- C. Contractor shall afford proper and safe access to the Site to each contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner's employees, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work.
- D. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected.

- E. If the proper execution or results of any part of Contractor's Work depends upon work performed by others, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.
- F. The provisions of this article are not applicable to work that is performed by third-party utilities or other third-party entities without a contract with Owner, or that is performed without having been arranged by Owner. If such work occurs, then any related delay, disruption, or interference incurred by Contractor is governed by the provisions of Paragraph 4.05.C.3.

8.02 *Coordination*

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

8.03 *Legal Relationships*

- A. If, in the course of performing other work for Owner at or adjacent to the Site, the Owner's employees, any other contractor working for Owner, or any utility owner that Owner has arranged to perform work, causes damage to the Work or to the property of Contractor or its Subcontractors, or delays, disrupts, interferes with, or increases the scope or cost of the performance of the Work, through actions or inaction, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times. Contractor must submit any Change Proposal seeking an equitable adjustment in the Contract Price or the Contract Times under this paragraph within 30 days of the damaging, delaying, disrupting, or interfering event. The entitlement to, and extent of, any such equitable adjustment will take into account information (if any) regarding such other work that was provided to Contractor in the Contract Documents prior to the submittal of the Bid or the final negotiation of the terms of the Contract, and any remedies available to Contractor under Laws or Regulations concerning utility action or inaction. When applicable, any such equitable adjustment in Contract Price will be conditioned on Contractor assigning to Owner all Contractor's rights against such other contractor or utility owner with respect to the damage, delay, disruption, or interference that is the subject of the adjustment. Contractor's entitlement to an adjustment of the Contract Times or Contract Price is subject to the provisions of Paragraphs 4.05.D and 4.05.E.

- B. Contractor shall take reasonable and customary measures to avoid damaging, delaying, disrupting, or interfering with the work of Owner, any other contractor, or any utility owner performing other work at or adjacent to the Site.
 - 1. If Contractor fails to take such measures and as a result damages, delays, disrupts, or interferes with the work of any such other contractor or utility owner, then Owner may impose a set-off against payments due Contractor, and assign to such other contractor or utility owner the Owner's contractual rights against Contractor with respect to the breach of the obligations set forth in this Paragraph 8.03.B.
 - 2. When Owner is performing other work at or adjacent to the Site with Owner's employees, Contractor shall be liable to Owner for damage to such other work, and for the reasonable direct delay, disruption, and interference costs incurred by Owner as a result of Contractor's failure to take reasonable and customary measures with respect to Owner's other work. In response to such damage, delay, disruption, or interference, Owner may impose a set-off against payments due Contractor.
- C. If Contractor damages, delays, disrupts, or interferes with the work of any other contractor, or any utility owner performing other work at or adjacent to the Site, through Contractor's failure to take reasonable and customary measures to avoid such impacts, or if any claim arising out of Contractor's actions, inactions, or negligence in performance of the Work at or adjacent to the Site is made by any such other contractor or utility owner against Contractor, Owner, or Engineer, then Contractor shall (1) promptly attempt to settle the claim as to all parties through negotiations with such other contractor or utility owner, or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law, and (2) indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claims, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such damage, delay, disruption, or interference.

ARTICLE 9—OWNER'S RESPONSIBILITIES

9.01 *Communications to Contractor*

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

9.02 *Replacement of Engineer*

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

9.03 *Furnish Data*

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

9.04 *Pay When Due*

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

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

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

9.06 *Insurance*

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

9.07 *Change Orders*

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

9.08 *Inspections, Tests, and Approvals*

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

9.09 *Limitations on Owner's Responsibilities*

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

9.10 *Undisclosed Hazardous Environmental Condition*

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

9.11 *Evidence of Financial Arrangements*

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

9.12 *Safety Programs*

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

ARTICLE 10—ENGINEER'S STATUS DURING CONSTRUCTION

10.01 *Owner's Representative*

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

10.02 *Visits to Site*

- A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe, as an experienced and qualified design professional, the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.
- B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 10.07. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

10.03 *Resident Project Representative*

- A. If Owner and Engineer have agreed that Engineer will furnish a Resident Project Representative to represent Engineer at the Site and assist Engineer in observing the progress and quality of the Work, then the authority and responsibilities of any such Resident Project Representative will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in the Supplementary Conditions and in Paragraph 10.07.
- B. If Owner designates an individual or entity who is not Engineer's consultant, agent, or employee to represent Owner at the Site, then the responsibilities and authority of such individual or entity will be as provided in the Supplementary Conditions.

10.04 *Engineer's Authority*

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

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

10.05 *Determinations for Unit Price Work*

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

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

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

10.07 *Limitations on Engineer's Authority and Responsibilities*

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

B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.

D. Engineer's review of the final Application for Payment and accompanying documentation, and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Contractor under Paragraph 15.06.A, will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals, that the results certified indicate compliance with the Contract Documents.

E. The limitations upon authority and responsibility set forth in this Paragraph 10.07 also apply to the Resident Project Representative, if any.

10.08 *Compliance with Safety Program*

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

ARTICLE 11—CHANGES TO THE CONTRACT

11.01 *Amending and Supplementing the Contract*

- A. The Contract may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.
- B. If an amendment or supplement to the Contract includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order.
- C. All changes to the Contract that involve (1) the performance or acceptability of the Work, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, must be supported by Engineer's recommendation. Owner and Contractor may amend other terms and conditions of the Contract without the recommendation of the Engineer.

11.02 *Change Orders*

- A. Owner and Contractor shall execute appropriate Change Orders covering:
 - 1. Changes in Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive;
 - 2. Changes in Contract Price resulting from an Owner set-off, unless Contractor has duly contested such set-off;
 - 3. Changes in the Work which are: (a) ordered by Owner pursuant to Paragraph 11.05, (b) required because of Owner's acceptance of defective Work under Paragraph 14.04 or Owner's correction of defective Work under Paragraph 14.07, or (c) agreed to by the parties, subject to the need for Engineer's recommendation if the change in the Work involves the design (as set forth in the Drawings, Specifications, or otherwise) or other engineering or technical matters; and
 - 4. Changes that embody the substance of any final and binding results under: Paragraph 11.03.B, resolving the impact of a Work Change Directive; Paragraph 11.09, concerning Change Proposals; Article 12, Claims; Paragraph 13.02.D, final adjustments resulting from allowances; Paragraph 13.03.D, final adjustments relating to determination of quantities for Unit Price Work; and similar provisions.
- B. If Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of Paragraph 11.02.A, it will be deemed to be of full force and effect, as if fully executed.

11.03 *Work Change Directives*

- A. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the modification ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order, following negotiations by the parties as to the Work Change Directive's effect, if any, on the Contract Price and Contract Times; or, if negotiations are unsuccessful, by a determination under the terms of the Contract Documents governing adjustments, expressly including Paragraph 11.07 regarding change of Contract Price.

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

11.04 *Field Orders*

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

11.05 *Owner-Authorized Changes in the Work*

- A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work. Changes involving the design (as set forth in the Drawings, Specifications, or otherwise) or other engineering or technical matters will be supported by Engineer's recommendation.
- B. Such changes in the Work may be accomplished by a Change Order, if Owner and Contractor have agreed as to the effect, if any, of the changes on Contract Times or Contract Price; or by a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved; or, in the case of a deletion in the Work, promptly cease construction activities with respect to such deleted Work. Added or revised Work must be performed under the applicable conditions of the Contract Documents.
- C. Nothing in this Paragraph 11.05 obligates Contractor to undertake work that Contractor reasonably concludes cannot be performed in a manner consistent with Contractor's safety obligations under the Contract Documents or Laws and Regulations.

11.06 *Unauthorized Changes in the Work*

- A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents, as amended, modified, or supplemented, except in the case of an emergency as provided in Paragraph 7.15 or in the case of uncovering Work as provided in Paragraph 14.05.C.2.

11.07 *Change of Contract Price*

- A. The Contract Price may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Price must comply with the provisions of Paragraph 11.09. Any Claim for an adjustment of Contract Price must comply with the provisions of Article 12.
- B. An adjustment in the Contract Price will be determined as follows:

1. Where the Work involved is covered by unit prices contained in the Contract Documents, then by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 13.03);
 2. Where the Work involved is not covered by unit prices contained in the Contract Documents, then by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.07.C.2); or
 3. Where the Work involved is not covered by unit prices contained in the Contract Documents and the parties do not reach mutual agreement to a lump sum, then on the basis of the Cost of the Work (determined as provided in Paragraph 13.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 11.07.C).
- C. *Contractor's Fee:* When applicable, the Contractor's fee for overhead and profit will be determined as follows:
1. A mutually acceptable fixed fee; or
 2. If a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
 - a. For costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2, the Contractor's fee will be 15 percent;
 - b. For costs incurred under Paragraph 13.01.B.3, the Contractor's fee will be 5 percent;
 - c. Where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 11.07.C.2.a and 11.07.C.2.b is that the Contractor's fee will be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2 by the Subcontractor that actually performs the Work, at whatever tier, and (2) with respect to Contractor itself and to any Subcontractors of a tier higher than that of the Subcontractor that actually performs the Work, a fee of 5 percent of the amount (fee plus underlying costs incurred) attributable to the next lower tier Subcontractor; provided, however, that for any such subcontracted Work the maximum total fee to be paid by Owner will be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the Work;
 - d. No fee will be payable on the basis of costs itemized under Paragraphs 13.01.B.4, 13.01.B.5, and 13.01.C;
 - e. The amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in Cost of the Work will be the amount of the actual net decrease in Cost of the Work and a deduction of an additional amount equal to 5 percent of such actual net decrease in Cost of the Work; and
 - f. When both additions and credits are involved in any one change or Change Proposal, the adjustment in Contractor's fee will be computed by determining the sum of the costs in each of the cost categories in Paragraph 13.01.B (specifically, payroll costs, Paragraph 13.01.B.1; incorporated materials and equipment costs, Paragraph 13.01.B.2; Subcontract costs, Paragraph 13.01.B.3; special consultants costs, Paragraph 13.01.B.4; and other costs, Paragraph 13.01.B.5) and applying to each such cost category sum the appropriate fee from Paragraphs 11.07.C.2.a through 11.07.C.2.e, inclusive.

11.08 *Change of Contract Times*

- A. The Contract Times may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Times must comply with the provisions of Paragraph 11.09. Any Claim for an adjustment in the Contract Times must comply with the provisions of Article 12.
- B. Delay, disruption, and interference in the Work, and any related changes in Contract Times, are addressed in and governed by Paragraph 4.05.

11.09 *Change Proposals*

- A. *Purpose and Content:* Contractor shall submit a Change Proposal to Engineer to request an adjustment in the Contract Times or Contract Price; contest an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; challenge a set-off against payment due; or seek other relief under the Contract. The Change Proposal will specify any proposed change in Contract Times or Contract Price, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents. Each Change Proposal will address only one issue, or a set of closely related issues.
- B. *Change Proposal Procedures*
 - 1. *Submittal:* Contractor shall submit each Change Proposal to Engineer within 30 days after the start of the event giving rise thereto, or after such initial decision.
 - 2. *Supporting Data:* The Contractor shall submit supporting data, including the proposed change in Contract Price or Contract Time (if any), to the Engineer and Owner within 15 days after the submittal of the Change Proposal.
 - a. Change Proposals based on or related to delay, interruption, or interference must comply with the provisions of Paragraphs 4.05.D and 4.05.E.
 - b. Change proposals related to a change of Contract Price must include full and detailed accounts of materials incorporated into the Work and labor and equipment used for the subject Work.

The supporting data must be accompanied by a written statement that the supporting data are accurate and complete, and that any requested time or price adjustment is the entire adjustment to which Contractor believes it is entitled as a result of said event.

- 3. *Engineer's Initial Review:* Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal. If in its discretion Engineer concludes that additional supporting data is needed before conducting a full review and making a decision regarding the Change Proposal, then Engineer may request that Contractor submit such additional supporting data by a date specified by Engineer, prior to Engineer beginning its full review of the Change Proposal.
- 4. *Engineer's Full Review and Action on the Change Proposal:* Upon receipt of Contractor's supporting data (including any additional data requested by Engineer), Engineer will conduct a full review of each Change Proposal and, within 30 days after such receipt of the Contractor's supporting data, either approve the Change Proposal in whole, deny it in whole, or approve it in part and deny it in part. Such actions must be in writing, with a copy provided to Owner and Contractor. If Engineer does not take action on the Change

Proposal within 30 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of Engineer's inaction the Change Proposal is deemed denied, thereby commencing the time for appeal of the denial under Article 12.

5. *Binding Decision*: Engineer's decision is final and binding upon Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under Article 12.
- C. *Resolution of Certain Change Proposals*: If the Change Proposal does not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters, then Engineer will notify the parties in writing that the Engineer is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice will be deemed a denial, and Contractor may choose to seek resolution under the terms of Article 12.
- D. *Post-Completion*: Contractor shall not submit any Change Proposals after Engineer issues a written recommendation of final payment pursuant to Paragraph 15.06.B.

11.10 *Notification to Surety*

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

ARTICLE 12—CLAIMS

12.01 *Claims*

- A. *Claims Process*: The following disputes between Owner and Contractor are subject to the Claims process set forth in this article:
 1. Appeals by Owner or Contractor of Engineer's decisions regarding Change Proposals;
 2. Owner demands for adjustments in the Contract Price or Contract Times, or other relief under the Contract Documents;
 3. Disputes that Engineer has been unable to address because they do not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters; and
 4. Subject to the waiver provisions of Paragraph 15.07, any dispute arising after Engineer has issued a written recommendation of final payment pursuant to Paragraph 15.06.B.
- B. *Submittal of Claim*: The party submitting a Claim shall deliver it directly to the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto; in the case of appeals regarding Change Proposals within 30 days of the decision under appeal. The party submitting the Claim shall also furnish a copy to the Engineer, for its information only. The responsibility to substantiate a Claim rests with the party making the Claim. In the case of a Claim by Contractor seeking an increase in the Contract Times or Contract Price, Contractor shall certify that the Claim is made in good faith, that the supporting data are accurate and complete, and that to the best of Contractor's knowledge

and belief the amount of time or money requested accurately reflects the full amount to which Contractor is entitled.

- C. *Review and Resolution*: The party receiving a Claim shall review it thoroughly, giving full consideration to its merits. The two parties shall seek to resolve the Claim through the exchange of information and direct negotiations. The parties may extend the time for resolving the Claim by mutual agreement. All actions taken on a Claim will be stated in writing and submitted to the other party, with a copy to Engineer.
- D. *Mediation*
 - 1. At any time after initiation of a Claim, Owner and Contractor may mutually agree to mediation of the underlying dispute. The agreement to mediate will stay the Claim submittal and response process.
 - 2. If Owner and Contractor agree to mediation, then after 60 days from such agreement, either Owner or Contractor may unilaterally terminate the mediation process, and the Claim submittal and decision process will resume as of the date of the termination. If the mediation proceeds but is unsuccessful in resolving the dispute, the Claim submittal and decision process will resume as of the date of the conclusion of the mediation, as determined by the mediator.
 - 3. Owner and Contractor shall each pay one-half of the mediator's fees and costs.
- E. *Partial Approval*: If the party receiving a Claim approves the Claim in part and denies it in part, such action will be final and binding unless within 30 days of such action the other party invokes the procedure set forth in Article 17 for final resolution of disputes.
- F. *Denial of Claim*: If efforts to resolve a Claim are not successful, the party receiving the Claim may deny it by giving written notice of denial to the other party. If the receiving party does not take action on the Claim within 90 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of the inaction, the Claim is deemed denied, thereby commencing the time for appeal of the denial. A denial of the Claim will be final and binding unless within 30 days of the denial the other party invokes the procedure set forth in Article 17 for the final resolution of disputes.
- G. *Final and Binding Results*: If the parties reach a mutual agreement regarding a Claim, whether through approval of the Claim, direct negotiations, mediation, or otherwise; or if a Claim is approved in part and denied in part, or denied in full, and such actions become final and binding; then the results of the agreement or action on the Claim will be incorporated in a Change Order or other written document to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

ARTICLE 13—COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

13.01 *Cost of the Work*

- A. *Purposes for Determination of Cost of the Work*: The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this Paragraph 13.01 are used for two distinct purposes:
 - 1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or

2. When needed to determine the value of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price. When the value of any such adjustment is determined on the basis of Cost of the Work, Contractor is entitled only to those additional or incremental costs required because of the change in the Work or because of the event giving rise to the adjustment.
- B. *Costs Included:* Except as otherwise may be agreed to in writing by Owner, costs included in the Cost of the Work will be in amounts no higher than those commonly incurred in the locality of the Project, will not include any of the costs itemized in Paragraph 13.01.C, and will include only the following items:
1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor in advance of the subject Work. Such employees include, without limitation, superintendents, foremen, safety managers, safety representatives, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work will be apportioned on the basis of their time spent on the Work. Payroll costs include, but are not limited to, salaries and wages plus the cost of fringe benefits, which include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, sick leave, and vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, will be included in the above to the extent authorized by Owner.
 2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts will accrue to Owner. All trade discounts, rebates, and refunds and returns from sale of surplus materials and equipment will accrue to Owner, and Contractor shall make provisions so that they may be obtained.
 3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, which will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee will be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 13.01.
 4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed or retained for services specifically related to the Work.
 5. Other costs consisting of the following:
 - a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
 - b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, which are

consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.

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

c. *Construction Equipment Rental*

- 1) Rentals of all construction equipment and machinery, and the parts thereof, in accordance with rental agreements approved by Owner as to price (including any surcharge or special rates applicable to overtime use of the construction equipment or machinery), and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs will be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts must cease when the use thereof is no longer necessary for the Work.
 - 2) Costs for equipment and machinery owned by Contractor or a Contractor-related entity will be paid at a rate shown for such equipment in the equipment rental rate book specified in the Supplementary Conditions. An hourly rate will be computed by dividing the monthly rates by 176. These computed rates will include all operating costs.
 - 3) With respect to Work that is the result of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price ("changed Work"), included costs will be based on the time the equipment or machinery is in use on the changed Work and the costs of transportation, loading, unloading, assembly, dismantling, and removal when directly attributable to the changed Work. The cost of any such equipment or machinery, or parts thereof, must cease to accrue when the use thereof is no longer necessary for the changed Work.
- d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.
- e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.
- f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of builder's risk or other property insurance established in accordance with Paragraph 6.04), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses will be included in the Cost of the Work for the purpose of determining Contractor's fee.

- g. The cost of utilities, fuel, and sanitary facilities at the Site.
 - h. Minor expenses such as communication service at the Site, express and courier services, and similar petty cash items in connection with the Work.
 - i. The costs of premiums for all bonds and insurance that Contractor is required by the Contract Documents to purchase and maintain.
- C. *Costs Excluded:* The term Cost of the Work does not include any of the following items:
- 1. Payroll costs and other compensation of Contractor's officers, executives, principals, general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 13.01.B.1 or specifically covered by Paragraph 13.01.B.4. The payroll costs and other compensation excluded here are to be considered administrative costs covered by the Contractor's fee.
 - 2. The cost of purchasing, renting, or furnishing small tools and hand tools.
 - 3. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.
 - 4. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
 - 5. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.
 - 6. Expenses incurred in preparing and advancing Claims.
 - 7. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 13.01.B.
- D. *Contractor's Fee*
- 1. When the Work as a whole is performed on the basis of cost-plus-a-fee, then:
 - a. Contractor's fee for the Work set forth in the Contract Documents as of the Effective Date of the Contract will be determined as set forth in the Agreement.
 - b. for any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work, Contractor's fee will be determined as follows:
 - 1) When the fee for the Work as a whole is a percentage of the Cost of the Work, the fee will automatically adjust as the Cost of the Work changes.
 - 2) When the fee for the Work as a whole is a fixed fee, the fee for any additions or deletions will be determined in accordance with Paragraph 11.07.C.2.
 - 2. When the Work as a whole is performed on the basis of a stipulated sum, or any other basis other than cost-plus-a-fee, then Contractor's fee for any Work covered by a Change

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

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

13.02 Allowances

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

13.03 Unit Price Work

- A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.
- B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Payments to Contractor for Unit Price Work will be based on actual quantities.
- C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.
- D. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision

thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, and the final adjustment of Contract Price will be set forth in a Change Order, subject to the provisions of the following paragraph.

E. *Adjustments in Unit Price*

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

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

14.01 *Access to Work*

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

14.02 *Tests, Inspections, and Approvals*

- A. Contractor shall give Engineer timely notice of readiness of the Work (or specific parts thereof) for all required inspections and tests, and shall cooperate with inspection and testing personnel to facilitate required inspections and tests.
- B. Owner shall retain and pay for the services of an independent inspector, testing laboratory, or other qualified individual or entity to perform all inspections and tests expressly required by the Contract Documents to be furnished and paid for by Owner, except that costs incurred in connection with tests or inspections of covered Work will be governed by the provisions of Paragraph 14.05.
- C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.

- D. Contractor shall be responsible for arranging, obtaining, and paying for all inspections and tests required:
1. by the Contract Documents, unless the Contract Documents expressly allocate responsibility for a specific inspection or test to Owner;
 2. to attain Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work;
 3. by manufacturers of equipment furnished under the Contract Documents;
 4. for testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work; and
 5. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.

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

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

14.03 *Defective Work*

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

losses, and damages resulting from defective Work, then Owner may impose a reasonable set-off against payments due under Article 15.

14.04 *Acceptance of Defective Work*

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

14.05 *Uncovering Work*

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

14.06 *Owner May Stop the Work*

- A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, then Owner may order Contractor to stop the Work,

or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work will not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

14.07 Owner May Correct Defective Work

- A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace defective Work as required by Engineer, then Owner may, after 7 days' written notice to Contractor, correct or remedy any such deficiency.
- B. In exercising the rights and remedies under this Paragraph 14.07, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this paragraph.
- C. All claims, costs, losses, and damages incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 14.07 will be charged against Contractor as set-offs against payments due under Article 15. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.
- D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 14.07.

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

15.01 Progress Payments

- A. *Basis for Progress Payments:* The Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments for Unit Price Work will be based on the number of units completed during the pay period, as determined under the provisions of Paragraph 13.03. Progress payments for cost-based Work will be based on Cost of the Work completed by Contractor during the pay period.
- B. *Applications for Payments*
 - 1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents.
 - 2. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment must also be accompanied by: (a) a bill of sale, invoice, copies of subcontract or purchase order payments, or other documentation

establishing full payment by Contractor for the materials and equipment; (b) at Owner's request, documentation warranting that Owner has received the materials and equipment free and clear of all Liens; and (c) evidence that the materials and equipment are covered by appropriate property insurance, a warehouse bond, or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

3. Beginning with the second Application for Payment, each Application must include an affidavit of Contractor stating that all previous progress payments received by Contractor have been applied to discharge Contractor's legitimate obligations associated with prior Applications for Payment.
4. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

C. Review of Applications

1. Engineer will, within 10 days after receipt of each Application for Payment, including each resubmittal, either indicate in writing a recommendation of payment and present the Application to Owner, or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.
2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:
 - a. the Work has progressed to the point indicated;
 - b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 13.03, and any other qualifications stated in the recommendation); and
 - c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.
3. By recommending any such payment Engineer will not thereby be deemed to have represented that:
 - a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract; or
 - b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.

4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
 - a. to supervise, direct, or control the Work;
 - b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto;
 - c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work;
 - d. to make any examination to ascertain how or for what purposes Contractor has used the money paid by Owner; or
 - e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.
5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 15.01.C.2.
6. Engineer will recommend reductions in payment (set-offs) necessary in Engineer's opinion to protect Owner from loss because:
 - a. the Work is defective, requiring correction or replacement;
 - b. the Contract Price has been reduced by Change Orders;
 - c. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
 - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible; or
 - e. Engineer has actual knowledge of the occurrence of any of the events that would constitute a default by Contractor and therefore justify termination for cause under the Contract Documents.

D. *Payment Becomes Due*

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

E. *Reductions in Payment by Owner*

1. In addition to any reductions in payment (set-offs) recommended by Engineer, Owner is entitled to impose a set-off against payment based on any of the following:
 - a. Claims have been made against Owner based on Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages resulting from Contractor's conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;

- b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;
 - c. Contractor has failed to provide and maintain required bonds or insurance;
 - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;
 - e. Owner has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;
 - f. The Work is defective, requiring correction or replacement;
 - g. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
 - h. The Contract Price has been reduced by Change Orders;
 - i. An event has occurred that would constitute a default by Contractor and therefore justify a termination for cause;
 - j. Liquidated or other damages have accrued as a result of Contractor's failure to achieve Milestones, Substantial Completion, or final completion of the Work;
 - k. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens; or
 - l. Other items entitle Owner to a set-off against the amount recommended.
2. If Owner imposes any set-off against payment, whether based on its own knowledge or on the written recommendations of Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and the specific amount of the reduction, and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, if Contractor remedies the reasons for such action. The reduction imposed will be binding on Contractor unless it duly submits a Change Proposal contesting the reduction.
 3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld will be treated as an amount due as determined by Paragraph 15.01.D.1 and subject to interest as provided in the Agreement.

15.02 *Contractor's Warranty of Title*

- A. Contractor warrants and guarantees that title to all Work, materials, and equipment furnished under the Contract will pass to Owner free and clear of (1) all Liens and other title defects, and (2) all patent, licensing, copyright, or royalty obligations, no later than 7 days after the time of payment by Owner.

15.03 *Substantial Completion*

- A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time

submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before final payment.

- B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.
- C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a preliminary certificate of Substantial Completion which will fix the date of Substantial Completion. Engineer shall attach to the certificate a punch list of items to be completed or corrected before final payment. Owner shall have 7 days after receipt of the preliminary certificate during which to make written objection to Engineer as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the preliminary certificate to Owner, notify Contractor in writing that the Work is not substantially complete, stating the reasons therefor. If Owner does not object to the provisions of the certificate, or if despite consideration of Owner's objections Engineer concludes that the Work is substantially complete, then Engineer will, within said 14 days, execute and deliver to Owner and Contractor a final certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as Engineer believes justified after consideration of any objections from Owner.
- D. At the time of receipt of the preliminary certificate of Substantial Completion, Owner and Contractor will confer regarding Owner's use or occupancy of the Work following Substantial Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Owner and Contractor agree otherwise in writing, Owner shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.
- E. After Substantial Completion the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.
- F. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the punch list.

15.04 *Partial Use or Occupancy*

- A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without

significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:

1. At any time, Owner may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 15.03.A through 15.03.E for that part of the Work.
2. At any time, Contractor may notify Owner and Engineer in writing that Contractor considers any such part of the Work substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.
3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 15.03 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.
4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 6.04 regarding builder's risk or other property insurance.

15.05 *Final Inspection*

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

15.06 *Final Payment*

A. *Application for Payment*

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, annotated record documents (as provided in Paragraph 7.12), and other documents, Contractor may make application for final payment.
2. The final Application for Payment must be accompanied (except as previously delivered) by:
 - a. all documentation called for in the Contract Documents;
 - b. consent of the surety, if any, to final payment;
 - c. satisfactory evidence that all title issues have been resolved such that title to all Work, materials, and equipment has passed to Owner free and clear of any Liens or other title defects, or will so pass upon final payment.

- d. a list of all duly pending Change Proposals and Claims; and
 - e. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of the Work, and of Liens filed in connection with the Work.
- 3. In lieu of the releases or waivers of Liens specified in Paragraph 15.06.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (a) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (b) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien, or Owner at its option may issue joint checks payable to Contractor and specified Subcontractors and Suppliers.
- B. *Engineer's Review of Final Application and Recommendation of Payment:* If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract have been fulfilled, Engineer will, within 10 days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the final Application for Payment to Owner for payment. Such recommendation will account for any set-offs against payment that are necessary in Engineer's opinion to protect Owner from loss for the reasons stated above with respect to progress payments. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.
- C. *Notice of Acceptability:* In support of its recommendation of payment of the final Application for Payment, Engineer will also give written notice to Owner and Contractor that the Work is acceptable, subject to stated limitations in the notice and to the provisions of Paragraph 15.07.
- D. *Completion of Work:* The Work is complete (subject to surviving obligations) when it is ready for final payment as established by the Engineer's written recommendation of final payment and issuance of notice of the acceptability of the Work.
- E. *Final Payment Becomes Due:* Upon receipt from Engineer of the final Application for Payment and accompanying documentation, Owner shall set off against the amount recommended by Engineer for final payment any further sum to which Owner is entitled, including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions of this Contract with respect to progress payments. Owner shall pay the resulting balance due to Contractor within 30 days of Owner's receipt of the final Application for Payment from Engineer.

15.07 *Waiver of Claims*

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

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

- B. The acceptance of final payment by Contractor will constitute a waiver by Contractor of all claims and rights against Owner other than those pending matters that have been duly submitted as a Claim, or appealed under the provisions of Article 17.

15.08 *Correction Period*

- A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the Supplementary Conditions or the terms of any applicable special guarantee required by the Contract Documents), Owner gives Contractor written notice that any Work has been found to be defective, or that Contractor's repair of any damages to the Site or adjacent areas has been found to be defective, then after receipt of such notice of defect Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:
 - 1. correct the defective repairs to the Site or such adjacent areas;
 - 2. correct such defective Work;
 - 3. remove the defective Work from the Project and replace it with Work that is not defective, if the defective Work has been rejected by Owner, and
 - 4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others, or to other land or areas resulting from the corrective measures.
- B. Owner shall give any such notice of defect within 60 days of the discovery that such Work or repairs is defective. If such notice is given within such 60 days but after the end of the correction period, the notice will be deemed a notice of defective Work under Paragraph 7.17.B.
- C. If, after receipt of a notice of defect within 60 days and within the correction period, Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. Contractor shall pay all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others). Contractor's failure to pay such costs, losses, and damages within 10 days of invoice from Owner will be deemed the start of an event giving rise to a Claim under Paragraph 12.01.B, such that any related Claim must be brought within 30 days of the failure to pay.
- D. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.
- E. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

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

ARTICLE 16—SUSPENSION OF WORK AND TERMINATION

16.01 *Owner May Suspend Work*

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

16.02 *Owner May Terminate for Cause*

- A. The occurrence of any one or more of the following events will constitute a default by Contractor and justify termination for cause:
 - 1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment, or failure to adhere to the Progress Schedule);
 - 2. Failure of Contractor to perform or otherwise to comply with a material term of the Contract Documents;
 - 3. Contractor's disregard of Laws or Regulations of any public body having jurisdiction; or
 - 4. Contractor's repeated disregard of the authority of Owner or Engineer.
- B. If one or more of the events identified in Paragraph 16.02.A occurs, then after giving Contractor (and any surety) 10 days' written notice that Owner is considering a declaration that Contractor is in default and termination of the Contract, Owner may proceed to:
 - 1. declare Contractor to be in default, and give Contractor (and any surety) written notice that the Contract is terminated; and
 - 2. enforce the rights available to Owner under any applicable performance bond.
- C. Subject to the terms and operation of any applicable performance bond, if Owner has terminated the Contract for cause, Owner may exclude Contractor from the Site, take possession of the Work, incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and complete the Work as Owner may deem expedient.
- D. Owner may not proceed with termination of the Contract under Paragraph 16.02.B if Contractor within 7 days of receipt of notice of intent to terminate begins to correct its failure to perform and proceeds diligently to cure such failure.
- E. If Owner proceeds as provided in Paragraph 16.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds the cost to complete the Work, including all related claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects,

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

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

16.03 *Owner May Terminate for Convenience*

- A. Upon 7 days' written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):
 - 1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;
 - 2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses; and
 - 3. other reasonable expenses directly attributable to termination, including costs incurred to prepare a termination for convenience cost proposal.
- B. Contractor shall not be paid for any loss of anticipated profits or revenue, post-termination overhead costs, or other economic loss arising out of or resulting from such termination.

16.04 *Contractor May Stop Work or Terminate*

- A. If, through no act or fault of Contractor, (1) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (2) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (3) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon 7 days' written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the contract and recover from Owner payment on the same terms as provided in Paragraph 16.03.
- B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, 7 days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The

provisions of this paragraph are not intended to preclude Contractor from submitting a Change Proposal for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this paragraph.

ARTICLE 17—FINAL RESOLUTION OF DISPUTES

17.01 *Methods and Procedures*

- A. *Disputes Subject to Final Resolution:* The following disputed matters are subject to final resolution under the provisions of this article:
 - 1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full, pursuant to Article 12; and
 - 2. Disputes between Owner and Contractor concerning the Work, or obligations under the Contract Documents, that arise after final payment has been made.
- B. *Final Resolution of Disputes:* For any dispute subject to resolution under this article, Owner or Contractor may:
 - 1. elect in writing to invoke the dispute resolution process provided for in the Supplementary Conditions;
 - 2. agree with the other party to submit the dispute to another dispute resolution process; or
 - 3. if no dispute resolution process is provided for in the Supplementary Conditions or mutually agreed to, give written notice to the other party of the intent to submit the dispute to a court of competent jurisdiction.

ARTICLE 18—MISCELLANEOUS

18.01 *Giving Notice*

- A. Whenever any provision of the Contract requires the giving of written notice to Owner, Engineer, or Contractor, it will be deemed to have been validly given only if delivered:
 - 1. in person, by a commercial courier service or otherwise, to the recipient's place of business;
 - 2. by registered or certified mail, postage prepaid, to the recipient's place of business; or
 - 3. by e-mail to the recipient, with the words "Formal Notice" or similar in the e-mail's subject line.

18.02 *Computation of Times*

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

18.03 *Cumulative Remedies*

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

18.04 *Limitation of Damages*

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

18.05 *No Waiver*

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

18.06 *Survival of Obligations*

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

18.07 *Controlling Law*

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

18.08 *Assignment of Contract*

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

18.09 *Successors and Assigns*

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

18.10 *Headings*

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

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SUPPLEMENTARY CONDITIONS

OF THE CONSTRUCTION CONTRACT

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Exhibit A – Form RD 400-6: Compliance Statement	
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Exhibit C - Form 1940-Q Exhibit A-1: Certification for Contracts, Grants, and Loans	

SUPPLEMENTARY CONDITIONS

OF THE CONSTRUCTION CONTRACT

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

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

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

ARTICLE 1—DEFINITIONS AND TERMINOLOGY

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

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

SC-1.01.A.16 Add the following to Paragraph 1.01.A.16:

When the Project is to be constructed under multiple direct Contracts awarded by the Owner, the term "Contractor" shall mean the appropriate prime contractor. Whenever a specific prime Contractor is referred to, terms such as "General Contractor", "Electrical Contractor", "Plumbing Contractor", "HVAC Contractor", or other appropriate Contract-indicating term will be used.

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

For the purposes of Rural Development, this term is synonymous with the term "applicant" as defined in 7 CFR 1780.7 (a) (1), (2) and (3) and is an entity receiving financial assistance from the federal programs.

SC-1.01.A.40 Add the following to Paragraph 1.01.A.40:

Trucking, shipping, delivery firms, consultants, and entities performing testing or inspection retained by Contractor or any Subcontractor are considered to be Subcontractors.

SC-1.01.A.45 Add the following to Paragraph 1.01.A.45:

Entities that rent construction equipment or machinery, but are not incorporated into the Work, are considered to be Suppliers. If such rental entity furnishes both equipment and one or more personnel to operate and maintain the equipment, such entity is a Subcontractor.

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

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

SC-1.01.A.51 Add the following new paragraph immediately after Paragraph 1.01.A.50:

51. Agency – The project is financed in whole or in part by USDA Rural Utilities Service pursuant to the Consolidated Farm and Rural Development Act (7 U.S.C. Section 1921 et seq.). The Rural Utilities Service programs are administered through the USDA Rural Development offices; therefore, the Agency for these documents is USDA Rural Development.

SC-1.01.A.52 Add the following new paragraph with the title “Domestic Preference Definitions” immediately after Paragraph 1.01.A.51:

52.a *Build America, Buy America Act (BABAA)* – Requirements mandated by Title IX of the Infrastructure Investment and Jobs Act (IIJA), Pub. L. 117-58, §§ 70901-70953-58 mandating domestic preference that all iron and steel, manufactured products, and construction materials are produced in the United States, in accordance with 2 CFR part 184.

52.b Construction Materials – Those articles, materials, or supplies — other than an item of primarily iron or steel; a manufactured product; cement and cementitious materials; aggregates such as stone, sand, or gravel; or aggregate binding agents or additives— that are or consist primarily of: non-ferrous metals, plastic and polymerbased products, glass, lumber or drywall.

52.c Contractor’s Certification – A certification submitted by Contractor that, to the best of the Contractor’s knowledge and belief, all Work complies with Domestic Preference requirements.

52.d De Minimis – Materials and products that represent a small portion of an infrastructure project, specifically no more than 5% of the project costs up to a maximum of \$1,000,000,

52.e Domestic Preference – The Build America, Buy America Act (BABAA) requirements under Title IX of the Infrastructure Investment and Jobs Act (IIJA), Pub. L. 117-58, §§ 70901-70953.

52.f Engineer’s Certification – Documentation submitted by the Engineer that Drawings, Specifications, and Bidding Documents comply with Domestic Preference requirements.

52.g Manufactured Product – Items assembled out of components, or otherwise made or processed from raw materials into finished products. Manufactured products must be manufactured (assembled) in the United States, and the cost of components that were mined, produced, or manufactured in the United States must be greater than 55 percent of the total cost of all components of the product.

52.h Manufacturer’s Certification – Documentation provided by the Manufacturer stating that Domestic Preference requirements have been satisfied for all provided items. Manufacturers’ Certifications must include (at a minimum): specific list of products (using common names) associated with the certificate, location of the final manufacturing, signature of the manufacturer’s representative, and a reference to the Domestic Preference statute. If items are purchased via a Supplier, distributor, vendor, etc. from

the Manufacturer directly, then the Supplier, distributor, vendor, etc. will be responsible for obtaining and providing these certifications to the parties purchasing the products.

52.i Minor Components - Components within an iron and/or steel product otherwise compliant with the Domestic Preference requirements. This waiver, typically used by Manufacturers, allows use of non-domestically produced miscellaneous Minor Components comprising up to five percent of the total material cost of an otherwise domestically produced iron and steel product. However, unless a separate waiver for a product has been approved, all other iron and steel components in said product must still meet the Domestic Preference requirements. This waiver does not exempt the whole product from the Domestic Preference requirements only Minor Components within said product and the iron or steel components of the product must be produced domestically.

52.j Primarily Iron or Steel - A product is made of greater than 50 percent iron or Steel on a materials cost basis.

ARTICLE 2—PRELIMINARY MATTERS

2.01 *Delivery of Bonds and Evidence of Insurance*

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

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

2.02 *Copies of Documents*

SC-2.02 Amend the first sentence of Paragraph 2.02.A to read as follows:

Owner shall furnish to Contractor two (2) paper copies of the Contract Documents (including one fully signed counterpart of the Agreement), and one copy in electronic portable document format (PDF).

SC-2.02 Delete Paragraph 2.02.A in its entirety and insert the following new paragraph in its place:

- A. Owner shall furnish to Contractor five paper copies of conformed Contract Documents incorporating and integrating all Addenda and amendments, if any, negotiated prior to the Effective Date of the Contract (including one fully signed counterpart of the Agreement), and one copy in electronic portable document format (PDF). Additional paper copies of the conformed Contract Documents will be furnished upon request at the cost of reproduction.

2.06 *Electronic Transmittals*

SC-2.06 Delete in its entirety Paragraph 2.06.B and replace with the following new paragraph:

- B. *Electronic Document Protocol:* Comply with Specifications Section 01 31 26 – Electronic Communication Protocols.

ARTICLE 3—CONTRACT DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 *Intent*

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

SC-3.01 Add the following new paragraphs immediately after Paragraph 3.01.E:

- F. The Specifications and other verbal components of the Contract Documents may vary in form, format, and style. Some Specification sections are written in varying degrees of streamlined or declarative style and some Specifications sections may, in comparison, employ a more-narrative style. Omissions of such words and phrases as "Contractor shall," "in conformity with," "as shown," or "as specified" are intentional in streamlined language in the Contract Documents. Omitted words and phrases are incorporated by inference. Similar types of provisions may appear in various parts of a Specifications section or elsewhere in the Contract Documents. Contractor shall not attempt to take advantage of any variation of form, format or style in Change Proposal(s) and Claim(s).
- G. Cross referencing of Specification sections in a Specifications section's heading "Related Sections includes, but are not necessarily limited to: "and elsewhere within each Specifications section is provided as an aid and convenience to Contractor. Contractor shall not rely on cross referencing indicated and is responsible for coordinating the entire Work and providing a complete Project whether or not cross referencing is provided in each Specifications section or whether or not cross referencing is complete.

ARTICLE 4—COMMENCEMENT AND PROGRESS OF THE WORK

SC-4.01.A Delete the Paragraph, and replace with:

A. The Contract Times will commence on the day indicated in the Notice to Proceed. The Notice to Proceed date must be no later than 30 days after the Effective Date of the Contract. The Owner must issue a Notice to Proceed.

SC-4.05.C Amend Paragraph 4.05.C by adding the following subparagraphs:

5. *Weather-Related Delays*

- a. If "abnormal weather conditions" as set forth in Paragraph 4.05.C.2 of the General Conditions are the basis for a request for an equitable adjustment in the Contract Times, such request must be documented by data substantiating each of the following: (1) that weather conditions were abnormal for the period of time in which the delay occurred, (2) that such weather conditions could not have been reasonably anticipated, and (3) that such weather conditions had an adverse effect on the Work on the critical path at the time of the delay. Extreme or unusual weather that is typical for a given region, elevation, or season should not be considered abnormal weather conditions. Requests for time extensions due to abnormal weather conditions will be submitted to the Engineer within five days of the end of the abnormal weather condition event. It is the responsibility of the Contractor to provide the information listed in SC 4.05.C.5.b.
- b. The existence of abnormal weather conditions will be determined on a month-by-month basis in accordance with the following:

- 1) Every workday on which one or more of the following conditions exist will be considered a “bad weather day”:
 - i) Total precipitation (as rain equivalent) occurring between 7:00 p.m. on the preceding day (regardless of whether such preceding day is a workday) through 7:00 p.m. on the workday in question equals or exceeds [threshold precipitation quantity] of precipitation (as rain equivalent, based on the snow/rain conversion indicated in Table SC-4.05.C-1—Foreseeable Bad Weather Days .
 - ii) Ambient outdoor air temperature at 11:00 a.m. is equal to or less than the following low temperature threshold: [temperature] degrees Fahrenheit; or, at 3:00 p.m. the ambient outdoor temperature is equal to or greater than the following high temperature threshold: [temperature] degrees Fahrenheit.
- 2) Determination of actual bad weather days during performance of the Work will be based on the weather records measured and recorded by [name of the entity operating the weather station] weather monitoring station at [location of the weather monitoring station].
- 3) Contractor shall anticipate the number of foreseeable bad weather days per month indicated in Table SC-4.05.C-1—Foreseeable Bad Weather Days.
- 4) In each month, every bad weather day exceeding the number of foreseeable bad weather days established in Table SC-4.05.C-1—Foreseeable Bad Weather Days, will be considered as “abnormal weather conditions.” The existence of abnormal weather conditions will not relieve Contractor of the obligation to demonstrate and document that delays caused by abnormal weather are specific to the planned work activities or that such activities thus delayed were on Contractor’s then-current Progress Schedule’s critical path for the Project.

Table SC-4.05.C-1—Foreseeable Bad Weather Days

Month	Number of Foreseeable Bad Weather Days in Month Based on Precipitation as Rain Equivalent (inches) ⁽¹⁾	Ambient Outdoor Air Temperature (degrees F)	
		Number of Foreseeable Bad Weather Days in Month Based on Low Temperature (at 11:00 a.m.)	Number of Foreseeable Bad Weather Days in Month Based on High Temperature (at 3:00 p.m.)
January			
February			
March			
April			
May			
June			
July			
August			

Month	Number of Foreseeable Bad Weather Days in Month Based on Precipitation as Rain Equivalent (inches) ⁽¹⁾	Ambient Outdoor Air Temperature (degrees F)	
		Number of Foreseeable Bad Weather Days in Month Based on Low Temperature (at 11:00 a.m.)	Number of Foreseeable Bad Weather Days in Month Based on High Temperature (at 3:00 p.m.)
September			
October			
November			
December			
Notes: 1. Two inches of sleet equal one inch of rain. Five inches of wet, heavy snow equal one inch of rain. Fifteen inches of "dry" powder snow equals one inch of rain.			

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

SC-5.04.A Add the following new paragraph immediately after Paragraph 5.04.A.4:

5. Contractor encounters human remains, recognizes the existence of burial markers, archaeological sites, historical sites, artifacts of potential archaeological or historical interest, or wetlands not shown or indicated in the Contract Documents, Contractor shall immediately cease operations that may disturb such area(s) and secure the adjacent Work; and Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations (Contractor shall continue to suspend such operations until otherwise instructed by Owner but shall continue with all other operations that do not affect those remains or features);

ARTICLE 6—BONDS AND INSURANCE

6.01 *Performance, Payment, and Other Bonds*

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

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

6.02 *Insurance—General Provisions*

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

1. Contractor may obtain worker's compensation insurance from an insurance company that has not been rated by A.M. Best, provided that such company (a) is domiciled in the state in which the Project is located, (b) is certified or authorized as a worker's compensation insurance provider by the appropriate state agency, and (c) has been

accepted to provide worker's compensation insurance for similar projects by the state within the last 12 months.

6.03 *Contractor's Insurance*

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

- D. *Other Additional Insureds:* As a supplement to the provisions of Paragraph 6.03.C of the General Conditions, the commercial general liability, automobile liability, umbrella or excess, pollution liability, and unmanned aerial vehicle liability policies must include as additional insureds (in addition to Owner and Engineer) the following: Not Applicable.
- E. *Workers' Compensation and Employer's Liability:* Contractor shall purchase and maintain workers' compensation and employer's liability insurance, including, as applicable, United States Longshoreman and Harbor Workers' Compensation Act, Jones Act, stop-gap employer's liability coverage for monopolistic states, and foreign voluntary workers' compensation (from available sources, notwithstanding the jurisdictional requirement of Paragraph 6.02.B of the General Conditions).

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

- F. *Commercial General Liability—Claims Covered:* Contractor shall purchase and maintain commercial general liability insurance, covering all operations by or on behalf of Contractor, on an occurrence basis, against claims for:
 - 1. damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees,

2. damages insured by reasonably available personal injury liability coverage, and
 3. damages because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom.
- G. *Commercial General Liability—Form and Content:* Contractor's commercial liability policy must be written on a 1996 (or later) Insurance Services Organization, Inc. (ISO) commercial general liability form (occurrence form) and include the following coverages and endorsements:
1. Products and completed operations coverage.
 - a. Such insurance must be maintained for three years after final payment.
 - b. Contractor shall furnish Owner and each other additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract) evidence of continuation of such insurance at final payment and three years thereafter.
 2. Blanket contractual liability coverage, including but not limited to coverage of Contractor's contractual indemnity obligations in Paragraph 7.18.
 3. Severability of interests and no insured-versus-insured or cross-liability exclusions.
 4. Underground, explosion, and collapse coverage.
 5. Personal injury coverage.
 6. Additional insured endorsements that include both ongoing operations and products and completed operations coverage through ISO Endorsements CG 20 10 10 01 and CG 20 37 10 01 (together). If Contractor demonstrates to Owner that the specified ISO endorsements are not commercially available, then Contractor may satisfy this requirement by providing equivalent endorsements.
 7. For design professional additional insureds, ISO Endorsement CG 20 32 07 04 "Additional Insured—Engineers, Architects or Surveyors Not Engaged by the Named Insured" or its equivalent.
- H. *Commercial General Liability—Excluded Content:* The commercial general liability insurance policy, including its coverages, endorsements, and incorporated provisions, must not include any of the following:
1. Any modification of the standard definition of "insured contract" (except to delete the railroad protective liability exclusion if Contractor is required to indemnify a railroad or others with respect to Work within 50 feet of railroad property).
 2. Any exclusion for water intrusion or water damage.
 3. Any provisions resulting in the erosion of insurance limits by defense costs other than those already incorporated in ISO form CG 00 01.
 4. Any exclusion of coverage relating to earth subsidence or movement.
 5. Any exclusion for the insured's vicarious liability, strict liability, or statutory liability (other than worker's compensation).
 6. Any limitation or exclusion based on the nature of Contractor's work.

7. Any professional liability exclusion broader in effect than the most recent edition of ISO form CG 22 79.

I. *Commercial General Liability—Minimum Policy Limits*

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

- J. *Automobile Liability*: Contractor shall purchase and maintain automobile liability insurance for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance, or use of any motor vehicle. The automobile liability policy must be written on an occurrence basis.

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

- K. *Umbrella or Excess Liability*: Contractor shall purchase and maintain umbrella or excess liability insurance written over the underlying employer's liability, commercial general liability, and automobile liability insurance described in the Paragraphs above. The coverage afforded must be at least as broad as that of each and every one of the underlying policies.

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

- L. *Using Umbrella or Excess Liability Insurance to Meet CGL and Other Policy Limit Requirements*: Contractor may meet the policy limits specified for employer's liability, commercial general liability, and automobile liability through the primary policies alone, or

through combinations of the primary insurance policy's policy limits and partial attribution of the policy limits of an umbrella or excess liability policy that is at least as broad in coverage as that of the underlying policy, as specified herein. If such umbrella or excess liability policy was required under this Contract, at a specified minimum policy limit, such umbrella or excess policy must retain a minimum limit of \$[specify amount] after accounting for partial attribution of its limits to underlying policies, as allowed above.

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

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

- N. *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 must cover negligent acts, errors, or omissions in the performance of professional design or related services by the insured or others for whom the insured is legally liable. The insurance must be maintained throughout the duration of the Contract and for a minimum of two years after Substantial Completion. The retroactive date on the policy must pre-date the commencement of furnishing services on the Project.

Contractor's Professional Liability	Policy limits of not less than:
Each Claim	\$2,000,000
Annual Aggregate	\$2,000,000

6.04 *Builder's Risk and Other Property Insurance*

SC-6.04 Supplement Paragraph 6.04 with the following provisions:

- F. *Builder's Risk Requirements:* The builder's risk insurance must:
1. be written on a builder's risk "all risk" policy form that at a minimum includes insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment stored and in transit, and must not exclude the coverage of the following risks: fire; windstorm; hail; flood; earthquake, volcanic activity, and other earth movement; lightning; riot; civil commotion; terrorism; vehicle impact; aircraft; smoke; theft; vandalism and malicious mischief; mechanical breakdown, boiler explosion, and artificially generated electric current; collapse; explosion; debris removal; demolition occasioned by enforcement of Laws and Regulations; and water damage (other than that caused by flood).

- a. Such policy will include an exception that results in coverage for ensuing losses from physical damage or loss with respect to any defective workmanship, methods, design, or materials exclusions.
 - b. 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 will be provided through other insurance policies acceptable to Owner and Contractor.
2. 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.
3. cover expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of contractors, engineers, and architects).
4. 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). If this coverage is subject to a sublimit, such sublimit will be a minimum of \$[amount].
5. extend to cover damage or loss to insured property while in transit. If this coverage is subject to a sublimit, such sublimit will be a minimum of \$[amount].
6. allow for the waiver of the insurer's subrogation rights, as set forth in this Contract.
7. allow for partial occupancy or use by Owner by endorsement, and without cancellation or lapse of coverage.
8. include performance/hot testing and start-up, if applicable.
9. be maintained in effect until the Work is complete, as set forth in Paragraph 15.06.D of the General Conditions, or until written confirmation of Owner's procurement of property insurance following Substantial Completion, whichever occurs first.
10. include as named insureds the Owner, Contractor, Subcontractors (of every tier), and any other individuals or entities required by this Contract to be insured under such builder's risk policy. For purposes of Paragraphs 6.04, 6.05, and 6.06 of the General Conditions, and this and all other corresponding Supplementary Conditions, the parties required to be insured will be referred to collectively as "insureds." In addition to Owner, Contractor, and Subcontractors of every tier, include as insureds the following:
 - a. [Here list by legal name (not Project role or classification) other persons or entities to be insured on the builder's risk policy; see the "HDR Guidance Note" at the start of SC-6.04.F, above). It is generally recommended to list the insured's full

legal/contractual name, address, contact person, telephone, and e-mail address. Include only persons or entities that have property at the Site that is to be insured by the builder's risk insurance. If applicable, separately identify any mortgagee or lender required to be named as a loss payee.]

11. 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:
 - a. [Here list or provide cross-reference to specific items of Owner-furnished (or third-party furnished) equipment, and purchase value; do not list items whose value is already included in the Contract Price (as is the case when an equipment procurement contract is assigned to the Contractor). Contact HDR's ENG MSS team for guidance on this matter when necessary.]
12. If debris removal in connection with repair or replacement of insured property is subject to a coverage sublimit, such sublimit will be a minimum of \$[amount].
13. In addition to the coverage sublimits stated above, the following coverages are also subject to sublimits, as follows:
 - a. [Here list a specific coverage, or cause of loss, that has been determined to be likely to be subject to a sublimit. If not applicable, then delete Paragraph SC-6.04.F.13 in its entirety.] If this coverage is subject to a sublimit, such sublimit will be a minimum of \$[amount].

SC-6.04 Supplement Paragraph 6.04 of the General Conditions with the following provision:

- G. *Coverage for Completion Delays:* The builder's risk policy will include, for the benefit of Owner, loss of revenue and soft cost coverage for losses arising from delays in completion that result from covered physical losses or damage. Such coverage will include, without limitation, fixed expenses and debt service for a minimum of 12 months with a maximum deductible of 30 days, compensation for loss of net revenues, rental costs, and attorneys' fees and engineering or other consultants' fees, if not otherwise covered.

SC-6.04 Supplement Paragraph 6.04 of the General Conditions with the following provisions:

- H. *Builder's Risk and Other Property Insurance Deductibles:* The purchaser of any required builder's risk, installation floater, or other property insurance will be responsible for costs not covered because of the application of a policy deductible.
 1. The builder's risk policy (or if applicable the installation floater) will be subject to a deductible amount of not more than \$[number] for direct physical loss in any one occurrence.

ARTICLE 7—CONTRACTOR'S RESPONSIBILITIES

7.02 *Supervision and Superintendence*

SC-7.02 Add the following to Paragraph 7.02, following Paragraph 7.02.B:

- C. Unless Owner otherwise agrees in writing, the superintendent will be Contractor's representative at the Site and shall have authority to act on behalf of Contractor. All communications given to or received from the superintendent shall be binding on Contractor.

7.03 *Labor; Working Hours*

SC-7.03 Add the following new subparagraphs immediately after Paragraph 7.03.C:

1. Regular working hours will be 8am-5pm.

SC-7.03 Delete Paragraph 7.03.C in its entirety, and insert the following:

- C. In the absence of any Laws or Regulations to the contrary, Contractor may perform the Work on holidays, during any or all hours of the day, and on any or all days of the week, at Contractor's sole discretion.

SC-7.03 Add the following new paragraph immediately after Paragraph 7.03.C:

- D. Contractor shall be responsible for the cost of overtime (premium) pay and other expense incurred by 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-7.04.D Add the following new paragraph immediately after Paragraph 7.04.C:

- D. All products must meet Domestic Preference Requirements.

SC-7.04.E Add the following new paragraph immediately after Paragraph 7.04.D:

For projects utilizing a *De Minimis* waiver, Contractor shall maintain an itemized list of non-domestically produced components and ensure that the cost is less than 5% of total project cost for project up to a maximum of \$1,000,000.

SC-7.05.A Amend the third sentence of paragraph by striking out the following words:

Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or-equal" item is permitted,

SC-7.05.A.1.a.3 Amend the last sentence of Paragraph a.3 by striking out "and;" and adding a period at the end of Paragraph a.3.

SC-7.05.A.1.a.4 Deleted paragraph in its entirety and insert "Deleted."

SC-7.05.B Add the following at the end of paragraph:

Contractor shall include a Manufacturer's Certification or waiver for compliance with Domestic Preference requirements and supporting data, as applicable. Refer to Sample Language for Manufacturer's Certification provided in these Contract Documents.

SC-7.06.A.3.a.2 Remove "and" from the end of paragraph.

SC-7.06.A.3.a.3 Add "; and" to the end of paragraph.

SC-7.06.A.3.a.4 Add the following new paragraph immediately after Paragraph 7.06.A.3.a.3:

4. Comply with Domestic Preference requirements by providing Manufacturers' Certification or waiver, as applicable. Refer to Sample Language for Manufacturers' Certification provided in these Contract Documents.

SC-7.07.B Delete paragraph in its entirety and insert "Deleted".

SC-7.07.E Delete the second sentence of paragraph and insert the following in its place:

Owner may not require that Contractor use a specific replacement.

7.10 Taxes

SC-7.10 Add a new paragraph immediately after Paragraph 7.10.A:

- A. Owner is exempt from payment of sales and compensating use taxes of the State of Kentucky and of cities and counties thereof on all materials to be incorporated into the Work.
 - 1. Owner will furnish the required certificates of tax exemption to Contractor for use in the purchase of materials and equipment to be incorporated into the Work.
 - 2. Owner's exemption does not apply to construction tools or machinery, construction equipment, or other property purchased by or leased by Contractor, or to supplies or materials not incorporated into the Work.

7.11 Laws and Regulations

SC-7.11 Add the following new paragraph immediately after Paragraph 7.10.C:

- D. Refer to Article SC-19 [and Document 00 73 73 – Statutory and Funding-Financing Entity Requirements], for Laws and Regulations that, by terms of said Laws and Regulations, are to be included in the Contract Documents. The failure to include in Article SC-19 [or Document 00 73 73 – Statutory and Funding-Financing Entity Requirements,] any Law or Regulation applicable to the performance of the Work does not diminish Contractor's responsibility to comply with all Laws and Regulations applicable to the performance of the Work.

SC-7.12.A Amend paragraph by adding the following after "written interpretations and clarifications,":

Manufacturers' Certifications

7.14 Hazard Communication Programs

SC-7.14 Add the following new paragraph immediately after Paragraph 7.14.A:

- B *Single Prime Contract:* Contractor shall be responsible for coordinating exchange of 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 and

Regulations. Contractor shall provide a centralized location for the maintenance of the safety data sheets or other hazard communication information required to be made available by any employer on the Site. Location of the material safety data sheets or other hazard communication information shall be readily accessible to the employees of employers on the Site.

SC-7.16.A.1.c Amend paragraph by deleting the last period and adding:

, including Manufacturer's Certification, or waiver for any item in the submittal subject to Domestic Preference requirements. Refer to the Sample Language for Manufacturer's Certification provided in these Contract Documents.

SC-7.16.C.9 Add new paragraph immediately after Paragraph 7.16.C.8:

9. Engineer's review and approval of a Shop Drawing or Sample shall include review of Manufacturers' Certifications and any waivers in order to document compliance with Domestic Preference requirements, as applicable.

SC-7.17.F Add new paragraph immediately after Paragraph 7.17.E:

F. Contractor shall certify prior to final payment that all Work and Materials have complied with Domestic Preference requirements. Contractor shall provide Certification to Owner and Engineer. Refer to the Sample Language for Contractor's Certification provided in these Contract Documents.

ARTICLE 8—OTHER WORK AT THE SITE

ARTICLE 9—OWNER'S RESPONSIBILITIES

ARTICLE 10—ENGINEER'S STATUS DURING CONSTRUCTION

10.03 Resident Project Representative

SC-10.03 Add the following new paragraphs immediately after Paragraph 10.03.B:

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

- a. Serve as Engineer's liaison with Contractor. Working principally through Contractor's authorized representative or designee, assist in providing information regarding the provisions and intent of the Contract Documents.
 - b. Assist Engineer in serving as Owner's liaison with Contractor when Contractor's operations affect Owner's on-Site operations.
 - c. Assist in obtaining from Owner additional details or information, when required for Contractor's proper execution of the Work.
4. *Review of Work; Defective Work*
- a. Conduct on-Site observations of the Work to assist Engineer in determining, to the extent set forth in Paragraph 10.02, if the Work is in general proceeding in accordance with the Contract Documents.
 - b. Observe whether any Work in place appears to be defective. This does not impose on either RPR or Engineer any obligation to find all, or any specific element of, defective Work, for which Contractor remains solely responsible.
 - b. Observe whether any Work in place should be uncovered for observation, or requires special testing, inspection or approval.
5. *Inspections and Tests*
- a. Observe Contractor-arranged inspections required by Laws and Regulations, including but not limited to (1) code-required tests and special inspections, and (2) those performed by public or other agencies having jurisdiction over the Work.
 - b. Observe specific tests, inspections, and other field quality control required by the Contract Documents and performed by Contractor, Subcontractor, Supplier, or by testing or laboratories retained by any of them, .
 - c. Accompany visiting inspectors representing public or other agencies having jurisdiction over the Work.
6. *Payment Requests:* Review Applications for Payment with Contractor and advise Contractor regarding quantities or extent of the Work eligible for payment.
7. *Completion*
- a. Participate in Engineer's visits regarding inspection for Substantial Completion.
 - b. Assist in the augmenting or amending the punch list of items to be completed or corrected prior to final inspection.
 - c. *Final Inspection:* Participate in Engineer's visit to the Site, in the company of Owner and Contractor, regarding completion of the Work, and prepare a final punch list (if any) of items to be completed or corrected by Contractor.
 - d. Observe whether items on the final punch list have been completed or corrected.
 - d. *Record Documents:* Periodically during the Work, review with Contractor the status of Contractor's record documents required by the Contract Documents and advise Contractor on whether such record documents appear to comply with the

Contract's requirements for record documents. Review final record documents submitted by Contractor.

D. The RPR will not:

1. Authorize any deviation from the Contract Documents or substitution of materials, equipment (including "or-equal" items), or procedures or sequences indicated in the Contract Documents.
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 or responsibility over any aspect of the means, methods, techniques, sequences or procedures of construction.
5. Advise on, issue directions regarding, or assume control over security protection, or safety practices, precautions, and programs in connection with the activities or operations of Owner or Contractor.
6. Participate in specialized field or laboratory tests or inspections conducted off-site by others except as specifically authorized by Engineer.
7. Authorize Owner to occupy the Project in whole or in part.

ARTICLE 11—CHANGES TO THE CONTRACT

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

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

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

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

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

For Owner-authorized changes in the Work, the Contractor will provide the Manufacturer's Certification, or waiver, for materials subject to Domestic Preference requirements except when sole-source is specified, in which case the Engineer will provide the Manufacturer's Certification, or waiver.

SC-11.08.B.2.c Add new paragraph immediately after Paragraph 11.09.B.2.b:

c. For change orders involving materials subject to Domestic Preference requirements, Contractor shall include a Manufacturer's Certification or waiver, as applicable. Refer to the Sample Language for Manufacturer's Certification provided in these Contractor Documents.

ARTICLE 12—CLAIMS

No Supplementary Conditions in this Article.

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

13.01 *Cost of the Work*

SC-13.01.B.5.c.(1) Supplement Paragraph 13.01.B.5.c.(1) by adding the following subparagraphs:

- a) Prior to commencing Work at the Site, submit to Owner, through Engineer, copies of the equipment rental agreements for Owner's approval.
- b) Should Contractor perform Work using rented construction equipment or machinery without Owner's written approval of the associated rental agreement and the parties subsequently disagree on the applicable rental rates, use of such construction equipment and machinery will be compensated on the basis of the rental rate book indicated in Paragraph SC-13.01.B.5.c.(2).
- c) When the rental rate book is used basis for determining compensation for construction equipment and machinery leased from a rental firm, the hourly rate for such equipment shall be determined in accordance with Paragraph 13.01.B.5.(2) of the General Conditions.

SC-13.01.B.5.c Supplement Paragraph 13.01.B.5.c by adding the following subparagraphs:

- 4) *Inactive Equipment and Machinery:* Rental of construction equipment and machinery shall cease when the use thereof is no longer necessary for the Work. Periods of inactivity for such construction equipment or machinery will not be compensable unless agreed upon in writing by Owner, unless the costs of disassembly, removal, transportation, reassembly, and remobilization, as submitted to and accepted by Owner (with advice of Engineer) would exceed the cost of continuing to rent the item(s) during the period(s) of inactivity. Contractor is responsible for obtaining Owner's written approval for compensation for construction equipment and machinery for periods of inactivity. Owner is not responsible for retroactively approving such inactivity. "Period of inactivity" for such items includes periods when the construction equipment or machinery is not used or necessary for the logical and efficient progression of the Work, or when other, available equipment or machinery is suitable for performing the given task.
- 5) *Condition of Equipment and Machinery:* Construction equipment and machinery will be compensable only for serviceable construction equipment and machinery capable of efficiently performing its intended function at the Site. Construction equipment and machinery not in compliance with this Paragraph SC-13.01.B.5.c.5) is not eligible for compensation.
- 6) *Capped Compensation:* Compensation paid Contractor for a given item of Contractor-owned construction equipment or machinery will be capped at, and shall

not exceed, the comparable purchase price of such item of equal or comparable capacity and capability.

SC-13.01.C.2 Supplement Paragraph 13.01.C.2 by adding the following definition of small tools and hand tools:

- a. For purposes of this paragraph, “small tools and hand tools” means items in one or more of the following categories: (1) Items that are ordinarily required for the performing worker’s job function, including but not limited to equipment which ordinarily has no associated licensing, insurance, or substantive storage costs; such as hammers, wrenches, socket tools, manual saws, power saws, chainsaws, common power tools, impact drills, threaders, benders, transits and theodolites and related equipment, and other tools transportable by hand, regardless of ownership of such items; (2) Items such as gang-boxes, ladders, hand carts and similar wheeled items manually operated by workers, extension cords, and similar items; (3) common testing equipment such as insulation testers (megger-testing equipment), amp meters, gas detectors, pressure gauges, and similar items; (4) A purchase price (if purchased new, at retail) of \$500, although such limit is not absolute, and certain items may be deemed by Owner or Engineer as “small tools or hand tools” (and not eligible for compensation) even though such item may have a purchase price greater than the amount indicated in this Paragraph 13.01.C.2.

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

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

E. Adjustments in Unit Price

1. Contractor or Owner shall be entitled to an adjustment in the unit price with respect to an item of Unit Price Work if:
 - a. the extended price of a particular item of Unit Price Work amounts to 15 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 15 percent from the estimated quantity of such item indicated in the Agreement; and
 - b. Contractor’s unit costs to perform the item of Unit Price Work have changed materially and significantly as a result of the quantity change.
2. The adjustment in unit price will account for and be coordinated with any related changes in quantities of other items of Work, and in Contractor’s costs to perform such other Work, such that the resulting overall change in Contract Price is equitable to Owner and Contractor.
3. Adjusted unit prices will apply to all units of that item.

E. Adjustments in Unit Price

1. Contractor or Owner shall be entitled to an adjustment in the unit price if the quantity on an individual bid item extends or fails to achieve [number] percent of the estimated

quantity at the time of Contract formation plus any additions or deletions included in change orders to the contract.

2. The adjusted unit price will apply only to all units installed for that bid item.

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

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

G. Installation of materials that are non-compliant with Domestic Preference requirements shall be considered defective work. Contractor should ensure that Engineer has approved Manufacturer's Certification, or waiver, prior to any domestic preference compliant item being delivered to project site.

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

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

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.5 Add new paragraph immediately after Paragraph 15.01.B.4:

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

SC-15.01.B.6 Add new paragraph immediately after Paragraph 15.01.B.5:

6. By submitting an Application for Payment, based in whole or in part on furnishing equipment or materials, Contractor certifies that such equipment and materials are compliant with Domestic Preference requirements. Manufacturer's Certification for material(s) satisfy these requirements. Refer to the Sample Language for Manufacturer's Certification provided in these Contract Documents.

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

d. The materials presented for payment in an Application for Payment comply with Domestic Preference requirements.

SC-15.01.D.1 Delete paragraph in its entirety and insert the following in its place:

The Application for Payment with Engineer's recommendations will be presented to the Owner and Agency for consideration. If both the Owner and Agency find the Application for Payment acceptable, the recommended amount less any reduction under the provisions of Paragraph 15.01.E will become due twenty (20) days after the Application for Payment is presented to the Owner, and the Owner will make payment to the Contractor.

SC-15.02.A Amend paragraph by striking out the following text: "7 days after".

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

Contractor shall also submit the Contractor's Certification of Compliance certifying that to the best of the Contractor's knowledge and belief all Iron and Steel products,

Manufactured Products, and Construction Materials proposed in the Shop Drawings, Change Orders, and Partial Payment Estimates, and those installed for the Project, comply with Domestic Preference requirements.

15.03 *Substantial Completion*

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

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

15.08 *Correction Period*

SC-15.08.G Add the following new Paragraph 15.08.G:

- G. The correction period specified as one year after the date of Substantial Completion in Paragraph 15.08.A of the General Conditions is hereby revised to be the number of years set forth in Paragraph SC-6.01.B.1; or if no such revision has been made in SC-6.01.B, then the correction period is hereby specified to be **[number]** years after the date of Substantial Completion established in Engineer's certificate of Substantial Completion.

ARTICLE 16—SUSPENSION OF WORK AND TERMINATION

No Supplementary Conditions in this Article.

ARTICLE 17—FINAL RESOLUTIONS OF DISPUTES

17.02 *Arbitration*

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

SC-17.02 *Arbitration*

- A. All matters subject to final resolution under this Article will be settled by arbitration administered by [the American Arbitration Association] in accordance with [its Construction Industry Arbitration Rules] (subject to the conditions and limitations of this Paragraph SC-17.02). Any controversy or claim in the amount of \$100,000 or less will be settled in accordance with [the American Arbitration Association's supplemental rules for Fixed Time and Cost Construction Arbitration]. This agreement to arbitrate will be specifically enforceable under the prevailing law of any court having jurisdiction.
- B. The demand for arbitration will be filed in writing with the other party to the Contract and with the selected arbitration administrator, and a copy will be concurrently sent to Engineer for information. The demand for arbitration will be made within the specific time required in Article 17, or, if no specified time is applicable, within a reasonable time after the matter in question has arisen, and in no event will any such demand be made after the date when institution of legal or equitable proceedings based on such matter in question would be barred by the applicable statute of limitations.

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

exception, the disclosure must be strictly and narrowly limited to maintain confidentiality to the extent possible.

17.03 *Attorneys' Fees*

SC-17.03 Add the following new paragraph immediately after Paragraph 17.02.

SC-17.03 *Attorneys' Fees*

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

ARTICLE 18—MISCELLANEOUS

18.08 *Assignment of Contract*

SC-18.11 Add a new paragraph immediately after Paragraph 18.10:

18.11 *Tribal Sovereignty*

- A. No provision of this Agreement will be construed by any of the signatories as abridging or debilitating any sovereign powers of the [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-18.11 *Confidential Information*

- A. All Drawings, Specifications, technical data, and other information furnished to Contractor either by Owner or Engineer or developed by Contractor or others in connection with the Work are, and will remain, the property of Owner or Engineer, and shall not be copied or otherwise reproduced or used in any way except in connection with the Work, or disclosed to third parties or used in any manner detrimental to the interests of Owner or Engineer.
- B. The following information is not subject to the above confidentiality requirements:
 - 1. information in the public domain through no action of Contractor in breach of the Contract Documents; or
 - 2. information lawfully possessed by Contractor before receipt from Owner or Engineer; or
 - 3. information required to be disclosed by Laws or Regulations, or by a court or agency of competent jurisdiction. However, in the event Contractor shall be so required to disclose such information, Contractor shall, prior to disclosure, provide reasonable notice to Owner and Engineer, who shall have the right to interpose all objections Owner may have to the disclosure of such information.

SC-18.12 Add a new paragraph immediately after Paragraph 18.11, to read as follows:

SC-18.12 *Publicity*

- A. Contractor shall not disclose to any third party the nature of its Work on the Project, nor engage in publicity or public media disclosures with respect to the Project without the prior written consent of Owner.

SC-19 Add the following new Article 19 immediately after Article 18:

ARTICLE 19—FEDERAL REQUIREMENTS

19.01 *Agency Not a Party*

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

19.02 *Contract Approval*

- A. Owner and Contractor will furnish Owner's attorney such evidence as required so that Owner's attorney can complete and execute the "Certificate of Owner's Attorney" before Owner submits the executed Contract Documents to Agency for approval. Refer to Certificate of Owner's Attorney and Agency Concurrence provided in these Contract Documents. B. Agency concurrence is required on both the Bid and the Contract before the Contract is effective.

19.03 *Conflict of Interest*

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

19.04 *Gratuities*

- A. If Owner finds after a notice and hearing that Contractor, or any of Contractor's agents or representatives, offered or gave gratuities (in the form of entertainment, gifts, or otherwise) to any official, employee, or agent of Owner or Agency in an attempt to secure this Contract or favorable treatment in awarding, amending, or making any determinations related to the performance of this Contract, Owner may, by written notice to Contractor, terminate this Contract. Owner may also pursue other rights and remedies that the law or this Contract provides. However, the existence of the facts on which Owner bases such findings shall be an issue and may be reviewed in proceedings under the dispute resolution provisions of this Contract.

- B. In the event this Contract is terminated as provided in paragraph 19.04.A, Owner may pursue the same remedies against Contractor as it could pursue in the event of a breach of this Contract by Contractor. As a penalty, in addition to any other damages to which it may be entitled by law, Owner may pursue exemplary damages in an amount (as determined by Owner) which shall not be less than three nor more than ten times the costs Contractor incurs in providing any such gratuities to any such officer or employee.

19.05 *Small, Minority and Women's Businesses*

A. If Contractor intends to let any subcontracts for a portion of the work, Contractor will take all necessary affirmative steps to assure that minority businesses, women's business enterprises, and labor surplus area firms are used when possible. Affirmative steps will include:

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

19.06 Anti-Kickback

A. Contractor shall comply with the Copeland Anti-Kickback Act (40 U.S.C. 3145) as supplemented by Department of Labor regulations (29 CFR part 3, "Contractors and Subcontractors on Public Buildings or Public Works Financed in Whole or in Part by Loans or Grants of the United States"). The Act provides that Contractor or subcontractor shall be prohibited from inducing, by any means, any person employed in the construction, completion, or repair of public facilities, to give up any part of the compensation to which they are otherwise entitled. Owner shall report all suspected or reported violations to Agency.

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

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

19.08 Equal Employment Opportunity

A. The Contract is considered a federally assisted construction contract. Except as otherwise provided under 41 CFR part 60, all contracts that meet the definition of "federally assisted construction contract" in 41 CFR part 60-1.3 must include the equal opportunity clause provided under 41 CFR 60-1.4(b), in accordance with Executive Order 11246, "Equal Employment Opportunity" (30 FR 12319, 12935, 3 CFR part, 1964-1965 Comp., p. 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."

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

A. Contractors that apply or bid for an award exceeding \$100,000 must file the required certification (RD Instruction 1940-Q Exhibit A-1). The Contractor certifies to the Owner and every subcontractor certifies to the Contractor that it will not and has not used federal appropriated

funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, officer or employee of Congress, or an employee of a member of Congress in connection with obtaining the Contract if it is covered by 31 U.S.C. 1352. The Contractor and every subcontractor must also disclose any lobbying with non-federal funds that takes place in connection with obtaining any federal award. Such disclosures are forwarded from tier to tier up to the Owner. Necessary certification and disclosure forms shall be provided by Owner.

19.10 *Environmental Requirements*

A. When constructing a Project involving trenching and/or other related earth excavations, Contractor shall comply with the following environmental conditions:

1. Wetlands – When disposing of excess, spoil, or other Construction Materials on public or private property, Contractor shall not fill in or otherwise convert wetlands.

2. Floodplains – When disposing of excess, spoil, or other Construction Materials on public or private property, Contractor shall not fill in or otherwise convert 100-year floodplain areas (Standard Flood Hazard Area) delineated on the latest Federal Emergency Management Agency Floodplain Maps, or other appropriate maps, e.g., alluvial soils on NRCS Soil Survey Maps.

3. Historic Preservation - Applicants shall ensure that Contractors maintain a copy of the following inadvertent discovery plan onsite for review:

a. If during the course of any ground disturbance related to any Project, any post review discovery, including but not limited to, any artifacts, foundations, or other indications of past human occupation of the area are uncovered, shall be protected by complying with 36 CFR § 800.13(b)(3) and (c) and shall include the following:

i. All Work, including vehicular traffic, shall immediately stop within a 50 ft. radius around the area of discovery. The Contractor shall ensure barriers are established to protect the area of discovery and notify the Engineer to contact the appropriate RD personnel. The Engineer shall engage a Secretary of the Interior (SOI) qualified professional archeologist to quickly assess the nature and scope of the discovery; implement interim measures to protect the discovery from looting and vandalism; and establish broader barriers if further historic and/or precontact properties, can reasonably be expected to occur.

ii. The RD personnel shall notify the appropriate RD environmental staff member, the Federal Preservation Officer (FPO), and State Historic Preservation Office (SHPO) immediately. Indian tribe(s) or Native Hawaiian Organization (NHOs) that have an interest in the area of discovery shall be contacted immediately. The SHPO may require additional tribes or NHOs who may have an interest in the area of discovery also be contacted. The notification shall include an assessment of the discovery provided by the SOI qualified professional archeologist.

iii. When the discovery contains burial sites or human remains, the Contractor shall immediately notify the appropriate RD personnel who will contact the RD environmental staff member, FPO, and the SHPO. The relevant law enforcement authorities shall be immediately contacted by onsite personnel to reduce delay times, in accordance with tribal, state, or local laws including 36 CFR part 800.13; 43 CFR part 10, subpart B; and the Advisory Council on Historic Preservation's

Policy Statement Regarding treatment of Burial Sites, Human Remains, or Funerary Objects (February 23, 2007).

iv. When the discovery contains burial sites or human remains, all construction activities, including vehicular traffic shall stop within a 100 ft. radius of the discovery and barriers shall be established. The evaluation of human remains shall be conducted at the site of discovery by a SOI qualified professional. Remains that have been removed from their primary context and where that context may be in question may be retained in a secure location, pending further decisions on treatment and disposition. RD may expand this radius based on the SOI professional's assessment of the discovery and establish broader barriers if further subsurface burial sites, or human remains can reasonably be expected to occur. RD, in consultation with the SHPO and interested tribes or NHOs, shall develop a plan for the treatment of native human remains.

v. Work may continue in other areas of the undertaking where no historic properties, burial sites, or human remains are present. If the inadvertent discovery appears to be a consequence of illegal activity such as looting, the onsite personnel shall contact the appropriate legal authorities immediately if the landowner has not already done so.

vi. Work may not resume in the area of the discovery until a notice to proceed has been issued by RD. RD shall not issue the notice to proceed until it has determined that the appropriate local protocols and consulting parties have been consulted. vii. Inadvertent discoveries on federal and tribal land shall follow the processes required by the federal or tribal entity.

4. Endangered Species – Contractor shall comply with the Endangered Species Act, which provides for the protection of endangered and/or threatened species and critical habitat. Should any evidence of the presence of endangered and/or threatened species or their critical habitat be brought to the attention of Contractor, Contractor will immediately report this evidence to Owner and a representative of Agency. Construction shall be temporarily halted pending the notification process and further directions issued by Agency after consultation with the U.S. Fish and Wildlife Service.

5. Mitigation Measures – The following environmental mitigation measures are required on this Project: Applicant is responsible for acquiring the necessary permits for construction and operation of the projects and adhering to all environmental commitments made regarding construction and maintenance of the proposed projects. An inadvertent discovery provision, developed in accordance with 36 CFR § 800.13(b) and (c), will be included as a condition of obligation in order to address any historic properties which may be inadvertently discovered or affected during project construction. The project shall be in compliance with all requirements noted in the Office for Local Development letter dated April 23, 2024, from Ms. Billie R. Johnson.

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

A. Where applicable, for contracts awarded by the Owner in excess of \$100,000 that involve the employment of mechanics or laborers, the Contractor will comply with 40 U.S.C. 3702 and 3704, as supplemented by Department of Labor regulations (29 CFR part 5). Under 40 U.S.C. 3702 of the Act, the Contractor will compute the wages of every mechanic and laborer on the basis of a standard work week of 40 hours. Work in excess of the standard work week is permissible

provided that the worker is compensated at a rate of not less than one and a half times the basic rate of pay for all hours worked in excess of 40 hours in the work week. The requirements of 40 U.S.C. 3704 are applicable to construction work and provide that no laborer or mechanic will be required to work in surroundings or under working conditions which are unsanitary, hazardous or dangerous. These requirements do not apply to the purchases of supplies or materials or articles ordinarily available on the open market, or contracts for transportation or transmission of intelligence.

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

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

19.13 *Procurement of recovered materials*

A. The Contractor will comply with 2 CFR 200.322, "Procurement of recovered materials."

19.14 *Domestic Preference*

A. Build America, Buy America Act (BABAA). All Iron and Steel Products, Manufactured Products, and Construction Materials used in this project must comply with the Build America, Buy America Act (BABAA) requirements mandated by Title IX of the Infrastructure Investment and Jobs Act (IIJA), Pub. L. 117-58, §§ 70901-70953. Aggregates such as stone, sand, or gravel do not apply to BABAA

B. The following waivers apply to this Contract:

1. BABAA De Minimis, Small Grants and Minor Components

19.15 *Telecommunications and Video Surveillance Services or Equipment Prohibitions*

A. The telecommunication and video surveillance services and equipment prohibitions under 2 CFR 200.216 apply to this contract. This contract may not be used to procure or obtain equipment, services, or systems that uses covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system. Covered telecommunications equipment is:

1. Telecommunications equipment produced by Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate of such entities).
2. Video surveillance and telecommunications equipment produced by Hytera Communications Corporation, Hangzhou Hikvision Digital Technology Company, or Dahua Technology Company (or any subsidiary or affiliate of such entities).
3. Telecommunications or video surveillance services provided by such entities or using such equipment.

4. Telecommunications or video surveillance equipment or services produced or provided by an entity that the Secretary of Defense, in consultation with the Director of the National Intelligence or the Director of the Federal Bureau of Investigation, reasonably believes to be an entity owned or controlled by, or otherwise connected to, the government of a covered foreign country.

COMPLIANCE STATEMENT

This statement relates to a proposed contract with _____

(Name of borrower or grantee)

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

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

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

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

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

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

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

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

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

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

Date _____

(Signature of Bidder or Prospective Contractor)

Address (including Zip Code)

**EXHIBIT B— FORM AD-1048: CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY,
AND VOLUNTARY EXCLUSION**



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

The following statement is made in accordance with the Privacy Act of 1974 (5 U.S.C. § 552a, as amended). This certification is required by the regulations implementing Executive Order 12549, Debarment and Suspension, and 2 CFR §§ 180.300, 180.335, Participants' responsibilities. The regulations were amended and published on August 31, 2005, in 70 Fed. Reg. 51865-51880. Copies of the regulations may be obtained by contacting the Department of Agriculture agency offering the proposed covered transaction.

According to the Paperwork Reduction Act of 1995, an agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0505-0027. The time required to complete this information collection is estimated to average 15 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. The provisions of appropriate criminal or civil fraud, privacy, and other statutes may be applicable to the information provided.

(Read instructions on page two before completing certification.)

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

ORGANIZATION NAME

PR/AWARD NUMBER OR PROJECT NAME

NAME(S) AND TITLE(S) OF AUTHORIZED REPRESENTATIVE(S)

SIGNATURE

DATE

In accordance with Federal civil rights law and U.S. Department of Agriculture (USDA) civil rights regulations and policies, the USDA, its Agencies, offices, and employees, and institutions participating in or administering USDA programs are prohibited from discriminating based on race, color, national origin, religion, sex, disability, age, marital status, family/parental status, income derived from a public assistance program, political beliefs, or reprisal or retaliation for prior civil rights activity, in any program or activity conducted or funded by USDA (not all bases apply to all programs). Remedies and complaint filing deadlines vary by program or incident.

Persons with disabilities who require alternative means of communication for program information (e.g., Braille, large print, audiotape, American Sign Language, etc.) should contact the State or local Agency that administers the program or contact USDA through the Telecommunications Relay Service at 711 (voice and TTY). Additionally, program information may be made available in languages other than English.

To file a program discrimination complaint, complete the USDA Program Discrimination Complaint Form, AD-3027, found online at [How to File a Program Discrimination Complaint](#) and at any USDA office or write a letter addressed to USDA and provide in the letter all of the information requested in the form. To request a copy of the complaint form, call (866) 632-9992. Submit your completed form or letter to USDA by: (1) mail: U.S. Department of Agriculture, Office of the Assistant Secretary for Civil Rights, 1400 Independence Avenue, SW, Washington, D.C. 20250-9410; (2) fax: (202) 690-7442; or (3) email: program.intake@usda.gov.

USDA is an equal opportunity provider, employer, and lender.

Instructions for Certification

- (1) By signing and submitting this form, the prospective lower tier participant is providing the certification set out on page 1 in accordance with these instructions.
- (2) The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the Department or agency with which this transaction originated may pursue available remedies, including suspension or debarment.
- (3) The prospective lower tier participant must provide immediate written notice to the person(s) to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.
- (4) The terms "covered transaction," "debarred," "suspended," "ineligible," "lower tier covered transaction," "participant," "person," "primary covered transaction," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of the rules implementing Executive Order 12549, at 2 CFR Parts 180 and 417. You may contact the Department or agency to which this proposal is being submitted for assistance in obtaining a copy of those regulations.
- (5) The prospective lower tier participant agrees by submitting this form that, should the proposed covered transaction be entered into, it may not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the Department or agency with which this transaction originated.
- (6) The prospective lower tier participant further agrees by submitting this form that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transactions," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.
- (7) A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the General Services Administration's System for Award Management Exclusions database.
- (8) Nothing contained in the foregoing shall be construed to require establishment of a system of records to render in good faith the certification required by this clause. The knowledge and information of a participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.
- (9) Except for transactions authorized under paragraph (5) of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the Department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

CERTIFICATION FOR CONTRACTS, GRANTS AND LOANS

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

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

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

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

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

(name)

(date)

(title)

000



2023 Water System Improvements

Meade County Water District
Meade County, Kentucky

ADDENDUM NO. [1]

[Month] [Day], [Year]

TO: Prospective Bidders

FROM: HDR (Engineer)
[HDR project office street address]
[HDR project office city, state, postal code]

OWNER: [Owner's organization name]
[Owner's street address]
[Owner's city, state, postal code]

SUBJECT: [Site or facility name]
[Project title—same as on Drawings and project manual cover]
[Owner's contract designation, if any]

This Addendum is part of the Bidding Documents and the Contract Documents and modifies the original Bidding Documents dated [____], as indicated below. Acknowledge receipt of this Addendum in the space provided on the Bid Form. Failure to do so may subject the Bidder to disqualification for award of the associated Contract.

This Addendum consists of [____] pages and the attachments, if any, listed on the last page.



ADDENDUM NO. [1] SEALS AND SIGNATURES

[insert licensee], PE License No. []	The seal and signature to the left applies to the changes made via this Addendum for the Work in the following divisions, sections, and Drawings of the proposed Contract Documents: • []. • [].
[insert licensee], PE License No. []	The seal and signature to the left applies to the changes made via this Addendum for the Work in the following divisions, sections, and Drawings of the proposed Contract Documents: • []. • [].
[insert licensee], PE License No. []	The seal and signature to the left applies to the changes made via this Addendum for the Work in the following divisions, sections, and Drawings of the proposed Contract Documents: • []. • [].



[insert licensee], PE License No. []	The seal and signature to the left applies to the changes made via this Addendum for the Work in the following divisions, sections, and Drawings of the proposed Contract Documents: • []. • [].

Engineer's seal and signature does not apply to the documents, or changes thereto, that comprise Division 00, Bidding and Contracting Requirements, except for revisions to provisions of prior Addenda that modify the Specifications and Drawings.

It is a violation applicable laws and regulations governing professional licensing and registration for any person, unless acting under the direction of the licensed and registered design professional(s) indicated above, to alter in any way the proposed Specifications, Drawings, and Addenda for this Project.

CHANGES TO PRIOR ADDENDA

None

CHANGES TO INTRODUCTORY INFORMATION

None

CHANGES TO BIDDING REQUIREMENTS

None

CHANGES TO CONTRACTING REQUIREMENTS

None

CHANGES TO SPECIFICATIONS

None

CHANGES TO DRAWINGS

None

ATTACHMENTS

END OF ADDENDUM NO. [1]

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DIVISION 01

GENERAL REQUIREMENTS



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SECTION 01 11 00

SUMMARY OF WORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Location and description of Work and prior uses of the Site.
2. Construction Contracts for this Project.
3. Others retained by Owner for the Project.
4. Contractor's use of the Site.
5. Easements and rights-of-way.

1.2 LOCATION AND DESCRIPTION OF WORK

A. The proposed project has (4) components including linear pipe installation, pump station improvements, and tank rehabilitation as described below:

1. Flaherty Transmission Main – Pipeline located along Joe Prather Highway (KY 313) and Garrett Road (KY 1238) starting at the Flaherty Tank and ending at the Garrett Tank. Approximately 18,500 linear feet of 16-inch water main will be installed via open cut and trenchless methods.
2. Flaherty Pump Station Upgrade – station will be upgraded with two (2) new 125 HP VFD-controlled pumps. Additional improvements include electrical upgrades, generator replacement, and minor site improvements.
3. Payneville Packaged Pump Station - New pump station site will be constructed along KY-144 near Payneville. Features at the site include a 20 HP VFD-controlled package pump station, water filling station, and related site improvements.
4. System Wide SCADA Improvements – Included upgrades, RTU cabinets, replacing PLCs, terminal boards, relays, servers, workstations and related hardware at various facilities. SCADA hardware list is provided in the appendix.
5. Two Additive Alternates:
 - a. Tank rehabilitation of the Garrett Tank and Payneville Tank including, but not limited to, new tank interior and exterior coating system, containment structure, tank repairs, and new tank inlet fill pipe at Payneville tank. The specific work required is listed in the Inspection Reports prepared by Horizon Inspection LLC.

B. Contracting Method: The Project will be constructed under a single prime construction Contract.

1.3 CONSTRUCTION CONTRACTS FOR THIS PROJECT

- A. Single Prime Construction Contract: The Contract requires all the Work for the Project not expressly allocated to Owner or others in the Contract Documents.**
- B. All contractors, subcontractors, suppliers, and other employers involved with work at the Project Sites shall be responsible for compliance with all federal, state, local, and Project Owner regulations, standards, and codes in effect during the Contract duration.**

1.4 OTHERS RETAINED BY OWNER FOR THE PROJECT

A. Engineer:

1. Engineer is identified in the Agreement.
2. Engineer's responsibilities for the Project, relative to Contractor, are indicated throughout the Contract Documents.
3. Whether the Engineer will furnish the services of a Resident Project Representative (RPR) for the Project is indicated in the Supplementary Conditions.

- B. Non-Professional Services Contracted by Owner: Owner will retain the services of a NACE certified Coatings Inspector for the duration of the Project.

1.5 WORK BY OWNER

- A. Owner will perform the following in connection with the Work:
 - 1. Operate all existing valves, flow-control gates, pumps, equipment, and appurtenances that will affect Owner's operations or facility processes, unless otherwise specified or indicated.

1.6 SEQUENCE AND PROGRESS OF WORK

- A. Sequencing:
 - 1. Incorporate sequencing of the Work into the Progress Schedule.

1.7 EASEMENTS AND RIGHTS-OF-WAY

- A. Easements and Rights-of-Way - General:
 - 1. Easements and rights-of-way required for the permanent improvements included in the Work will be provided by Owner in accordance with the General Conditions and Supplementary Conditions.
 - 2. Confine construction operations within Owner's property, public rights-of-way, easements obtained by Owner, and limits shown, and property for which Contractor has made arrangements directly with property owner(s).
 - 3. Use care in placing construction tools, machinery and equipment, excavated materials, and materials and equipment to be incorporated into the Work to avoid damaging property and interfering with traffic.
 - 4. Do not enter private property outside the construction limits without permission from the owner of the property.
- B. On Private Property:
 - 1. General limits of Owner-furnished easements are shown on the Drawings.
 - 2. The Owner is the fee simple owner of the tank sites.

PART 2 - PRODUCTS - (NOT USED)

PART 3 - EXECUTION - (NOT USED)

END OF SECTION

SECTION 01 14 33
WORK IN RIGHTS-OF-WAY

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. General requirements for:
 - a. Work in street and highway rights-of-way.
- B. Scope:
 - 1. Contractor shall obtain necessary permits, arrange and pay for inspections required by each right-of-way owner, and pay all charges for the Work in each right-of-way where the Work will be performed.
 - 2. Comply with applicable rules, regulations, permits, and standards of right-of-way owner.
 - 3. As indicated in other Article(s) of this Section, Owner has obtained or will obtain occupancy permits or similar permits required by owners of rights-of-way for the permanent location of Owner's facilities within the subject right-of-way. Contractor shall obtain necessary work permits and similar permits necessary for installing the Work in and adjacent to each subject right-of-way.

1.2 WORK IN STREET AND HIGHWAY RIGHTS-OF-WAY

- A. Owners of streets or highway rights-of-way in which the Work will be performed include:
 - 1. Street or highway name as it appears on the Drawings:
 - a. Jurisdiction: Kentucky Transportation Cabinet.
 - b. Method: The Work will be via open cut installation and bore and jack installation.
 - c. Occupancy Permit: Has been obtained by Owner and is available to Contractor upon request.
 - d. Maintain not less than one lane(s) of traffic in each direction during the Work.
- B. Traffic Control During Construction: Comply with Section 01 55 26 - Traffic Control.

1.3 SUBMITTALS

- A. Informational Submittals: Submit the following:
 - 1. Permits:
 - a. Copy of work permit obtain from owner of each right-of-way in which Work will be performed.
 - b. Submit prior to starting work in or adjacent to the associated right-of-way.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Materials used shall be in accordance with requirements of associated right-of-way owner and the Contract Documents.

PART 3 - EXECUTION

3.1 PREPARATION AND PROTECTION

- A. Contractor shall implement means necessary to prevent accidents caused or influenced by the Work. Provide flaggers, temporary barriers, barricades, lights, signs, and other temporary measures to provide safe conditions during the Work.

3.2 INSTALLATION

A. Utility Crossings of Rights-of-Way:

1. Work shall be located as shown on the Drawings.
2. Provide materials, equipment, piping, and appurtenances required for crossings of existing Underground Facilities and aboveground facilities, utilities, and structures.
3. Furnish and maintain at the Site sufficient additional pipe fittings, adapters, and short lengths of required utility carrier pipe (quantities to be determined by Contractor) to expedite providing complete installation of utility carrier piping without unduly long period for open excavations in or adjacent to rights-of-way. Such pipe fittings, adapters, and short pieces are eligible for payment when properly installed and are in accordance with the Contract Documents.

B. Pavement:

1. When fill is stabilized in accordance with requirements of owner of the street or highway right-of-way and the Contract Documents, replace roadway subbase material and pavement with materials as required by the Contract Documents and, if not expressly required, replace with pavement of similar type and equal thickness to the pavement in place prior to start of the Work.
2. Paving shall comply with requirements of owner of the street or highway right-of-way and the Contract Documents.

C. Restoration for Other than Paved Areas:

1. Restore disturbed areas of rights-of-way in accordance with associated permits and the Contract Documents. Where permits and the Contract Documents do not expressly address the type or extent of such restoration, restore all areas disturbed during the Work to condition equal to or better than preconstruction conditions.
2. If owner of the right-of-way requires restorations beyond that required by the Contract Documents and applicable permits, promptly advise Engineer and submit Change Proposal in accordance with the Contract Documents. Obtain authorization in accordance with the Contract prior to performing any Work not in accordance with or beyond the scope of the Contract Documents.

END OF SECTION

SECTION 01 21 00 ALLOWANCES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Administrative and procedural requirements for:
 - a. Quantity allowances.
- B. Related Requirements:
 - 1. Include but are not necessarily limited to the following:
 - a. Section 01 26 00 - Contract Modification Procedures.

1.2 REFERENCES

- A. Terminology:
 - 1. Terminology indicated below are not defined terms and are not indicated with initial capital letters, but when used in this section have the following meanings:
 - a. "Allowance authorization" or "authorization", whether singular or plural, are Owner's written and signed approval for using a specific allowance item, in a specific authorized amount, for a specific construction task or activity. Allowance authorizations include all associated attachments at the time of Owner's signature and as delivered to Contractor.
 - b. "Quantity allowance" is an item of Unit Price Work that is included in the Contract Price but the location of which is not shown or indicated on the Drawings or other Contract Documents at the time Bids were opened. When authorized, quantity allowances are to be performed at locations to be indicated by Owner or Engineer. Quantity allowances are controlled by Owner and are for Owner's sole use. The terms "quantity allowance", "extra work item", "extra work unit price item", and the like have the same meaning.

1.3 ALLOWANCES – GENERAL

- A. This Article applies to all allowance types and all authorized allowance Work performed in accordance with the Contract Documents.
- B. All allowances in the Contract are Owner-controlled and for Owner's sole use. Contractor has no right or entitlement to any allowance or part thereof without express, written authorization from Owner.
- C. Authorization of Allowances:
 - 1. Only Owner can authorize use of an allowance. No other entity, including Engineer, Resident Project Representative (RPR, if any), Owner's Site Representative (OSR, if any), or others may authorize use of allowances in place of Owner.
 - 2. Allowance Authorization Mechanism:
 - a. To be binding and enforceable, allowance authorizations must be in writing, signed by one of the Owner's employees indicated immediately above.
 - b. Allowance authorization form is attached to this Section.
 - c. Allowance authorizations issued in accordance with the procedures set forth in this Section, are binding and enforceable under the Contract, unless promptly contested in writing by Contractor in accordance with this Section.
 - d. Oral authorizations, authorizations without an appropriate signature, and authorizations not on the proper form, will not be binding or enforceable.
 - 3. Allowance authorizations duly signed by Owner's authorized person may be delivered to Contractor by Engineer, RPR, OSR, or other Owner-authorized representative, and shall be binding and enforceable when so delivered (unless properly contested).

4. Do not perform Work presumed for compensation under an allowance without first obtaining Owner's allowance authorization.
 5. Work presumed by Contractor to be under an allowance and performed without: (a) written authorization duly signed by Owner, or (b) Change Order, or (c) Work Change Directive, is not be eligible for payment.
- D. Contract Times:
1. Allowance authorizations do not have any effect on, and do not change, the Contract Times. The Contract Times can be changed only via a duly authorized Change Order.
 2. Should the Work included in an allowance authorization adversely affect Contractor's ability to comply with the Contract Times, promptly submit Change Proposal (including appropriate supporting documentation), in accordance with the Contract Documents, indicating the associated, specific, proposed effect on each of the Contract Times.
- E. Payment for Work Under an Allowance Authorization:
1. Work duly authorized by Owner under an allowance is eligible for payment upon performance of the associated Work, in accordance with the Contract Documents and the associated allowance authorization.
 2. When applying for payment for Work under an allowance authorization, the Application for Payment shall include a copy of the associated allowance authorization(s) signed by Owner.
 3. When requested by Owner or Engineer, amend the Schedule of Values to indicate Work authorized under contingency allowances or cash allowances.
- F. Compensation for Bonds and Insurance:
1. Contractor is not eligible for compensation under an allowance, or for an increase in the Contract Price, for costs associated with insurance, performance bond, payment bond, or warranty bond (when such bond is required by the Contract). Compensation for such costs is included elsewhere in the Contract Price, under other (non-allowance) bid/pay items.
- G. Change Orders:
1. A Change Order is not required for authorization of an allowance that is already included in the Contract.
 2. Prior to final payment, all allowances with funds remaining (not yet authorized) shall be reduced to the total amount authorized by Owner for that allowance item, via a Change Order.

1.4 QUANTITY ALLOWANCES

- A. In addition to this Section, Contract provisions governing Unit Price Work apply to quantity allowances.
- B. Owner may authorize Work under a quantity allowance item only when the contemplated Work is; (1) reasonably within the scope of the associated quantity allowance item, and, (2) the quantity allowance item has available quantity reasonably sufficient for the authorization in accordance with in the General Conditions and applicable Supplementary Conditions.
- C. Procedure for Quantity Allowances:
1. Contractor-furnished Change Proposal is not necessary or required for Owner to authorize use of a quantity allowance already in the Contract.
 2. Owner's allowance authorization to Contractor shall expressly show or indicate:
 - a. Locations where the quantity allowance Work is to be provided.
 - b. Specific quantity allowance bid/pay item(s) for the associated Work.
 - c. Maximum quantity authorized.
 3. If Contractor objects to Owner's direction to perform the associated Work under the authorized item(s) of quantity allowance Unit Price Work, promptly submit Change Proposal in accordance with the Contract Documents, clearly indicating:

- a. Specific work areas and quantity allowance items to which Contractor objects.
 - b. Detailed reasons for Contractor's objections to using the quantity allowance(s) for the authorized Work, citing relevant provisions of the Contract to support and substantiate Contractor's position.
 - c. Proposed compensation for the work in question and basis therefor.
 - d. Proposed change in the Contract Times.
4. Engineer will respond to such Change Proposal in accordance with the Contract Documents provisions on decisions on Change Proposals.
5. Upon receipt of quantity allowance authorization, when Contractor does not reject or disagree with the authorization, Contractor shall sign allowance authorization form indicating acceptance and return signed form to Owner and Engineer within [two] days of receipt.
6. When Contractor accepts authorization of Work under the associated quantity allowance (whether expressly or by failing to make timely objection in writing), Contractor shall promptly perform the authorized Work, in accordance with the Contract Documents and the allowance authorization.
7. Application for Payment for the associated Work may be made in accordance with Article 1.3 of this Section and the Contract's provisions for progress payments.

PART 2 - PRODUCTS - (NOT USED)

PART 3 - EXECUTION

3.1 ATTACHMENTS

- A. The following, bound after this Specifications Section's "End of Section" designation, are part of this Specifications Section:
 1. Forms:
 - a. Allowance Authorization Form, (one page).

END OF SECTION

Project:	_____	Authorization Number:	_____
	_____	From:	_____
To:	_____	Date:	_____
	_____	Engineer Project No.:	_____
Re:	_____	Contract For:	_____

1. [Allowance Title] / [Title of Change]:

Original Allowance	\$
Allowance Expenditures prior to this Authorization	\$
Allowance Balance prior to this Authorization	\$
Allowance will be decreased by this Authorization	\$
New Allowance Balance	\$

OWNER APPROVAL

Owner

Date _____

Date _____

Copies: ☐ Owner ☐ Contractor ☐ Consultants ☐ ☐ ☐ ☐ File

SECTION 01 22 00
MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. The Contractor shall furnish all necessary labor, machinery, tools, apparatus, equipment, materials, services and other necessary supplies and perform all work shown on the Drawings and/or described in the Specifications and Contract Documents at the unit or lump sum prices for the items enumerated in Part 2 of this Section.

1.2 COMPUTATION OF QUANTITIES

- A. For estimating quantities in which the computation of areas by geometric methods would be comparatively laborious, it is agreed that the planimeter shall be considered an instrument of precision adapted to the measurement of such areas.
- B. It is further agreed that the computation of the volume of prisms shall be by the method of average end area.

PART 2 - PRODUCTS

2.1 MOBILIZATION

- A. Payment for the Contractor's mobilization will be made at the Contract lump sum price and shall include all costs incurred for moving equipment onto the Project area and any pertinent costs related thereto.

2.2 BONDS AND INSURANCE

- A. Payment for bonds and insurance will be made at the Contract lump sum price, and shall include the costs of the Performance and Payment Bonds provided under the Contract, and the premiums for insurance required under the Contract.

2.3 GENERAL REQUIREMENTS

- A. Payment for general requirements will be made at the Contract lump sum price distributed over the initial term of the Contract and shall include field supervision and support staff, office supervision and support staff, costs associated with maintaining the field operation, and other items required by the general requirements and conditions of the Contract.

2.4 WATER LINE

- A. Payment for this item includes the pipe specified by the plans and specifications, restrained and regular joint pipe, all fittings (including, but not limited to, bends, tees, reducers, plugs, and caps), line markers, tracing wire with test boxes (if required by specification), friction type retainer glands on all MJ fittings, polyethylene wrap on ductile iron pipe and DI fittings, labor, equipment, including clearing, grubbing, removing and disposing of vegetation, brush and tress inside the right of way and easement areas, excavation, bedding, n testing, backfill, required to install the specified new pipe and fittings, whether shown on the plans or not, to achieve the required pipeline horizontal and vertical alignment, or as directed, in accordance with the specifications and standard drawings complete and ready for use.
- B. Excavation is unclassified. No additional payment will be made for rock excavation.

- C. This bid item includes crushed stone initial and final backfill under existing and proposed pavement, crushed stone paving restoration (No. 57's and DGA), and wherever else specified on the plans or in the specifications.
- D. Bituminous asphalt and concrete pavement restoration is paid for separately under the Asphalt Driveway Restoration and Concrete Paving Restoration line items.
- E. Measurement of quantities under this item shall be through fittings, encasements, and directional bores (only when a separate carrier pipe is specified within the directional bore pipe). Measurements shall be further defined to be to the center of tie-in where new pipe contacts existing pipe at the center of connecting fittings, to the outside face of vault or structure walls, or to the point of main termination at dead ends. Paid Linear Feet (LF)
- F. Testing of the completed water line is included in this pay item. However, no payment for the labor portion of this unit item shall be made until the line has been tested and accepted by the Engineer.
- G. Payment for seeding and final clean-up (including furnishing and placing topsoil, finish grading, seeding, mulching and erosion control, removal of construction materials and debris, cleaning, and site restoration) is included in this pay item. However, the Owner will not pay eight percent (8%) per foot of the line unit cost until final clean-up, seeding and vegetative cover has been established to the satisfaction of the Owner. The eight percent (8%) per foot of the line unit cost shall be shown as a subsidiary line item on the payment request, which shall also be subject to retainage.
- H. Fence, mailbox and driveway culvert repair/replacement incidental to water line construction is included in this pay item and will not be paid for separately.

2.5 GATE VALVES

- A. This description shall apply to all gate valves of every size required in the plans and specifications. Payment under this description is to be for gate valves being installed with the new main. This item includes the valve as specified in the plans and specifications, polyethylene wrap (if required by specification), labor, equipment, excavation, anchoring (if any), valve box and valve stem extensions, backfill, concrete pad around valve box (if required by specification), restoration, testing, disinfection, etc. required to install the specified valve at the location shown on the plans in accordance with the specifications and standard drawings complete and ready for use. Mechanical joint valve connections shall be restrained. Valve restraint shall be considered incidental to the valve and adjoining pipe. Paid EACH (EA) when complete.
- B. Valves related to fire hydrants are NOT included in this pay item and shall be paid for under Fire Hydrant Assembly line item..

2.6 BUTTERFLY VALVES

- A. This description shall apply to all butterfly valves of every size required in the plans and specifications. Payment under this description is to be for gate valves being installed with the new main. This item includes the valve as specified in the plans and specifications, polyethylene wrap (if required by specification), labor, equipment, excavation, anchoring (if any), valve box and valve stem extensions, backfill, concrete pad around valve box (if required by specification), restoration, testing, disinfection, etc. required to install the specified valve at the location shown on the plans in accordance with the specifications and standard drawings complete and ready for use. Mechanical joint valve connections shall be restrained. Valve restraint shall be considered incidental to the valve and adjoining pipe. Paid EACH (EA) when complete.

- B. Valves related to fire hydrants are NOT included in this pay item and shall be paid for under Fire Hydrant Assembly line item.

2.7 AIR RELEASE VALVE ASSEMBLY

- A. This bid item description shall apply to all air release valve installations. This item shall include the air release valve, main to valve connecting line or piping, manhole, vault, structure, access casting or doors, tapping the main, labor, equipment, excavation, proper backfill and restoration required to install the air release valve at the location shown on the plans or as directed in accordance with the specifications and standard drawings complete and ready for use. All air release valves on a project shall be paid under one bid item regardless of size. Paid EACH (EA) when complete.

2.8 STEEL ENCASEMENT PIPE – BORE AND JACK

- A. Payment for trenchless waterline crossings under roadways or railroads as shown on the drawings shall include the respective steel encasement pipe bored and jacked under the roadway or railroad and will be paid for at the Contract unit price per linear foot for the size and type shown. This work shall include the steel encasement pipe, casing spacers, end seals, labor and equipment to bore and jack, welding sections and all items necessary for its construction and installation. Paid Linear Feet (LF). Carrier pipe is paid separately under Water Line bid item.

2.9 FREEBORE DRIVEWAY

- A. Payment to freebore across driveways and access roads as shown on the drawings shall include the labor and equipment required to freebore the water pipe under the driveway or access road. Paid EACH (EA) when complete. The water line for freebore applications is paid separately under Item 2.4 – Water Line.

2.10 FIRE HYDRANT ASSEMBLY

- A. This item shall include the fire hydrant assembly which includes the hydrant service line and valve, tapping the main, fittings, anchor tees, thrust blocking, drainage pit and all labor, equipment, excavation, backfill, and restoration required to install the fire hydrant at the location shown on the plans and in accordance with the specifications and standard drawings, complete and ready for use. Paid EACH (EA) when complete.

2.11 TAPPING SLEEVE AND VALVE

- A. Wet-Tap Method. Payment for tapping sleeve and valve connections from the new water line to the existing water system will be made at the contract unit price EACH (EA) which includes excavation, backfill, valve box, sleeve, gaskets and fittings, concrete thrust blocking behind the sleeve, required to complete the connections.

2.12 CONNECT TO EXISTING WATER MAIN

- A. This bid description shall be used for all new water main connections (tie-in to end of or cut-in) of every size to the existing water main when not using the wet tap method, which is paid for under Item 2.11 – Tapping Sleeve and Valve. This item includes all labor, equipment, excavation, fittings, friction type retainer glands, sleeves, reducers, couplings, concrete thrust blocking, anchoring, capping and blocking existing main, restoration, disinfection, testing and backfill required to make the water main tie-in as shown on the plans, and in accordance with the specifications complete and ready for use. Paid EACH (EA) when complete.
- B. Pipe for tie-ins shall be paid under Item 2.4 – Water Line.

- C. Gate valves are not included in this pay item and will be paid for separately under Item 2.5 – Gate Valves.

2.13 INSTALL NEW WATER SERVICE – SHORT SIDE

- A. This bid item description shall apply to service line installations of every size bid up to and including 2 inch diameter. This item includes the specified service piping material, tapping saddle and corporation stop materials, coupling for connecting the new service piping to the surviving existing service line. . Paid EACH (EA) when complete.
- B. This bid item is to pay for new service installations where the ends of the service connection are on same side of the public roadway as the new water main. The length of the service line is not to be specified. Payment under this item shall not be restricted by minimum or maximum length. The contractor shall draw his own conclusions as to the length of piping that may be needed.
- C. Placement of a service line across a private residential or commercial entrance if required, is included in this pay item.
- D. This pay item does not include installation or relocation of meters, setters, and boxes. This work will be paid for separately in Item 2.14 – Meter Relocate.
- E. Included in this pay item is all work, labor, and equipment to locate and close the existing corporation stop and provide a cap on existing service line to be abandoned.
- F. No additional payment will be made for rock excavation or for special bedding required in rock excavation.

2.14 METER RELOCATE

- A. This item includes all labor, equipment, excavation, additional fittings, disinfection, testing, restoration, etc. to relocate the existing water meter (all sizes), meter setter, meter box, casting, etc. from its old location to the new location shown on the plans or as directed, in accordance with the specifications and standard drawings complete and ready for use. The new meter location shall be confirmed with the Owner and Engineer. Paid EACH (EA) when complete.
- B. The Owner will provide a new meter setter and meter vault for the Contractor to install at the new meter location as shown on the plans. The Contractor shall relocate the existing meter to the new meter vault location. The Contractor is responsible for connecting the tail pipe (customer side of meter) to the new meter setter under this pay item. The Contractor must hire a licensed plumber to complete all work on customer side of meter.
- C. The contractor shall remove the existing meter setter and meter box and return to MCWD.
- D. The required new service pipe (if required) will be paid under short side or long side service bid items.

2.15 TRANSFER SERVICE

- A. Transferring a service is defined to include installing a small segment of service line, as required, to reconnect an existing service line to the new main and shall include, but is not limited to the following: excavation, installing corporation stop, tapping saddle, and associated fittings; and backfilling and restoring all surfaces.
- B. This pay item will apply when the existing meter is not relocated or a new service line relocation is needed.

- C. No separate pay item will be made under Meter Relocate and/or Service Short Side, when a service is transferred, as described in paragraph A above.

2.16 FLAHERTY PUMP STATION UPGRADE

- A. Payment for this item will be made at the Contract lump sum price and shall include all work performed and all materials and equipment supplied, including the removal of the existing pumps and pump bases and inlet and outlet piping and fittings, as necessary, the new installation of pump stands reducers, elastic pipe connectors, pipes, VFDs, control panel , bypass pumping to maintain service, new and upsized electric service, generator, transformer, concrete, asphalt, excavation (including rock excavation), backfill, grading, security fence, and seeding/restoration in accordance with the drawings and specifications, Complete.
- B. The contractor shall include in this LS price the cost of a structural engineer to design and provide shop drawings and connection details for the new pump base connection to the existing structural member to provide the required foundation to support and anchor the pump to withstand vibration, thrust and torsional moment forces. .
- C. Included in this pay item is the cost for the Contractor to relocate the existing generator to the new Payneville Pump Station site. The labor and equipment for this relocation shall be paid under this Pay Item.

2.17 PAYNEVILLE PACKAGE PUMP STATION

- A. Payment for the new Payneville Pump Station will be made at the Contract lump sum price and shall include all work performed and all materials and equipment supplied for a new package booster pump station and related site work. This item shall include fill material, grading and drainage, site lighting, excavation (including rock excavation), backfill, retaining walls, fencing, gates, site piping including suction, discharge, a new package bulk water filling station, gravel, concrete and asphalt paving, new electric service and equipment, and seeding and and indal restoration, as shown on the Contract Drawings, accordance with the drawings and specifications, complete.
- B. Payment for to relocate the generator from the Flaherty Pump Station to this site will be paid for under the Flaherty Pump Station Upgrade line item.

2.18 CONTROL VALVE

- A. Payment for the Midway-Sirocco Road Control Valve Vault and New Highland Church Road Control Valve Vault and related site improvements will be made at the Contract Lump Sum price EA and shall include excavation (including rock excavation), grading, cut-ins to the existing water line, valves, water lines, pipe fittings, restraints, below grade concrete vault, control valve with electric motor actuator, new electrical service, installation of RTU cabinet, service rack, conductors and control wiring and conduits, and seeding/restoration, Complete.
- B. The cost for building the RTU cabinet with NEMA 4X enclosure, including subpanel, PLC, terminal blocks, circuit breakers, relays, duplex receptacle, mounting rail, battery and related items, is NOT included in this pay item and shall be paid for separately under the System Wide SCADA Improvements line item.

2.19 SYSTEM WIDE SCADA IMPROVEMENTS

- A. Payment for this bid item shall include the fabrication of RTU cabinets, subpanels, PLCs, and related hardware (such as terminal boards, receptacles, etc.) as specified in the hardware list for each facility in Appendix A. The payment shall also cover labor, as well as site visits to each facility for commissioning and coordination. Payment will be made at the Contract Lump Sum price.

- B. Payment for Electrical work to support the SCADA Improvements at the MCWD Office - RTU, Server and Work Station 1 and 2, Flaherty tank RTU, Garrett tank RTU, Payneville tank RTU and HCWD1 Interconnect Meter RTU will be paid for under the Electric Allowance (SCADA Support) line item.
- C. Payment for Electrical work to support the SCADA Improvements identified at the Control Valves, Flaherty Pump Station Upgrade and Payneville Package Pump Station is NOT included in this item and shall be included in the Lump Sum cost for each facility line item.

2.20 ELECTRICAL ALLOWANCE (SCADA SUPPORT)

- A. Payment from this Allowance shall cover miscellaneous electrical work required to support the SCADA improvements at the following locations: MCWD Office (RTU, Server, and Workstations 1 and 2), Flaherty Tank RTU, Payneville Tank RTU, Garrett Tank RTU, and HCWD1 Interconnect Meter RTU.
- B. Cost for electrical work to support SCADA Improvements at the Control Valve Vaults, Flaherty Pump Station Upgrade, and Payneville Package Pump Station shall be included in those Lump Sum line items.
- C. An adjustment to the Contract price will be adjusted up/down for this item. Payment will be made Lump Sum (LS).

2.21 NEW TANK INTERIOR AND EXTERIOR COATING SYSTEM

- A. Payment for this bid item shall include all time, material, hoisting and safety apparatus, equipment, and labor needed to drain the tank, cleaning of sediment from the tank bowl, tank, interior and exterior surface preparation and new coating system, including containment system for blasting and painting, per specification section 09 096 00, High Performance Industrial Coatings.
- B. Also including is applying the MCWD logo, replacing all manway gaskets, making other tank repairs per inspection report, removing all debris and equipment, containment system, disinfection of the tank in accordance with AWWA Standard C652 – Latest Edition, Section 4.3, by Chlorination Method 2, and flushing and filling the tank and placing into service, Complete,
- C. Payment at Contract Lump Sum price when complete.

2.22 COATINGS INSPECTION ALLOWANCE

- A. Payment from this allowance shall cover the Owner's tank coatings inspector, including labor, equipment, hoisting apparatus, preparation of reports and travel expenses.
- B. An adjustment to the Contract price will be adjusted up/down for this item. Payment will be made by Lump Sum (LS).

2.23 TANK REPAIR ALLOWANCE

- A. Payment from this allowance shall cover tank repairs based on the repair type, quantity and supplemental unit prices provided.
- B. An adjustment to the Contract price will be adjusted up/down for this item. Payment will be made by Lump Sum (LS).

2.24 TANK INLET RISER PIPE

- A. Payment for this item will be made at the contract lump sum price and shall include all necessary labor, equipment, and materials required to install a new inlet pipe within the existing Payneville Tank Wet Riser. This item includes all piping, fittings, and pipe supports and installation methods required to install the assembly as shown on the Contract Drawings. Payment will be made by Lump Sum (LS).

2.25 EROSION PREVENTION AND SEDIMENT CONTROL

- A. Payment for the erosion prevention and sediment control will be made at the contract lump sum price and shall include all necessary labor, equipment and materials to install and maintain erosion and sediment control measures including silt fences, stone bag check dams, stabilized construction entrances, and temporary seeding to prevent the erosion of exposed soil and transportation of sediment offsite.

2.26 TRAFFIC CONTROL

- A. Payment for traffic control will be made at the Contract lump sum price. Payment shall include all signs, traffic control devices and other materials, flaggers and other labor required, and all items necessary to provide traffic control for the duration of the project, in accordance with the specifications.

2.27 ASPHALT DRIVEWAY RESTORATION

- A. Payment for asphalt driveway restoration will be made at the Contract lump sum price. Payment for restoring existing asphalt driveways shall include all necessary labor, equipment, and materials needed to restore asphalt driveways. Paid Square Yard (SY) when complete.

2.28 DEMOBILIZATION

- A. Payment for the Contractor's demobilization upon completion of the Project will be made at the Contract lump sum price and shall include all costs incurred for removing equipment and materials from the Project area and any pertinent costs related thereto.

PART 3 - EXECUTION

3.1 PAY ITEMS

- A. The pay items listed hereinbefore refer to the items listed in the Bid Schedule and cover all of the pay items for this Contract.
- B. Any and all other items of Work listed in the Specifications or shown on the Drawings for this Contract shall be considered incidental to and included in those pay items.

3.2 ESTIMATED QUANTITIES OF WORK

- A. Wherever the estimated quantities of work to be done and materials to be furnished under this Contract are shown in any of the documents, including the Bid Proposal, they are given for use in comparing bids and the right is specifically reserved, except as otherwise limited by the Contract Documents, to increase or diminish them as may be deemed reasonably necessary or desirable by the Owner to complete the Work contemplated by this Contract. Such increase or diminution shall be accompanied by an adjustment in the Contract Amount in accordance with the Contract Conditions and shall not give cause for claims or liability for damages against the Owner or the Engineer, due to such increase or diminution.

- B. END OF SECTION

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SECTION 01 26 00
CONTRACT MODIFICATION PROCEDURES

1.1 SUMMARY

A. Section Includes:

1. This Specifications section expands upon provisions of the General Conditions, as may be modified by the Supplementary Conditions, and includes:
 - a. Requests for interpretation.
 - b. Written clarifications.
 - c. Minor changes in the Work and Field Orders.
 - d. Work Change Directives.
 - e. Proposal Requests.
 - f. Change Proposals.
 - g. Change Orders.

1.2 GENERAL – APPLICABLE TO ALL PROVISIONS OF THIS SECTION

- A. Submit Contract modification documents to Engineer, addressed to the contact person and contact information indicated in Section 01 33 00 - Submittal Procedures.
- B. Retain at Contractor's office and at the Site complete copy of each Contract modification document, all interpretations and clarifications, related documents, and Engineer's response.

1.3 REQUESTS FOR INTERPRETATION

A. General.

1. Transmit written requests for interpretation to Engineer. Contractor and Owner may prepare and transmit requests for interpretation.
2. Prepare and transmit request for interpretation to obtain clarifications or interpretations of the Contract Documents. Report conflicts, errors, ambiguities, and discrepancies in the Contract Documents by requesting an interpretation.
3. Do not transmit request for interpretation when other form of communication is appropriate, such as Submittals, requests for approvals of substitutes, notices, ordinary correspondence, or other form of communication. Improperly prepared or inappropriate requests for interpretation will be returned without response or action by Engineer.
4. Do not submit request for interpretation or clarification when:
 - a. answer may be obtained by observations at the Site; or.
 - b. required information is clearly indicated in the Contract Documents; or.
 - c. required information is included in industry standards referenced in the Contract Documents or Supplier's instructions that are consistent with the Contract Documents; or.
 - d. are reasonably inferable from any of foregoing.
5. Engineer will return requests for interpretation without response for any of the following reasons:
 - a. Request is regarding one of the items addressed in Paragraphs 1.3.A.3 and 4 of this Specifications section.
 - b. Request is unclear or incomplete.
 - c. Request was answered in Engineer's response to a prior request for interpretation.
 - d. Request is related to construction means, methods, techniques, procedures, or sequences of construction that are not required by the Contract Documents.
 - e. Request is related to safety and protection matters that are solely Contractor's responsibility.

- f. Request resulted in whole or in part to lack of adequate coordination by Contractor, including coordination of Subcontractors and Suppliers.
 - g. Requests that are otherwise frivolous or unnecessary.
6. Should requests be categorized by Engineer as within the limits of Paragraphs 1.3.A.3, 4, or 5 of this Specifications Section, Engineer may recommend and Owner may withhold from payments due Contractor under the Contract set-off(s) sufficient to cover Owner's costs of Contractor's submittal of invalid, frivolous, unnecessary, or inappropriate requests for interpretation or clarification.
 7. Contractor shall have sole financial responsibility for Contractor's costs for requests for interpretation or clarification that are submitted late, out of sequence, or that are unnecessary.

B. Procedure.

1. Transmit requests for interpretation in accordance with Section 01 33 00 - Submittal Procedures, and requirements of this Specifications section. Include with each request for interpretation a separate letter of transmittal.
2. Engineer will review and respond to requests for interpretation with reasonable promptness. Allow sufficient time for review and response.
3. Engineer will maintain log of requests for interpretation. Upon request, copy of log will be transmitted to requestor.
4. Engineer's response to requests for interpretation will be transmitted in accordance with Section 01 33 00 - Submittal Procedures, and requirements of this Specifications section. Each response to a request for interpretation will include a separate letter of transmittal.
5. Engineer's response to each request for interpretation will be distributed to:
 - a. Contractor.
 - b. Owner.
 - c. Resident Project Representative (RPR).
 - d. Engineer.
6. If Contractor desires to appeal Engineer's interpretation or clarification, comply with the appeals procedure set forth in the General Conditions, as may be modified by the Supplementary Conditions.
7. Interpretations that One or Both Parties Believes Entails a Change to the Contract:
 - a. If Contractor or Owner believes that a change in the Contract Price or Contract Times or other change to the Contract is required as a result of Engineer's interpretation, so advise Engineer in writing before proceeding with the Work associated with the request for interpretation.
 - b. If, after this initial communication, either Owner or Contractor believes that change in Contract Price, Contract Times, both, or other relief with respect to the terms of the Contract is necessary, recourse shall be in accordance with the Contract Documents.

C. Preparation of Requests for Interpretation:

1. Prepare each request for interpretation on the "Request for Interpretation" form included with this Specifications section, or other form acceptable to Engineer.
2. Number each request for interpretation as follows: Numbering system shall be the Contract number and designation followed by a hyphen and three-digit sequential number. Example: First request for interpretation on the general contract for project titled, "Contract WWTP09" would be, "RFI No. WWTP09-GC-001".
3. In space provided on form, describe the interpretation requested. Provide additional sheets as necessary. Include text and sketches as required in sufficient detail to describe the need for interpretation.
4. When applicable, request for interpretation shall include Contractor's recommended resolution.

1.4 WRITTEN CLARIFICATIONS

A. General:

1. Written clarifications, when required, will be initiated and issued by Engineer.
2. Written clarifications do not change the Contract Price or Contract Times, and do not alter the Contract Documents.
3. Written clarifications will be issued as correspondence or using clarification notice form acceptable to Engineer, with additional information as required.

B. Procedure.

1. Engineer's written clarifications will be transmitted in accordance with Section 01 33 00 - Submittal Procedures, and requirements of this Specifications section.
2. Each written clarification will be distributed to:
 - a. Contractor.
 - b. Owner.
 - c. Resident Project Representative (RPR).
 - d. Engineer.
3. If Contractor desires to appeal Engineer's interpretation or clarification, comply with the appeals procedure set forth in the General Conditions, as may be modified by the Supplementary Conditions.
4. Written Clarifications that One or Both Parties Believes Entails a Change to the Contract:
 - a. If Contractor or Owner believe that a change in the Contract Price or Contract Times or other change to the Contract is required as a result of Engineer's written clarification, so advise Engineer in writing before proceeding with the Work associated with the written clarification.
 - b. If, after this initial communication, either Owner or Contractor believes that change in the Contract Price, Contract Times, both, or other relief with respect to the terms of the Contract is necessary, recourse shall be in accordance with the Contract Documents.
5. If Engineer's written clarification is unclear, prepare and transmit a request for interpretation in accordance with the Contract Documents.

1.5 MINOR CHANGES IN THE WORK AND FIELD ORDERS

A. General:

1. Field Orders, when required, will be initiated and issued by Engineer.
2. Field Orders authorize minor changes in the Work but do not change the Contract Price or Contract Times.
3. Field Orders will be in the form of Engineers Joint Contract Documents Committee document EJCDC C-942, "Field Order".
4. Engineer will maintain a log of Field Orders issued. Copy of Engineer's log of Field Orders will be transmitted to Contractor or Owner upon request.

B. Procedure:

1. Field Orders will be transmitted in accordance with Section 01 33 00 - Submittal Procedures, and requirements of this Specifications section. Each Field Order will include a separate letter of transmittal.
2. Each Field Order will be distributed to the following:
 - a. Contractor.
 - b. Owner.
 - c. Resident Project Representative (RPR).
 - d. Engineer.
3. Field Orders that One or Both Parties Believes Entails a Change to the Contract Price or Contract Times:

- a. If Contractor or Owner believes that a change in the Contract Price or Contract Times or other change to the Contract is required as a result of a Field Order, so advise Engineer in writing before proceeding with the Work associated with the Field Order.
- b. If, after this initial communication, Contractor believes that change in Contract Price, Contract Times, both, or other relief with respect to the terms of the Contract is necessary, recourse shall be in accordance with the Contract Documents.
4. If the Field Order is unclear, submit request for interpretation.
5. If Owner disagrees with the Field Order, Engineer may issue a revised or amended Field Order, or a Change Order or Work Change Directive may be issued.

1.6 WORK CHANGE DIRECTIVES

A. General:

1. Work Change Directives, when issued, order additions, deletions, or revisions to the Work. When issued, Contractor shall promptly implement the changes ordered in the associated work Change Directive.
2. Work Change Directives do not change the Contract Price or Contract Times but are evidence that the parties to the Contract expect that the change ordered or documented by the Work Change Directive will be incorporated in subsequently issued Change Order following agreement by the parties as to the Work Change Directive's effect, if any, on the Contract Price, Contract Times, or both.
3. Work Change Directives will be in the form of EJCDC C-940, "Work Change Directive".

B. Procedure.

1. Work Change Directives signed by Owner and Engineer will be transmitted in accordance with Section 01 33 00 - Submittal Procedures, and requirements of this Specifications section. Each Work Change Directive will include a separate letter of transmittal. Signed Work Change Directives will be transmitted to:
 - a. Contractor.
 - b. Owner.
 - c. Engineer.
 - d. Resident Project Representative.
 - e. Contractor: One original.
 - f. Owner: One original.
 - g. Engineer: One original.
 - h. Resident Project Representative (RPR): One copy.
2. Documentation of Costs:
 - a. Promptly following receipt of the Work Change Directive:
 - 1) Advise Engineer and Owner in writing of the anticipated quantity and types of construction equipment and machinery required or anticipated for the associated Work.
 - 2) Advise Engineer and Owner in writing of which construction equipment and machinery is owned by the Contractor or Subcontractor and which is, or will be, rented from an equipment rental firm.
 - 3) When construction equipment and machinery is rented from a rental firm, transmit to Engineer and Owner copy of the associated rental agreements(s) pertinent to the Work ordered by the Work Change Directive.
 - 4) For all construction equipment and machinery, indicate to Engineer and Owner whether each item is required only for the Work ordered by the Work Change Directive and whether each item is being, or will be, used for other Work on the Project or other projects for Owner.
 - 5) Advise Engineer and Owner in writing of information on anticipated temporary materials (including items such as temporary support of excavations, scaffolding,

temporary barriers, temporary plates covering excavations, and other temporary materials) to the same extent as that required for construction equipment and machinery.

- b. When basis of payment for Work ordered under a Work Change Directive will be paid as Cost of the Work plus a fee, or when otherwise required by Engineer, document for the Work performed under each separate Work Change Directive, for each day, the following:
 - 1) Number and labor classifications of workers employed and hours worked each day on the Work ordered via the Work Change Directive.
 - 2) Construction equipment used, including manufacturer, model, and year of manufacture, and number of hours such equipment was onsite and used each day for the Work under the Work Change Directive. Indicate where the equipment was used for other Work under the Contract and idle time.
 - 3) Temporary materials; furnish the same information as required for construction equipment and machinery. Where rental costs of such items approaches the purchase cost of such item, or when otherwise requested by Engineer, furnish evidence, satisfactory to Engineer, of the purchase price of such temporary materials.
 - 4) Consumables and similar materials used.
 - 5) Suppliers' receipts, bills, or invoices for and descriptions of materials and equipment incorporated into the Work.
 - 6) Invoices and labor and equipment breakdowns for Subcontractors.
 - 7) Other information required by Owner or Engineer.
 - 8) Transmit such documentation as a Change Proposal promptly after such documentation is available to Contractor. Actively pursue Subcontractors and Suppliers for required documentation to promptly furnish required documentation to Engineer.
 - c. Separately track and document Work performed in accordance with each Work Change Directive and Work performed under stipulated price methods of compensation (including lump sums and Unit Price Work).
 - d. Submit such information in a format acceptable to Engineer.
3. Documentation of Time:
- a. General:
 - 1) Contractor will be entitled to change of Contract Times Work ordered by a Work Change Directive in accordance with the requirements of the General Conditions, as may be modified by the Supplementary Conditions.
 - 2) Contractor will be entitled to a change in Contract Times only when the Work ordered by the Work Change Directive is implemented promptly and affects the Contractor's ability to comply with the Contract Times.
 - b. Requirement Documentation: Submit the following as part of the Change Proposal documenting price-related impact of the Work ordered by the Work Change Directive:
 - 1) Statement on whether the subject Work affected Contractor's ability to comply with the Contract Times.
 - 2) If Contractor's ability to comply with the Contract Times was so affected, indicate the effect on each of the relevant Contract Times.
 - 3) Document that Contractor acted promptly and properly upon receipt of the Work Change Directive to promptly implement the Work ordered thereby.
 - 4) Time impact analysis for the affected Work, in accordance with Specifications.
 - 5) Other time-related documentation required by Engineer.

1.7 PROPOSAL REQUESTS

- A. General:

1. Proposal Requests may be initiated by Engineer or Owner.
2. Proposal Requests are for requesting the effect on the Contract Price and the Contract Times and other information relative to contemplated changes in the Work. Proposal Requests do not authorize changes or variations in the Work, and do not change the Contract Price or Contract Times or terms of the Contract.
3. Proposal Requests will be furnished using the "Proposal Request" form included with this Specifications section.

B. Procedure:

1. Proposal Requests will be transmitted in accordance with Section 01 33 00 - Submittal Procedures, and requirements of this Section. Each Proposal Requests will include a separate letter of transmittal.
2. Each signed Proposal Request will be transmitted to the following:
 - a. Contractor.
 - b. Owner.
 - c. Resident Project Representative (RPR).
 - d. Engineer.
3. Transmit request for interpretation to obtain clarification of conflicts, errors, ambiguities, and discrepancies in Proposal Request.
4. Upon receipt of Proposal Request, Contractor shall prepare and transmit to Engineer a Change Proposal, in accordance with the Contract Documents, for the proposed Work described in the Proposal Request.

1.8 CHANGE PROPOSALS

A. General:

1. Prepare and transmit written Change Proposal to Engineer in response to each Proposal Request; or when Contractor believes a change in the Contract Price, Contract Times, both, or other change to the terms of the Contract is required; or to 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.

B. Procedure:

1. Prepare and transmit Change Proposals within time limits indicated in the General Conditions, as may be modified by the Supplementary Conditions.
2. Submit only one Change Proposal for each change issue, unless Engineer requires additional information or clarification. Do not submit repeated Change Proposals for the same change issue. Rather, when Contractor is dissatisfied with Engineer's decision on a Change Proposal, recourse is set forth in the General Conditions, as may be modified by the Supplementary Conditions, and elsewhere in this Article.
3. Transmit Change Proposals in accordance with Section 01 33 00 - Submittal Procedures, and requirements of this Specifications section. Include with each Change Proposal all required supporting documentation and a separate letter of transmittal.
4. Engineer's Review and Requests for Additional Information:
 - a. Engineer will review and act on each Change Proposal in accordance with, and within the time limits indicated in, the General Conditions, as may be modified by the Supplementary Conditions.
 - b. When, Engineer requests additional information to render a decision, submit required information within five days of receipt of Engineer's request, unless Engineer allows more time. Submit the required information via correspondence that refers to the specific Change Proposal number.
 - c. Owner shall transmit to Engineer such comments, if any, that Owner has on the Change Proposal, within 10 days of Owner's receipt of the Change Proposal.

- d. Engineer will render a written decision on the Change Proposal or take other action in accordance with the General Conditions, as may be modified by the Supplementary Conditions.
 - e. Engineer's response to Change Proposals will be transmitted in accordance with Section 01 33 00 - Submittal Procedures, and requirements of this Specifications section, the General Conditions, and the Supplementary Conditions.
 - 5. Engineer's response to each Change Proposal will be distributed to:
 - a. Contractor.
 - b. Owner.
 - c. Resident Project Representative (RPR).
 - d. Engineer.
 - 6. If Change Proposal is recommended for approval by Engineer and is approved by Owner, a Change Order will be issued or, when applicable, an appropriate use of an allowance (already included in the Contract Price) will be authorized by Owner.
 - 7. If parties do not agree on terms for the change, Owner or Contractor may file a Claim against the other, in accordance with the General Conditions, as may be modified by the Supplementary Conditions.
- C. Preparation of Change Proposals:
- 1. Each Change Proposal shall be submitted on the "Change Proposal" form included with this Specifications section, or other form acceptable to Engineer.
 - 2. Number each Change Proposal as follows: Numbering system shall be the Contract number and designation followed by a hyphen and three-digit sequential number. Example: First Change Proposal for the general contract for project named "Contract No. 8" would be, "Change Proposal No. 8-GC-001".
 - 3. In space provided on Change Proposal form:
 - a. Describe scope of each proposed change. Include text and sketches on additional sheets as required to provide detail sufficient for Engineer's review and response. If a change item is submitted in response to Proposal Request, write in as scope, "In accordance with Proposal Request No." followed by the Proposal Request number. Submit written clarifications, if any, to scope of change.
 - b. Submit justification for each proposed change. If change is in response to proposal request, write in as justification, "In accordance with Proposal Request No." followed by the Proposal Request number.
 - c. Indicate the total change in the Contract Price and Contract Times for each separate change item included in the Change Proposal.
 - 4. Proposed Effect on Contract Price: Unless otherwise directed by Engineer, attach to the Change Proposal detailed breakdowns of pricing (Contractor's cost and Contractor's fee) including:
 - a. List of Work tasks to accomplish the change.
 - b. For each task, labor cost breakdown including labor classification, total hours per labor classification, and hourly cost rate for each labor classification. Where overtime is included, indicate the overtime hours, labor classifications, and associated overhead rates.
 - c. Construction equipment and machinery to be used, including manufacturer, model, and year of manufacture, and number of hours for each. Indicate whether the construction equipment or machinery is owned by Contractor, Subcontractor, or leased from a rental firm; if leased, include with the Change Proposal a copy of the rental agreement. Indicate whether the construction equipment and machinery is already onsite and used for other activities, or whether it is required solely for the Work in the contemplated change. Indicate overtime hours budgeted, if any, and the associated cost rate for overtime compared with the straight-time rate.

- d. Indicate temporary materials required, including description of extent, scope, and quality, and associated cost. Temporary materials include items such as temporary sheeting for support of excavations, scaffolding, temporary plates to cover open excavations, temporary barriers, and other temporary items. Indicate ownership or source of such items. Include copy of rental agreement if rented from a third-party rental firm in which neither Contractor nor any Subcontractor has a financial interest. Indicate intended duration of use for such items and purchase cost of such items.
 - e. Detailed breakdown of cost of materials and equipment to be incorporated into the Work, including quantities, unit costs, and total cost, with Supplier's written quotations. When requested by Engineer, submit quotes by multiple prospective Suppliers.
 - f. Breakdowns of each Subcontractors' pricing, including labor, construction equipment and machinery, temporary materials, and materials and equipment incorporated into the Work, other costs, and Subcontractor fees (e.g., overhead and profit). Breakdown of Subcontractors' pricing shall be the same level of detail as that for Contractor.
 - g. Breakdown of other costs eligible, in accordance with the General Conditions and the Supplementary Conditions under "Cost of the Work" provisions.
 - h. Other information required by Engineer.
 - i. Contractor's fees (overhead and profit) applied to eligible Contractor costs and eligible Subcontractor costs.
5. Proposed Effect on Contract Times: Unless otherwise directed by Engineer, attach to the Change Proposal detailed information substantiating the proposed change in Contract Times, including:
- a. Time impact analysis required by Specifications.
 - b. Indication of whether the Work associated with the contemplated change will affect Contractor's ability to comply with the Contract Times.
 - c. Other time-related information requested by Engineer.

1.9 CHANGE ORDERS

A. General:

- 1. Change Orders will be recommended by Engineer (when required by the General Conditions) and will be signed by Owner and Contractor (subject to the General Conditions related to a party withholding its signature from a contractually-required Change Order)), to authorize additions, deletions, or revisions to the Work, changes to the Contract Price, changes in the or Contract Times, changes to the terms of the Contract, or a combination thereof.
- 2. Change Orders will be in the form of EJCDC C-941, "Change Order".

B. Procedure.

- 1. Change Orders for signature by Contractor will be transmitted in accordance with Section 01 33 00 - Submittal Procedures, and requirements of this Specifications section. Each Change Order will include a separate letter of transmittal. Contractor shall print three originals of Change Order for Contractor's signature.
- 2. Contractor shall promptly sign each original Change Order and, within five days of receipt, deliver all originals to Engineer.
- 3. Engineer will sign each original Change Order and forward them to Owner.
- 4. After approval and signature by Owner, original Change Orders will be distributed as indicated below.
- 5. Original, signed Change Orders will be distributed as follows:
 - a. Contractor: One original.
 - b. Owner: One original.
 - c. Engineer: One original.
 - d. Resident Project Representative (RPR): One copy.

6. Upon Contractor's receipt of the fully-signed Change Order, promptly perform the Work ordered thereby in accordance with the Contract Documents and the Progress Schedule accepted by Engineer.

PART 2 - PRODUCTS - (NOT USED)

PART 3 - EXECUTION

3.1 ATTACHMENTS

- A. The forms listed below and bound following this Specifications section's "End of Section" designation, are part of this Specifications section:
 1. Request for Interpretation form (one page).
 2. Proposal Request form (one page).
 3. Change Proposal form (one page).

END OF SECTION

REQUEST FOR INTERPRETATION

Owner: _____

Project Name: _____

Contractor: _____ RFI No. [____]

Date Transmitted: _____ Date Received: [____]

Date Response Requested: _____ Date Response Transmitted: [____]

Subject: _____ [____]

Specification Section and Paragraph: _____

Drawing References: _____

INTERPRETATION REQUESTED:

Signature: _____ Date: [____]

ENGINEER'S RESPONSE:

Signature: _____ Date: [____]

PROPOSAL REQUEST

Owner: _____

Project Name: _____

Proposal Request No.: _____ Date: [____]

Contract Name and No.: _____

Contractor: _____

Other Contracts Involved in Proposed Change: _____

TO CONTRACTOR: Please submit a complete Change Proposal for the proposed modifications described below. If the associated Change Proposal is approved, a Change Order or allowance authorization will be issued to authorize adjustment to the Contract. This Proposal Request is not a Change Order, Work Change Directive, Field Order, or an authorization to proceed with the proposed Work described below.

SCOPE OF PROPOSED CHANGE(S) IN THE WORK:

1. [Title 1]:
2. [Title 2]:
3. [Title 3]:

Attachments to this Proposal Request:

1. [None].

Proposal requested by: _____
HDR (Engineer)

Signature of Requestor: _____

CHANGE PROPOSAL

Owner: _____

Project Name: _____

Change Proposal No.: _____ Date: [____]

Submitted in Response to Proposal No.: _____

Contractor Name and No.: _____

Contractor: _____

Subject: _____

The following changes to the Contract are proposed:

SCOPE OF PROPOSED CHANGE TO CONTRACT: *(attach supporting information as required)*

1. [Title 1]:

2. [Title 2]:

JUSTIFICATION:

1. [Title 1]:

2. [Title 2]:

PROPOSED CHANGES IN CONTRACT PRICE AND CONTRACT TIMES:

We propose that the Contract Price and Contract Times be changed as follows:

For Contract Price, attach detailed cost breakdowns for Contractor and Subcontractors, Supplier quotations, and other information required.

For the Contract Times, state increase, decrease, or no change to Contract Times for Substantial Completion, readiness for final payment, and Milestones, if any. If increase or decrease, state specific number of days for changes to the Contract Times. Submit supporting data, including time impact analysis for the Progress Schedule.

Description	Amount	Contract Times (days)	
		Substantial	Final
1. [Title 1]	\$0.00	0	0
2. [Title 2]	\$0.00	0	0
Total This Change Proposal	\$0.00	0	0

Changes to Milestones, if any: [____][____]

Contractor represents that supporting data attached to this Change Proposal are accurate and complete. The requested time or price adjustment indicated in this Change Proposal is the entire adjustment to which Contractor believes it is entitled as a result of the proposed change(s) indicated herein.

Change Proposal by: _____

Signature of Proposer: _____

SECTION 01 29 73
SCHEDULE OF VALUES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Requirements for the Schedule of values, including:
 - a. Applicability.
 - b. General provisions for Schedules of Values.
 - c. Format, organization, and content of Schedule of Values.
- B. Related Requirements: Include but are not necessarily limited to:
1. Section 01 22 00 - Measurement and Payment.
 2. Section 01 29 76 - Progress Payment Procedures.

1.2 PRICE AND PAYMENT PROCEDURES

- A. Schedule of Values and Payment – General:
1. Contractor shall prepare and submit to Engineer for acceptance Schedule of Values that presents (as applicable): (a) an appropriate, detailed breakdown of the price of lump sum bid/pay items, and (b) an appropriate, detailed breakdown of the price of Work compensated on the basis of Cost of the Work plus a fee, and (c) lists bid/pay items of Unit Price Work. The total of all Work among the various bid/pay items shall equal the Contract Price.
 2. For each item of lump sum Work and Work compensated on the basis of Cost of the Work plus a fee, the Schedule of Values shall, establish in detail the portion of the Contract Price allocated to each component of such Work.
 3. Upon request of Engineer, promptly furnish data and information that substantiates and supports the amounts indicated in the Schedule of Values.
 4. Submit preliminary Schedule of Values to Engineer for initial review. Contractor shall incorporate Engineer's comments into the Schedule of Values and resubmit to Engineer. Engineer may require corrections and re-submittals until Schedule of Values is acceptable.
 5. Schedule of Values may be used, where appropriate, as a basis for negotiating price of changes, if any, in the Work.
- B. Applicability:
1. Lump Sum Work:
 - a. For Work paid on a lump sum basis, progress payments will be on the basis of Work performed in accordance with the Contract Documents, for each line item in the Schedule of Values, as recommended to Owner by Engineer..
 2. Work Compensated on the Basis of Cost of the Work Plus a Fee:
 - a. Such Work will be paid, based on Engineer's recommendation to Owner, based on documentation of eligible costs submitted by Contractor with progress payment requests, in accordance with the General Conditions (as may be modified by the Supplementary Conditions) and Section 01 29 76 - Progress Payment Procedures.
 - b. Schedule of Values accepted by Engineer will be used by Engineer in evaluating reasonableness of Contractor's progress payment requests.
 - c. While the actual Cost of the Work plus applicable fee for a given line item in the Schedule of Values may vary somewhat from the scheduled amount of such line item, where actual Cost of the Work (plus fee) for such line item differs substantially from the scheduled amount of such line item indicated in the Schedule of Values, Engineer may

refuse to recommend further payment for such line item, in accordance with the Contract Documents.

- d. Nothing in the Schedule of Values accepted by Engineer changes the Guaranteed Maximum Price, if any.
3. Unit Price Work:
 - a. Breakdown of unit prices (whether in a Schedule of Values or elsewhere) into detailed cost or price components is not required.
 - b. Unit Price Work will be measured for payment in accordance with the Contract Documents, including Section 01 22 00 - Measurement and Payment.

1.3 ADMINISTRATIVE PROCEDURES

A. General Provisions for Schedules of Values:

1. This Section augments requirements for the Schedule of Values, indicated in the General Conditions, as may be augmented by the Supplementary Conditions.

1.4 SUBMITTALS

A. Informational Submittals: Submit the following:

1. Submit to Engineer the Schedule of Values in the form and quantity required in the Contract Documents.
2. Content of Schedule of Values Submittals shall be in accordance with this Section.
3. Timing of Submittals:
 - a. Preliminary Schedule of Values:
 - 1) Submit preliminary Schedule of Values within time limit indicated in the General Conditions.
 - b. Initial Acceptable Schedule of Values:
 - 1) Revise the preliminary Schedule of Values in accordance with Engineer's comments.
 - 2) Contractor will not be eligible for progress payment until acceptable Schedule of Values is submitted in accordance with the Contract Documents.
 - 3) Submit the Schedule of Values acceptable to Engineer in accordance with the General Conditions.
 - c. Updates: Submit updated Schedule of Values when:
 - 1) The Contract Price has changed.
 - 2) Requested by Engineer

1.5 FORMAT, ORGANIZATION, AND CONTENT OF SCHEDULE OF VALUES

A. Organization and Major Elements of Schedule of Values.

1. Prepare Schedule of Values on the "progress estimate" or "continuation sheets", as applicable, of the Application for Payment form indicated in Section 01 29 76 - Progress Payment Procedures.
2. Include in Schedule of Values itemized list of Work for each major work area included in the Work, for each lump sum payment item included in the Contract.
 - a. Contractor will not be eligible for progress payment until acceptable Schedule of Values is submitted in accordance with the Contract Documents.
3. In addition, list either in the Schedule of Values or on a separate worksheet included with Applications for Payment all Unit Price Work bid/pay items in the Contract. The balance of this Article applies to lump sum Work and Work compensated on the basis of Cost of the Work plus a fee.
4. Organization in Accordance with Specification Sections:

- a. Within each work area, organize the Schedule of Values by the various Specifications section numbers and titles included in the Contract Documents.
 - b. Label each row in the Schedule of Values with the appropriate Specifications section number. Include an amount for each row in the Schedule of Values.
 - c. List sub-items of major materials, equipment, or systems, as appropriate or when requested by Engineer.
- B. Requirements for both the preliminary Schedule of Values Submittal and the Schedule of Values Submittal for Engineer's acceptance are:
 1. Subcontracted Work:
 - a. Schedule of Values shall indicate division of Work between Contractor and each Subcontractor.
 - b. Line items for Work to be performed by each Subcontractor shall include the word, "(SUBCONTRACTED)" and the name of the Subcontractor once the associated subcontract is signed and effective.
 2. Apportionment between Materials and Equipment, and Installation: Schedule of Values shall include separate apportionment of costs for:
 - a. Cost of materials and equipment to be incorporated into the completed construction.
 - b. Cost of delivery, handling, and storage of materials and equipment to be incorporated into the completed construction.
 - c. Cost of temporary materials (such as excavation supports, scaffolding, and other temporary materials), and their associated delivery, handling, and storage costs, if any.
 - d. Cost of rentals of construction equipment and machinery, whether owned by Contractor or Subcontractor or leased from a third-party equipment rental entity.
 - e. Cost of installing materials and equipment.
 - f. Travel and subsistence costs, if any.
 - g. Other costs used in preparing the Bid by Contractor and each Subcontractor.
 3. Sum of individual line item amounts indicated on the Schedule of Values shall equal the total of associated bid/pay item. Sum of bid/pay item totals in the Schedule of Values, plus the sum of any separate listing of Unit Price Work items, shall equal the [total Contract Price.
 4. Overhead and Profit:
 - a. Include in each line item a directly proportional amount of Contractor's overhead and profit in the Contract Price.
 - b. Do not include overhead and profit as separate line item(s).
 5. Allowances: Include separate line item for each allowance.
 6. Unit Price Work: Separately indicate items of Unit Price Work in the overall Schedule of Values. Where the required form (in accordance with Section 01 29 76 - Progress Payment Procedures) includes a separate worksheet or page for Unit Price Work, indicate all items of Unit Price Work on such worksheet or page of the form.
 7. Bonds and Insurance Costs:
 - a. When greater than the amount stipulated immediately above is proposed by Contractor in the Schedule of Values, submit to Engineer documentation substantiating the proposed amounts. Submit to Engineer such documentation when otherwise requested by Engineer.
 - b. When Contractor has furnished performance and payment bonds and evidence of insurance acceptable to Owner and in accordance with the Contract Documents, entire amount for bonds and insurance may be applied for in the first Application for Payment.
 8. Construction Support, Project Management, and Administrative Cost Elements:
 - a. Costs under this category are sometimes informally referred to as "field overhead", but are Project costs rather than costs related to Contractor's general business operations.

- b. Include in the Schedule of Values relevant line items and amounts for work and services required by the General Conditions and specific Division 01 Specifications sections, such as:
 - 1) Project management costs.
 - 2) Onsite superintendence and supervision costs.
 - 3) Itemized list of Work by work area, as applicable, for costs associated with coordination with the Owner's operations, including required sequencing, as set forth in the Contract Documents.
 - 4) Updating the construction Progress Schedule, preparing time impact analyses, and preparing recovery schedules. Preparation of preliminary Progress Schedule and the initial ("baseline") Progress Schedule acceptable to Engineer are part of mobilization.
 - 5) Construction progress photographic documentation. Preconstruction photographic documentation and final photographic documentation are, respectively, part of mobilization and demobilization.
 - 6) Updates of the Schedule of Submittals.
 - 7) Contractor's safety representative and ongoing implementation of Contractor's Site-specific health and safety plan (SSHASP). Establishing the SSHASP is part of mobilization.
 - 8) Ongoing compliance with permits (when applicable). Contractor's securing of required work permits is part of mobilization.
 - 9) Ongoing cost for temporary utilities and temporary facilities. Establishing such services and facilities is part of mobilization.
 - 10) Ongoing costs for temporary security .
 - 11) Field offices (monthly rental and maintenance) and storage facilities (excluding costs of establishment and removal, which are part of mobilization and demobilization).
 - 12) Ongoing site maintenance, such as temporary controls (dust, air pollution, water pollution, solid waste control, pest and rodent control, temporary erosion and sediment controls, and others), snow and ice removal, and similar activities.
 - 13) Field engineering and surveying.
 - 14) Progress cleaning and cleaning for Substantial Completion.
 - 15) Record documents (preparation, maintenance, and submittal).
 - a) If adequate record documents are maintained, up to 50 percent of the value of the record documents line item will be eligible for payment, spread evenly over those progress payments in which construction at the Site is performed.
 - b) Remainder of Project record documents line item will be eligible for payment when complete record documents are submitted in accordance with the Contract Documents.
 - c) If record documents submitted are unsatisfactory to Engineer, amount may be reduced via set-offs in accordance with the Contract Documents.
 - 16) Other items required by Engineer.
 - c. Include such items in Applications for Payment on payment schedule acceptable to Engineer.
 - d. Such line items in the Schedule of Values shall exclude any and all costs associated with Contractor's permanent place(s) of business, personnel stationed at permanent office(s), salaries and bonuses of executive and administrative personnel not directly performing work on the Project, and general business expenses, all of which are part of Contractor's overhead costs.
9. Mobilization and Demobilization: Include all associated costs in the separate bid/pay item for mobilization and demobilization. The scope of such bid/pay item is indicated in Section 01 22 00 – Measurement and Payment.

10. Mobilization and Demobilization:

- a. Include separate line items under each appropriate lump sum bid/pay item for mobilization and demobilization.
- b. Document for Engineer the activities included in mobilization and demobilization line items.
- c. Mobilization includes:
 - 1) Obtaining Owner's acceptance of proposed Subcontractors and Suppliers and entering into subcontracts and purchase orders needed to start the Work.
 - 2) Preparing and obtaining Engineer's approval of Shop Drawings.
 - 3) Preparing and obtaining Engineer's acceptance of schedules, including Progress Schedule, Schedule of Submittals, and Schedule of Values.
 - 4) Preconstruction conference(s) required by the Contract Documents.
 - 5) Preconstruction photographic documentation.
 - 6) Establishing Contractor's Site-specific health and safety plan, preconstruction activities needed to start implementing Contractor's safety programs, and verifying status of training of construction workers and personnel and condition of construction equipment, machinery, and tools.
 - 7) Submitting acceptable emergency contact information
 - 8) Obtaining required permits needed to start the Work.
 - 9) Initial establishment of temporary utilities and temporary facilities.
 - 10) Establishing Contractor's field office and sheds, Contractor's storage areas, staging and laydown areas, and other areas necessary to perform the Work.
 - 11) Initial establishment of construction vehicular access to the Site, parking needed for construction, and offsite haul routes.
 - 12) Establishing construction equipment, machinery, and tools at the Site.
 - 13) Providing initial temporary controls.
 - 14) Establishing temporary security needed to start Work at the Site.
 - 15) Other mobilization acceptable to Engineer.
- a. Demobilization includes:
 - 1) Removal from the Site and adjacent areas of excess materials and equipment.
 - 2) Removal of temporary controls, temporary facilities, temporary barriers, and similar materials and equipment.
 - 3) Removal of temporary access roads and parking areas not part of permanent pavement or otherwise allowed to remain by Owner, including temporary traffic controls established for construction vehicles and equipment.
 - 4) Removal of all field office and sheds, storage areas, staging and laydown areas, and other areas needed to perform the Work and restoration of such areas.
 - 5) Removal from the Site of all construction equipment, machinery, tools, Contractor's containers, temporary fuel storage tanks, and similar items.
 - 6) Closeout of permits on which Contractor is a permittee or co-permittee.
 - 7) Final cleaning.
 - 8) Furnishing required closeout documents.
 - 9) Other costs and effort by Contractor for demobilization.

PART 2 - PRODUCTS - (NOT USED)

PART 3 - EXECUTION - (NOT USED)

END OF SECTION

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SECTION 01 29 76
PROGRESS PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Administrative and procedural requirements for Contractor's progress payments.

B. Scope:

1. Contractor's requests for payment shall be in accordance with the Agreement, General Conditions and Supplementary Conditions, and the Specifications.

1.2 CONTENT AND PROCEDURE FOR REQUESTING PROGRESS PAYMENTS

A. Procedure:

1. Review with Resident Project Representative (RPR) quantities and the Work proposed for inclusion in each progress payment request. Application for Payment shall cover only the Work and quantities recommended by the RPR.
2. When the paragraph immediately below is retained, coordinate with EJCDC C-700—2018 Paragraph GC-7.12 (and associated Supplementary Conditions, if any); Section 01 29 73 - Schedule of Values (which may address assigning an appropriate value for Project record documents); Section 01 78 39 – Project Record Documents. To improve the potential for enforcing the paragraph immediately below, establish in the Schedule of Values an appropriate amount for record documents.
3. Engineer will act on request for payment in accordance with the General Conditions and Supplementary Conditions.

B. Content: Each request for payment shall include:

1. Completed Application for Payment form, including summary/signature page, progress estimate sheets, and stored materials summary. Progress estimate sheets shall have the same level of detail as the Schedule of Values.
2. Documentation for Stored Materials and Equipment:
 - a. For materials and equipment not incorporated in the Work but suitably stored, submit documentation in accordance with the General Conditions and Supplementary Conditions.
 - b. Legibly indicate on invoice or bill of sale the specific stored materials or equipment included in the payment request and corresponding bid/payment item number for each and the Supplier price for each item.
3. Listing of Subcontractors and Suppliers:
 - a. In accordance with the General Conditions, submit not less than monthly updated listing of all Subcontractors and Suppliers known to Contractor, whether or not such entities have a contract directly with Contractor.
 - b. Submit complete information using the form attached to this Specifications section.
4. Allowance Work:
 - a. For payment requests that include payment for Work under an allowance, include with the progress payment request copy of Owner's authorization of the associated allowance Work, in accordance with Section 01 21 00 - Allowances.
5. Partial Release or Reduction of Retainage:
 - a. For each Application for Payment where Contractor requests partial release or reduction of retainage in any amount (other than request for final payment), submit with associated progress payment request consent of surety to partial release or reduction of retainage, duly completed by Contractor and surety.

- b. For payment requests that include reduction in or payment of retainage in an amount greater than that required by the Contract Documents, obtain Owner's concurrence for partial release or reduction in retainage prior to submitting such Application for Payment.

C. Final Payment:

- 1. Requirements for request for final payment are in the General Conditions, as may be modified by the Supplementary Conditions.

PART 2 - PRODUCTS - (NOT USED)

PART 3 - EXECUTION – (NOT USED)

END OF SECTION

SECTION 01 33 00
SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Definition of various types of Submittals.
2. Coordination requirements for Submittals.
3. General provisions concerning Submittals.
4. Schedule of Submittals.
5. Contractor's preparation of Submittals, including:
 - a. Numbering.
 - b. Marking.
 - c. Organization and content.
 - d. Proposed "or-equals", substitutes, and deviations from Contract requirements.
 - e. Electronic Documents Submittals.
 - f. Contractor's review and approval of each Submittal.
 - g. Resubmittals.
6. Contractor's transmittal of Submittals, including transmittal letters, transmittal and delivery method, and delivery of Samples, Closeout Submittals, and Maintenance Materials Submittals.
7. Engineer's review, including:
 - a. Timing.
 - b. Meaning of Engineer's Submittal action code(disposition) assigned.
 - c. Delivery of Engineer's responses on Submittals.

B. Scope:

1. Contractor shall provide all labor, materials, equipment, tools, services, incidentals, and other effort necessary to furnish Shop Drawings, product data Submittals, Samples, and other Submittals in accordance with the Contract Documents.
2. This Section's Article, "General Provisions Concerning Submittals" includes a summary of the Contract Documents' locations of Submittals requirements.
3. Shop Drawings, product data Submittals, Samples, and other Submittals, whether or not approved or accepted by Engineer, are not Contract Documents. Engineer's approval or acceptance, as applicable, of a Submittal does not alter or modify the Contract Documents.
4. Engineer and Owner have the right to rely on Contractor's representations and certifications made regarding each Submittal.

1.2 REFERENCES

A. References – Introduction:

1. This Article presents definitions and terminology used in this Section and throughout the Contract Documents.
2. Applicability of the Term "Submittals": Where reference is made to Shop Drawings, product data Submittals, Samples, or other Submittals in this Section and

elsewhere in the Contract Documents, the term “Submittals”, as defined in the Contract Documents, is intended. The foregoing applies regardless of whether such term is indicated with an initial capital letter, unless context of the subject provision clearly indicates otherwise.

3. Types of Submittals:

- a. Submittal types are classified as follows: (1) Action Submittals, (2) Informational Submittals, (3) Closeout Submittals, and (4) Maintenance Materials Submittals.
- b. Type of each required Submittal is indicated in the associated Specifications section. When Submittal type is not clearly indicated in the associated Specifications section, Submittal will be classified as indicated in this Article. Submit request for interpretation when Contractor is uncertain of required Submittal type.

B. Action Submittals:

1. Action Submittals require an explicit, written approval or other appropriate action by Engineer (or other entity to whom the Submittal is required to be furnished, in accordance with the Contract Documents) before Contractor may release the associated item(s) for raw materials procurement, fabrication, production, and shipping.
2. Unless otherwise indicated in the Contract Documents, Action Submittals include the following:
 - a. Shop Drawings.
 - b. Product data.
 - c. Samples.
 - d. Testing plans for quality control activities required by the Contract Documents.
 - e. Delegated Designs: Delegated design professional's “instruments of service” Submittals required by the Contract Documents.
3. General Conditions' requirements for Shop Drawings and Samples hereby apply to all Action Submittals.

C. Informational Submittals:

1. Informational Submittals are so indicated in the Contract Documents. Unless otherwise indicated, Informational Submittals include certifications, evaluation reports, results of source quality control activities, results of field quality control activities, Supplier instructions, reports of Suppliers' visits to the Site, sustainable design Submittals (that are not Closeout Submittals), delegated design Submittals that are not “instruments of service” Submittals, qualifications statements, and others.
2. Informational Submittals, when submitted in accordance with the Contract and indicating full compliance with the Contract Documents, do not require explicit response from Engineer (or other entity to whom the Submittal is to be delivered); Engineer's (or other entity's) acceptance thereof will be indicated in the Engineer's Submittals log. Copy of Engineer's Submittals log is available to Contractor upon Contractor's written request.
3. When Informational Submittal does not indicate full compliance with the Contract Documents, Engineer (or other entity to which Submittal is to be delivered) will indicate the non-compliance in a written response to Contractor.

D. Closeout Submittals:

1. Closeout Submittals are so indicated in the Contract Documents and are, in general, required before the associated Work is completed, unless earlier submittal is required by the Contract Documents.
2. Unless indicated otherwise in the Contract Documents, Closeout Submittals include maintenance contracts, operation and maintenance data, warranties, bonds (other than performance and payment bonds required prior to the start of construction), record documents, sustainable design closeout Submittals, software, keys, and others.
3. Closeout Submittals are processed in the same manner as described above for Informational Submittals.

E. Maintenance Materials Submittals:

1. Maintenance materials include spare parts, extra materials, tools, and similar items required to be furnished in accordance with the Contract Documents.
2. Furnish required physical maintenance materials, delivered to Owner or facility manager (if other than Owner), as applicable, at the location(s) indicated in the Contract Documents, for the corresponding required Maintenance Materials Submittals.
3. Maintenance Materials Submittals are documentation of delivery to Owner's or facility manager, and their acceptance of, required physical maintenance materials.
4. Maintenance Materials Submittals are processed in the same manner as described above for Informational Submittals.

F. Additional Terms:

1. The following terms have the meanings indicated below, regardless of whether such terms are indicated using initial capital letters, and apply to singular and plural of each:
 - a. "Product data" means illustrations, standard schedules, performance charts, Supplier's published instructions, brochures, diagrams, and other information furnished by Contractor to illustrate or describe materials or equipment for some portion of the Work. In general, product data are manufacturers' pre-published information on the items proposed to be incorporated into the Work. Product data includes manufacturer's catalog pages and similar documents with contractor-made markings and indications of proposed products and proposed options.
 - b. The term "Shop Drawings", defined in the General Conditions, is supplemented by the following: Shop Drawings include: (1) fabrication and assembly drawings, usually having a title block, or (2) schedules, prepared specifically for the Project. Here, "schedules" means a Project-specific summary of systems and components, such as a schedule of HVAC equipment, schedules of doors and door hardware, or windows, or a schedule of paint systems by room and surface, or other, similar Project information in a tabular format. In contrast, construction Progress Schedules, Schedules of Submittals, and Schedules of Values are not Shop Drawings.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Furnish Submittals well in advance of need for the associated material or equipment, or procedure (as applicable), in the Work and with ample time necessary for delivery of materials and equipment and to implement procedures following Engineer's approval or acceptance of the associated Submittal.

2. Work covered by a Submittal will not be included in payments by Owner until approval or acceptance (as applicable) of related Submittals has been obtained in accordance with the Contract Documents.

1.4 GENERAL PROVISIONS CONCERNING SUBMITTALS

A. Locations of Requirements:

1. Requirements concerning Submittals are generally located as follows:
 - a. General Conditions, as may be modified by the Supplementary Conditions, applicable to the Project.
 - b. This Section, which presents general requirements for Submittals applicable to the Project.
 - c. The "Submittals" Article of the various Specifications sections, which indicates the required Submittals for the associated Work. Furnish all Submittals required by the Contract Documents regardless of whether explicitly indicated in the associated Specifications' "Submittals" Article.

- B. This Section augments and supplements the requirements of the General Conditions, as may be modified by the Supplementary Conditions, relative to Submittals.

1.5 SCHEDULE OF SUBMITTALS

A. Informational Submittals: Submit the following:

1. Schedule of Submittals:
 - a. Timing:
 - 1) Furnish Schedule of Submittals within time frames indicated in the General Conditions, as may be modified by the Supplementary Conditions.
 - 2) Submit updated Schedule of Submittals with each submittal of the updated Progress Schedule.
 - b. Content: In accordance with the General Conditions, as may be modified by the Supplementary Conditions, and this Section. Requirements for content of preliminary Schedule of Submittals and subsequent Submittals of the Schedule of Submittals are identical. Identify on Schedule of Submittals all Submittals required in the Contract Documents. Updates of Schedule of Submittals shall show scheduled dates and actual dates for completed tasks. Clearly indicate Submittals that are on the Project's critical path. Indicate the following for each Submittal:
 - 1) Date by which Submittal will be received by Engineer.
 - 2) Whether Submittal will be for a substitution or "or-equal".
 - 3) Date by which Engineer's response is required. Allow not less than 14 days for Engineer's review, starting on Engineer's actual receipt of each Submittal. Allow increased time for large or complex Submittals.
 - 4) For Submittals for materials or equipment, date by which material or equipment must be at the Site to avoid delaying the Work and to avoid delaying the work of others (if any).
 - c. Coordinate Schedule of Submittals with the Progress Schedule.
 - d. Schedule of Submittals that is not compatible with the Progress Schedule, or that does not indicate Submittals on the Project's critical path, or that places extraordinary demands on Engineer for time and resources, is unacceptable. Do not include Submittals not required by the Contract Documents.
 - e. In preparing Schedule of Submittals:

- 1) Considering the nature and complexity of each Submittal, allow sufficient time for reviews and revisions.
- 2) Allow reasonable time for: Engineer's review and processing of Submittals, for Submittals to be revised and resubmitted, and for returning Submittals to Contractor.
- 3) Identify and accordingly schedule Submittals that are expected to have long anticipated review times.

1.6 PREPARATION OF SUBMITTALS

A. Prior to Submittal Preparation:

1. The General Conditions, as may be modified by the Supplementary Conditions, address Contractor's responsibility for submitting for Owner's acceptance identification of Subcontractors and Suppliers. Obtain Owner's acceptance before entering into subcontracts and purchase orders for the Work.
2. Comply with the Contract Documents relative to terms and conditions of subcontracts and purchase orders for the Work.
3. Contractor's responsibilities for the following are set forth in the General Conditions, as may be modified by the Supplementary Conditions, and as may be augmented elsewhere in the Contract Documents:
 - a. Obtaining field measurements and dimensions.
 - b. Determining and verifying required quantities.
 - c. Verifying compatibility of materials.
 - d. Apportioning the Work among Subcontractors, Suppliers, and Contractor.
 - e. Reconciling required materials, equipment, and other Contract requirements with Contractor's means, methods, techniques, sequences, and procedures of construction and with Contractor's safety and protection programs and precautions incident thereto.
 - f. Reviewing applicable provisions of the Contract Documents and obtaining from Engineer necessary interpretations or clarifications.

B. Submittal Identification:

1. Submittal Number: Shall be a unique number assigned to each individual Submittal. Assign Submittal numbers as follows:
 - a. First part of Submittal number shall be the applicable Specifications section number, followed by a hyphen.
 - b. Second part of Submittal number shall be a three-digit number (sequentially numbered from 001 through 999) assigned to each separate Submittal furnished under the associated Specifications section.
 - c. Example: Submittal number for the third Submittal furnished for Section 10 14 00 - Signage, would be "10 14 00-003".
2. Review Cycle Number: Each resubmittal of a given Submittal shall be indicated with a lower-case letter designation:
 - a. No letter designation for initial (first) submittal of the Submittal number.
 - b. "a" shall indicate first resubmittal of the Submittal number.
 - c. "b" shall indicate second resubmittal of the Submittal number.
3. Examples:

Example Description	Submittal Identification

	Submittal No.	Review Cycle
Initial (first) review cycle of the third Submittal furnished under Section 10 14 00 – Signage	10 14 00-003-	
Second review cycle (first resubmittal) of third Submittal furnished under Section 10 14 00 - Signage	10 14 00-003-	a

C. Marking of Submittals:

1. Mark on each page of each Submittal and each individual component submitted with Submittal number and applicable Specifications paragraph.
2. Mark each page of each Submittal with the Submittal page number.
3. Each Shop Drawing sheet shall have title block with complete identifying information satisfactory to Engineer.
4. For product data Submittals, operation and maintenance data Submittals, and other Submittals:
 - a. Mark options to be furnished using broad, dark arrows or “clouds” clearly drawn around the relevant text or diagrams. Do not use highlighter for indicating options and features.
 - b. Indicate options and features not furnished using clear strikeouts through the text or diagrams.

D. Submittal Organization and Content – General:

1. Page or Sheet Size; Furnish Submittals with one or more of the following page or sheet sizes: (a) 8.5 inches by 11 inches; (b) 11 inches by 17 inches; (c) 22 inches by 34 inches; unless another sheet size is acceptable to Engineer.
2. Language: All parts of each Submittal shall be in the English language.
3. Units of Measurement: Clearly indicate units of measurement on Shop Drawings, product data Submittals, record documentation, and operation and maintenance data Submittals.
4. Organize each Submittal logically to facilitate ease of understanding and review.
5. To the extent practicable, arrange Submittal information in same order as requirements are written in the associated Specifications section.
6. Each Submittal shall cover Work under only one Specifications section.
7. To the extent practicable, package together Submittals for the same Specifications section. Do not furnish required information piecemeal.
8. For large or complex Submittals, include a title page and table of contents.
9. Include appropriately labeled fly sheets to separate distinct parts of each Submittal.
10. Ensure legibility of all pages in each Submittal.
11. Minimize extraneous and unnecessary information in Submittals for materials and equipment. Do not submit information not relevant to the Submittal and associated requirements of the Contract Documents.
12. Contractor's, Subcontractor's, and Supplier's written comments on Shop Drawings and product data diagrams shall be colored green
13. Do not submit under Specifications sections with title that include “Basic Requirements”, unless the subject material or equipment is specified, in total, in a Specifications section with the words, “Basic Requirements” in its title.

14. Final Drawing and Record Drawings submittals with drawings shall include DWG files.
- E. Electronic Documents Submittals:
1. Format: Electronic Documents Submittals shall be "portable document format" (.PDF) files unless expressly required otherwise by applicable provisions of the Contract Documents.
 2. Electronic Documents Submittals must be electronically searchable when delivered to Engineer and other recipients.
 3. Organization and Content:
 - a. Each Electronic Documents Submittal shall be one file; do not divide individual Submittals into multiple Electronic Documents files each unless file size will exceed 20 MB.
 - b. When Submittal is large or contains multiple parts, furnish PDF file with suitably titled electronic bookmark for each section of the Submittal.
 - c. Content shall be identical to paper or other original Submittal. First page of each Electronic Documents Submittal shall be transmittal letter required in this's Paragraph 1.7.A.
 4. Quality and Legibility: Electronic Documents Submittal files shall be made from the original and shall be clear and legible. Markings applied by Contractor, Subcontractor, or Supplier shall be clear, distinct, and readily apparent. Electronic Documents file shall be full size of original documents. Properly orient all pages for convenient reading on a computer display; do not furnish pages sideways or upside-down.
 5. Provide sufficient internet service, software, and systems for Contractor with capability appropriate for transmitting the necessary files and receiving responses from Engineer or other entities.
 6. Check not less than once per day for distribution of Electronic Documents Submittals responses and related Electronic Documents correspondence.
- F. Proposed "Or-Equals", Substitutes, and Deviations from Contract Requirements:
1. "Or-Equals":
 - a. Contractor's request for approval of "or-equals" is to be presented via the associated Action Submittal(s) and shall include the information required in provisions governing "or-equals."
 - b. Expressly and prominently indicate, "Proposed Or-Equal" on the associated Action Submittals when Submittal is for an "or-equal".
 - c. Submittals requesting approval of an "or-equal" but not accompanied by the required, supplemental information will be deemed incomplete by Engineer and returned to Contractor without approval.
 2. Substitutes:
 - a. Contractor's request for approval of substitute is separate from the associated Action Submittal(s). Action Submittals that request approval of a substitute when a separate, formal substitution request (furnished in accordance with the Contract Documents) was not previously furnished to Engineer, followed by formal approval in via an appropriate contract modification (typically either a Field Order or Change Order), will be deemed by Engineer as non-compliant with the Contract Documents and will be returned to Contractor without approval.

- b. Contractor is solely responsible for delays incurred due to substitutes proposed via Submittals that have not been previously duly approved via an appropriate Contract modification.
 - c. Action Submittals for items or procedures approved via an appropriate Contract modification shall include a copy of the Contract modification in which the substitute was approved.
 - 3. Submittals with Proposed Deviations from Contract Requirements:
 - a. When Submittal proposes deviations from requirements of the Contract Documents, the Submittal shall clearly and expressly indicate each proposed deviation.
 - b. Also comply with this Section's provision, in the Article below, on Contractor's transmittal letter expressly alerting Engineer to the proposed deviations.
 - c. Comply with requirements of the Contract regarding substitutes and "or-equals".
 - d. When deviation is proposed, also appropriately revise text of Contractor's approval, from that required below in this Article.
 - e. When Submittal includes deviations from Contract requirements and either the Submittal itself, Contractor's transmittal letter, or both, do not comply fully with Contract requirements for indicating deviations in Submittals and giving separate written notice thereof, Engineer's approval of such deviations will be deemed null and void unless Engineer's written response to the Submittal has expressly acknowledged such deviation and indicated Engineer's approval thereof.
 - f. Contractor is solely responsible for delays and costs incurred due to any and all Submittals with deviations from Contract requirements that were not properly, expressly indicated and approved in accordance with the Contract Documents. Deviations not duly approved in accordance with the Contract Documents may be deemed defective Work. Contractor is solely responsible for remedying defective Work and all associated cost and time impacts.
- G. Contractor's Approval of Submittals:
- 1. Contractor's Review: Before transmitting Submittals to Engineer, review each Submittal to:
 - a. Ensure proper coordination of the Work.
 - b. Determine that each Submittal is in accordance with Contractor's desires.
 - c. Verify that Submittal contains sufficient information for Engineer to determine compliance with the Contract Documents.
 - 2. Incomplete or inadequate Submittals will be returned without detailed review by Engineer.
 - 3. Contractor's Approval Stamp and Signature:
 - a. Each Submittal furnished shall bear Contractor's approval stamp (or facsimile thereof) and signature, as evidence that the Submittal has been reviewed and approved by Contractor and verified as complete and in accordance with the Contract Documents.
 - b. Submittals without Contractor's approval and signature (as required by the contract Documents) will be returned to Contractor without further review by Engineer and deemed incomplete.
 - c. Engineer reserves the right to reject as incomplete Submittals where Contractor's approval signature appears computer-generated or reproduced without the active involvement or review of Contractor's signatory.

- d. Contractor's approval shall contain the following text:

Project Name: _____
Contractor's Name: _____
Contract Designation: _____
Date: _____

----- *Reference* -----

Submittal Title: _____
Specifications: _____
Section: _____
Page No.: _____
Paragraph No.: _____
Drawing No.: [] of _____
Location of Work: _____

Submittal No. and Review Cycle: _____
Coordinated by Contractor with Submittal Nos.: _____

I hereby certify that Contractor has satisfied Contractor's obligations under the Contract Documents relative to Contractor's review and approval of this Submittal, including: (1) reviewed and coordinated the Submittal with other Submittals and with the requirements of the Work and the Contract Documents; (2) determined and verified all: field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect to the Submittal, (b) 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 (c) all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto; (3) confirmed the Submittal is complete with respect to all related data included in the Submittal; and (4) clearly and expressly indicated all proposed deviations (if any) from the requirements of the Contract Documents both in the Submittal itself and in the Submittal's transmittal letter. Accordingly, this Submittal is hereby approved for Contractor by:

Approved for Contractor by: _____

H. Resubmittals:

1. Refer to the General Conditions, as may be modified by the Supplementary Conditions, for requirements regarding resubmitting required Submittals.
2. In addition to limits on the quantity of resubmittals, as indicated in the General Conditions, Contractor shall furnish Submittals with such completeness, accuracy, and compliance with the Contract Documents to obtain Engineer's approval or acceptance, as applicable, without the total quantity of Submittals furnished, including all initial Submittals and all resubmittals, exceeding 125 % of the number of Submittals indicated on the Schedule of Submittals initially accepted by Engineer, plus a corresponding percentage of the quantity of Submittals required by Change Orders, Work Change Directives, and Field Orders.
3. Do not increase the scope of prior review cycle of the same Submittal.

4. Indicate on Contractor's transmittal letter how Submittal was revised from previous review cycle of the Submittal and where the revisions or corrections are located within the resubmittal.
5. Expressly address and provide response for all components previously transmitted by Engineer on prior review cycles of the subject Submittal. Where resubmittal lacks complete response to Engineer's prior comments, Engineer may deem such resubmittal as incomplete and return it to Contractor without further review.
6. Where part of the Submittal's prior review cycle was expressly approved or accepted, as applicable, by Engineer, do not include such items in subsequent resubmittals.
7. Indicate, "Not Yet Resolved—To Be Resubmitted at a Later Date" for any items not approved in prior review cycle of the Submittal for items not included in the subject resubmittal. Engineer reserves the right to deem incomplete Submittals "Not Approved" or "Revise and Resubmit". Furnishing incomplete or partial resubmittals is discouraged.
8. Resubmittal of Previously Approved or Accepted Items:
 - a. Do not resubmit on a given item previously approved or accepted, as applicable, by Engineer, without Engineer's advance consent. Consent will be given for bona-fide unavailability of a previously approved or accepted item where Contractor has acted in good faith in a timely manner with due diligence to comply with the Contract Times.
 - b. Destroy or conspicuously mark "SUPERSEDED" on all documents having previously received Engineer's approval or acceptance, as applicable, that are superseded by a resubmittal.

1.7 TRANSMITTAL OF SUBMITTALS BY CONTRACTOR

A. Contractor's Transmittal Letters for Submittals:

1. Furnish separate transmittal letter with each Submittal. Use transmittal form attached to this Section (as Exhibit 01 33 00-A) unless other transmittal form is acceptable to Engineer at the start of the Project's construction.
2. When transmittal form other than this Section's Exhibit 01 33 00-A is acceptable to Engineer, at beginning of each transmittal, include a reference heading indicating: Contractor's name, Owner's name, Project designation, Contract designation, transmittal number, and Submittal number (with review cycle).
3. "Or-Equals": When the Submittal is proposing an "or-equal", expressly so indicate on transmittal form submitted by Contractor.
4. Proposed Deviations from Contract Requirements: When the Submittal proposes deviations from requirements of the Contract Documents, transmittal letter shall specifically describe each proposed deviation.

B. Submittal Delivery Method:

1. This provision presents general requirements for delivery of all Submittals unless otherwise required elsewhere in the Contract Documents.
2. Furnish Submittals as Electronic Documents delivered in accordance with Section 01 31 26 – Electronic Communication Protocols.
3. Furnish Submittals to Engineer and each other entity indicated in the Contract Documents as receiving a Submittal directly from Contractor.

C. Samples - Transmittal and Delivery:

1. Labeling and Tagging Samples:

- a. Securely label or tag each Sample with Submittal identification number.
 - b. Label or tag shall include clear space at least 4 inches by 4 inches in size for affixing Engineer's review stamp indicating disposition assigned by Engineer.
 - c. Label or tag shall not cover, conceal, or alter Sample's appearance or features.
 - d. Label or tag shall not be separated from the Sample.
 2. Timing: Deliver required Samples concurrently with other Action Submittals required for the same element of the Work, unless other delivery time frame is indicated in the Schedule of Submittals accepted by Engineer.
 3. Quantity Required:
 - a. Where the Contract Documents require a Sample as a field mock-up, provide Sample at the Site or in the Work at location acceptable to Engineer. Provide the quantity of field mock-ups required by the contract Documents; if not otherwise shown or specified, provide one of each required field mock-up. .
 - b. For reasonably portable Samples, deliver the quantity of Samples required in the associated Specifications. If quantity of Samples is not indicated in the associated Specifications section, deliver to Engineer not less than [three] identical Samples of each item for which Sample is required.
 - c. Samples will not be returned to Contractor. If Contractor requires Sample(s) for Contractor's use, so advise Engineer in writing and furnish additional copies of the Sample. Contractor is responsible for furnishing, shipping, and transporting additional Samples.
 4. Locations for Delivery of Reasonably Portable Samples for Review:
 - a. Deliver one physical Sample to Owner's Site Representative's field office at the Site.
 - b. Deliver balance of required physical Samples to Engineer at address indicated in this Article for receipt of Submittals, unless otherwise directed by Engineer.
- D. Closeout Submittals –Transmittal and Delivery:
1. Furnish the following Closeout Submittals in accordance with general requirements for transmitting and delivering Submittals, indicated above in this Article: maintenance contracts; warranty bonds (when required) and other bonds required for specific materials, equipment, or systems; warranty documentation; and sustainable design closeout documentation (when required). On documents such as maintenance contracts and bonds, include on each document furnished original ("wet") signature of entity issuing said document. When original "wet" signatures are required, furnish such Submittals to Engineer both on original paper and as Electronic Documents, and to other entities furnish as indicated above in this Article for general requirements for Submittals.
 2. Operations and Maintenance Manuals: Submit in accordance with Section 01 78 23 - Operation and Maintenance Data.
 3. Software: In addition to software installed on Owner's computer system, furnish number of copies of software required in the Specifications section where the software is specified. Preferred means of transmittal is via secure file transfer directly to Owner (or facility manager, if other than Owner) via secure file transfer method mutually acceptable to software developer and the receiving entity. When secure file transfer is used, submit to Engineer documentation signed or electronically acknowledged by Owner that the files were received. Where such software is available only on the software developer's portable media, furnish such software on software developer's original, portable media, sealed in software developer's original, unopened, clearly labeled packaging.

E. Maintenance Materials Submittals – Delivery:

1. Deliver physical maintenance materials required by the Contract Documents in accordance with applicable provisions of the Contract.
2. Submit documentation of delivery of (Maintenance Materials Submittals) in accordance with general requirements for Submittals as indicated in this Section.

1.8 ENGINEER'S REVIEW OF SUBMITTALS

A. This Article applies to review of all Submittals by Engineer or other entity to whom the Contract Documents require such Submittal be furnished.

B. Timing:

1. Timing of Engineer's review will be in accordance with the Schedule of Submittals accepted by Engineer.
2. When Submittal is delivered to Engineer on a date other than that indicated in the Schedule of Submittals accepted by Engineer, duration of Engineer's review may differ from that indicated in the Schedule of Submittals, based on Engineer's availability and resources. Engineer will make good-faith effort to furnish responses to Submittals in a timely manner.
3. Contractor is responsible for communicating to Engineer when a Submittal is on the Project's critical path.

C. Engineer's Review:

1. Markings:
 - a. Comments or responses marked directly on Submittal by Engineer (or other entity reviewing Submittal) will be colored red.
 - b. Engineer may also present narrative comments on a comment sheet inserted by Engineer into the Submittal or included on Engineer's transmittal letter for the Submittal. Such comments will be in black text. When a separate comment sheet is included by Engineer, such sheet will be clearly identified as Engineer's comments.
2. Engineer's review and disposition assigned to Submittal are subject to the following:
 - a. Submittal disposition is subject to: Engineer's comments on the Submittal; disclaimer language on Engineer's Submittal transmittal letter; Engineer's Submittal review stamp (when used) or equivalent (when used); and this provision.
 - b. Engineer's review is only for general compatibility with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents, and for general compliance with the information given in the Contract Documents.
 - c. Contractor shall be solely responsible for complying with the Contract Documents, as well as with Supplier instructions consistent with the Contract Documents, Owner's directions, and Laws and Regulations. Contractor is solely responsible for obtaining, correlating, confirming, and correcting dimensions at the Site; quantities; information and choices pertaining to fabrication processes; means, methods, sequences, procedures, and techniques of construction; safety precautions and programs incident thereto; and for coordinating the work of all trades.
 - d. Engineer is not responsible for resubmittals not yet furnished by Contractor or tracking Contractor's progress on resubmittals.
3. Documents not required by the Contract Documents but nonetheless furnished by Contractor as submittals will not be reviewed by Engineer.

D. Meaning of Submittal disposition Assigned by Engineer:

1. Action Submittals:

- a. "Approved" (Action Code A): Upon return of Submittal marked "Approved", order, ship, or fabricate materials and equipment included in the Submittal (pending Engineer's approval or acceptance, as applicable, of production-related qualifications statements and certifications, and required source quality control Submittals) or otherwise proceed with the Work in accordance with the Submittal and the Contract Documents.
- b. "Approved as Noted" (Action Code B): Upon return of Submittal marked "Approved as Noted", order, ship, or fabricate materials and equipment included in the Submittal (pending Engineer's approval or acceptance, as applicable, of production-related qualifications statements and certifications, and required source quality control Submittals) or otherwise proceed with the Work in accordance with the Submittal and the Contract Documents, and in accordance with Engineer's comments and notes indicated in Engineer's Submittal response
- c. "Revise and Resubmit" (Action Code C): Upon return of Submittal marked "Revise and Resubmit", make the revisions necessary and indicated and resubmit to Engineer for approval.
- d. "Not Approved" (Action Code D): This disposition indicates material or equipment that cannot be approved. "Not Approved" disposition may also be applied to Submittals that are incomplete. Upon return of Submittal marked "Not Approved", repeat initial submittal procedure utilizing approvable material or equipment, with a complete Submittal clearly indicating all information required.

2. Informational, Closeout, and Maintenance Materials Submittals:

- a. "Accepted" (Action Code F): Information included in Submittal complies with the applicable requirements of the Contract Documents and is acceptable. No further action by Contractor is required relative to such Submittal, and the Work covered by the Submittal may proceed. Materials and equipment with Submittals with this disposition may be shipped or operated, as applicable. Submittals assigned "Accepted" by Engineer (or other reviewing entity) does not indicate Engineer's acceptance of the associated Work, which is indicated only as set forth in the General Conditions.
- b. "Not Acceptable" (Action Code G): Submittal, or part thereof, does not indicate full compliance with applicable requirements of the Contract Documents and is not acceptable. Provide labor, materials, equipment, services, and incidentals necessary to properly and accurately revise Submittal and resubmit to indicate acceptability and compliance with the Contract Documents

3. Other:

- a. "Submittal Not Reviewed" (Action Code E): Documents so marked by Engineer are not required by the Contract Documents. Submittals may also be marked with this disposition when information in the document was previously reviewed and approved or accepted by Engineer, as applicable.

E. Distribution of Engineer's Responses:

1. Unless otherwise indicated in the Contract Documents, Engineer will distribute written responses (as Electronic Documents) to Submittals to the following:
 - a. Contractor.
 - b. Owner.

- c. Engineer's file.
2. Engineer's acceptance of Informational Submittals, Closeout Submittals, and Maintenance Materials Submittals will be recorded in Engineer's Submittal log. Copy of Engineer's Submittals log is available from Engineer upon written request of Owner or Contractor. If no such request is received by Engineer, Engineer will distribute copy of Engineer's Submittals log once per month (when Submittals have been received or acted on by Engineer). Engineer may distribute copy of Engineer's Submittals log as an Electronic Document or as handout at construction progress meetings.
3. Paper copies of Engineer's Submittal responses will not be distributed unless otherwise required by the Contract Documents or otherwise agreed to by Engineer.
4. Contractor is responsible for forwarding Engineer's Submittals responses to Subcontractors and Suppliers as appropriate, and for coordinating the Work of all trades.

PART 2 - PRODUCTS - (NOT USED)

PART 3 - EXECUTION

3.1 ATTACHMENTS

- A. The documents listed below, following this Section's "End of Section" designation, are part of this Specifications Section:
 1. "Exhibit 01 33 00-A – Transmittal for Submittal No. [____]" (one page).

END OF SECTION

Transmittal for Submittal No. []-[]

Project Name:				Date Received:	
Project Owner:				Checked By:	
Contractor:		HDR Engineering, Inc.		Log Page:	
Address:		Address:		HDR No.:	
				Spec Section:	
				Drawing/Detail No.:	
Attn (Contractor):		Attn (HDR):		Review Cycle	
Date Transmitted by Contractor:		Date of Engineer's Response Transmittal:			
Item No.	Submittal No.	Description (indicate number of copies where paper copies of physical Samples are returned)	Manufacturer	Supplier Dwg or Data No.	Engineer's Disposition (Action Code) *
1					
2					
3					
4					
Contractor's Remarks (<i>insert text</i>):					
Engineer's Remarks (<i>insert text</i>): :					
* Legend for Action Code indicated above, assigned by Engineer:					
Action Submittal: A – Approved B – Approved as Noted C – Revise and Resubmit D – Not Approved			E – Submittal Not Reviewed Informational, Closeout, or Maintenance Materials Submittal: F – Accepted (this code normally recorded in Engineer's Submittals log). G – Not Acceptable		
Engineer's Disclaimer (for Submittals that do <u>not</u> involve delegated design):					
a. Submittal action code is subject to: Engineer's comments on the Submittal, comment sheets (if any), and this transmittal letter; disclaimer language on Engineer's Submittal review stamp or equivalent; and Specifications Section 01 33 00 – Submittal Procedures. b. Engineer's review is only for general compatibility with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents, and for general compliance with the information given in the Contract Documents. c. Contractor shall be solely responsible for complying with the Contract Documents, as well as with Supplier instructions consistent with the Contract Documents, Owner's directions, and Laws and Regulations. Contractor is solely responsible for obtaining, correlating, confirming, and correcting dimensions at the Site; quantities; information and choices pertaining to fabrication processes; means, methods, sequences, procedures, and techniques of construction; safety precautions and programs incident thereto; and for coordinating the work of all trades.					
Reviewed for HDR by:				Date of Engineer's Review:	
Distribution:		Contractor	File	Field	Owner
					Other

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SECTION 01 55 26

TRAFFIC CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. General requirements for traffic control during construction, including:
 - a. Coordination with owners of streets, highways, and other travelled ways affected by the Project and coordination with owners of properties at or adjacent to the Site regarding traffic control.
 - b. Traffic controls for general vehicular traffic affected by the Work.
 - c. Traffic controls for pedestrians and other non-vehicular traffic affected by the Work.
 - d. Temporary bridging over excavations in travelled ways.
 - e. Traffic control personnel.
 - f. Maintenance of traffic controls.
 - g. Removal of traffic controls.

B. Scope:

1. Contractor shall provide all labor, materials, tools, equipment, services, incidentals, and pay all expenses necessary and required to keep all streets, highways, and other travelled ways open for passage of traffic and pedestrians during the Project, unless: (1) otherwise approved by owner of the street, highway, or travelled way, and Engineer, or (2) as expressly allowed by the Contract Documents.

C. Related Requirements:

1. Include but are not necessarily limited to:
 - a. Section 01 57 05 - Temporary Controls.

1.2 REFERENCES

A. Terminology:

1. The following terminology, although not indicated with initial capital letters, has the following meaning in this Section:
 - a. "Maintenance and protection of traffic" and "traffic control":
 - 1) "Maintenance and protection of traffic" and "traffic control", whether singular or plural, have the same meaning and, unless expressly indicated otherwise, refer to temporary measures provided by Contractor to control, maintain, and safeguard vehicular traffic, pedestrians, bicycles, and other traffic during construction.
 - 2) "Traffic controls" are signage, barriers, barricades, signal and warning lights, and other measures provided by Contractor for controlling other than routine use of existing and temporary access roads and parking areas by construction traffic.
 - 3) "Traffic control" includes, but is not necessarily limited to, traffic controls for: (a) excavations, (b) construction vehicle parking areas, (c) storage and laydown areas for materials and equipment to be incorporated in the Work, and (d) other work-related areas; in, opening into, or adjacent to streets, highways, or other travelled ways.
 - b. "Traffic" means any and all users of the subject street, highway, or other travelled way, including sidewalks, bicycle paths, and similar facilities. "Traffic" includes motor vehicles of all types, including automobiles, motorcycles and similar vehicles, trucks, busses, light rail, mobile equipment, and others; pedestrians; bicyclists; and others using the travelled way or right-of-way.

- B. Reference Standards: Standards referenced in this Section include, but are not necessarily limited to, the following:
1. Unless otherwise shown or indicated in the Contract Documents, traffic controls shall be in accordance with:
 - a. KYTC Standard Specifications for Road and Bridge Construction, 2019 Edition.
 - b. Part 6 ("Temporary Traffic Control") of the Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD), by the United States Department of Transportation (USDOT) Federal Highway Administration (FHWA).
 2. In the event of conflict between the standard specifications referenced above and the MUTCD, the referenced standard specifications will govern.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Owner of Street, Highway, or Travelled Way:
 - a. Coordinate with owner of each street, highway, and other travelled way affected by the Work and the Project and obtain from such owner requirements for traffic control during construction.
 - b. Obtain and pay for work permits, street opening permits, and other permits required by the owner of the street, highway, or other travelled way.
 - c. Give written notices required by the owner of the street, highway, or other travelled way.
2. Notice to Emergency Services:
 - a. Give required advance, oral and written notices to fire departments, police departments having jurisdiction, ambulance services, and other emergency services as applicable, of proposed construction operations that may impact or affect emergency services' ability to perform their respective functions.
 - b. Give such notices as indicated immediately below for notice to adjacent properties.
3. Notice to Adjacent Properties:
 - a. Give reasonable advance, written notice to owners and occupants of private property directly affected by construction operations, including properties adjacent to the Site where such property's vehicular or pedestrian access will be affected by the Project.
 - b. Give such notice not less than [five] days prior to when such property will or may be affected by construction operations and again not less than [24] hours prior to such property being affected by construction operations.
 - c. Such notices to properties shall clearly indicate the intended dates the property will be affected and the scheduled end-date of such activity, and a brief summary of the ways the property will be affected during the Project's construction. Such notices shall be on Contractor's letterhead and shall indicate the Project name, Owner, Owner's project or contract number (if any), and Contractor's contact person with telephone number and office hours.
 - d.

1.4 SUBMITTALS

A. Informational Submittals: Submit the following:

1. Traffic Control Plan: Detailed plan, procedures, and sequencing for traffic control during construction.
 - a. The Submittal shall clearly indicate the following:
 - 1) Traffic staging plan, and construction sequencing as applicable to traffic control during construction. Coordinate with the Progress Schedule accepted by Engineer.
 - 2) Product data, including Supplier's catalog information, standard detail drawings, and specifications, for temporary barriers, barricades, signs, signals and warning lights, illumination devices, and other items used for traffic control during construction.

- 3) Materials and procedures for providing access to properties along the route of the proposed traffic controls.
 - 4) Identity and pertinent qualifications of the entity, such as Subcontractor or Contractor, that will select, install, maintain, and remove traffic controls.
 - 5) Number and types of personnel dedicated to traffic control during construction, including flaggers. Include documentation of flaggers' training and qualifications. Indicate where number of personnel will vary by work shift or during certain hours.
 - 6) Evidence of plan acceptance from authorities having jurisdiction, including owner of each street, highway, and other travelled ways that will have traffic controls during construction.
 - 7) Proposed signage, including layout, colors, text, quantity, and locations, for advising the public in advance of implementing traffic controls.
- b. Submit updates to the traffic control plan as necessary.
 - c. Engineer's or Owner's comments on or acceptance of traffic control plan Submittal is only for the limited purpose of endeavoring to verify compliance with the Contract Documents and in no way imposes on Owner, Engineer, or any of their respective consultants or subcontractors, any responsibility for construction means, methods, procedures, techniques, or sequences, or the safety and protection measures and programs incident thereto, or any of Contractor's other responsibilities under the Contract. Engineer's and Owner's review is in no way for benefit of Contractor or anyone for whom Contractor is responsible.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT FOR TRAFFIC CONTROL DURING CONSTRUCTION

A. Materials and Equipment Used for Traffic Control:

1. Materials and equipment used for traffic control during construction shall comply with the reference specifications indicated in Paragraph 1.2.B of this Section and the MUTCD.
2. Materials and equipment used for traffic control shall include easily legible, weather-resistant text indicating contact information, including telephone number, for entity providing and maintaining traffic controls, for alerts of damage, mislocation, or apparent unsafe traffic control items.

PART 3 - EXECUTION

3.1 TRAFFIC CONTROL – GENERAL

A. General Provisions for Traffic Control:

1. Provide traffic controls, as necessary and required, prior to commencing work in, or adjacent to, streets, highways, and other travelled ways.
2. Provide traffic controls in accordance with the Contract Documents, applicable permits, requirements of authorities having jurisdiction, referenced standard specifications indicated in Paragraph 1.2.B of this Section, and the MUTCD.
3. Not less than once per month, check and ensure legibility of contract information on each traffic control device or item, as required in Article 2.1 of this Section.
4. Traffic controls such as temporary barriers and barricades; channelizing devices such as delineators, traffic cones, traffic barrels, temporary bollards, vertical panels, and similar items; signs (including reflective signs, mobile changeable-message signs, and temporary LED-illuminated signs), temporary signals; warning lights; and temporary illumination shall be prominently but safely positioned and located, be highly visible to traffic and pedestrians, and include provisions for visibility during periods of darkness, reduced light, and reduced visibility such as smoke and fog.
5. Supplement temporary traffic barriers and barricades with standard delineation pavement markings or channelizing devices for improved daytime and nighttime visibility, when traffic controls channel vehicular traffic.

6. Keep accessible for use permanent facilities such as hydrants, utility valves, fire alarm boxes, postal boxes, delivery service boxes, existing permanent traffic controls (including signs and signals) as appropriate, and other facilities that may require access or use during construction.
 7. Do not block access to essential facilities including hospitals, emergency services, and the like, and public facilities such as public buildings, public schools, public event venues, recreational facilities open during construction, and similar facilities.
 8. Coordinate traffic controls for commercial and residential access with their respective owners and occupants.
 9. Provide traffic controls suitable for pedestrians and bicyclists with disabilities. Comply with the MUTCD, referenced specifications indicated in Paragraph 1.2.B of this Section, and Laws and Regulations, including the Americans with Disabilities Act (ADA).
- B. Temporary Obstructions of Streets, Highways, and Other Travelled Ways:
1. Do not store materials or equipment to be incorporated into the Work; construction equipment, machinery, or tools; Contractor's vehicles, vehicles owned by construction workers and personnel; or other items, whether on short-term, infrequent basis or on a more-frequent basis, in streets, highways, and other travelled ways. Do not store or locate materials and equipment in rights-of-way or adjacent areas in positions that reduce traffic visibility or otherwise create or exacerbate traffic hazards.
 2. When construction activities necessitate a short-term obstruction of traffic, provide adequate traffic controls, flaggers, and other measures as appropriate. Have such obstructions in place for the shortest duration possible and do not leave such obstructions in place at the end of the work day.
 3. When construction activities necessitate a longer-duration obstruction or partial closure to traffic, provide appropriate temporary barriers and barricades, signage, warning devices, and other appropriate measures for traffic control.
 4. Obstruction of public parking shall be in accordance with requirements of authorities having jurisdiction.
- C. Temporary Closures of Streets, Highways, and Other Travelled Ways:
1. This provision applies to full closure of all traffic or partial closure.
 2. Do not close passage to traffic or pedestrians without approval of authorities having jurisdiction and obtaining necessary permits.
 3. Provide appropriate temporary signage, signals and warning devices, temporary barriers and barricades, detours, and temporary facilities (such as temporary bridges or covered walkways, and other temporary facilities) as necessary.
 4. Detours shall be as short as practicable but should generally avoid, when feasible, routing traffic through residential areas and other sensitive areas. Provide appropriate temporary signage to mark detours.
 5. Detours and temporary facilities shall be appropriate for the types of traffic (which may include heavy truck traffic or construction equipment), traffic volume, loading, and hours of the day.
 6. Closures shall be for shortest duration practical, and passage shall be restored immediately after completion of filling and temporary paving, bridging, or other Work.
 7. Obtain approvals and permits needed for full and partial lane closures.
 8. Provide all required temporary signage, signals, and warning devices prior to implementing each closure.

3.2 TRAFFIC SIGNS, SIGNALS, AND LIGHTS

- A. Provide and operate temporary traffic signs, signals, and warning lights necessary and required to direct and maintain orderly flow of traffic in areas under Contractor's control, and areas affected by the Project's construction.

- B. Provide temporary traffic signs, signals, and warning lights mounted on temporary barriers, barricades, or standard posts, at the following locations:
 - 1. Each change of direction of a roadway and at each crossroad.
 - 2. Detours and areas of hazard.
 - 3. Parking areas.
 - 4. Vehicular entrance and exit from each of the Project's construction work areas and construction vehicle and machinery parking and storage areas.
- C. Lighting and Flares: During periods of low visibility provide temporary lights and, where appropriate, flares for the following:
 - 1. To clearly delineate traffic lanes, to guide traffic, and to warn of hazardous areas.
 - 2. For use by traffic control personnel directing traffic.
 - 3. Provide adequate illumination of critical traffic and parking areas.
- D. Power and Fuel:
 - 1. Provide appropriate power supply for temporary lighting and illuminated devices, whether battery-powered, solar-powered, or temporary generators.
 - 2. At the end of each work day, check power supplies and fuel supplies and ensure sufficient power and fuel is in place and available for proper traffic control until Contractor's personnel return to the Site
 - 3. Comply with noise control and air quality control Laws and Regulations and Section 01 57 05 – Temporary Controls.
 - 4. Locate and position temporary generators to avoid nuisances, such as noticeable emissions, odors, noise, and vibration, and other nuisances, and hazards to traffic, pedestrians, adjacent occupants of buildings and structures, and the public.

3.3 TEMPORARY BRIDGING OVER EXCAVATIONS

- A. Areas of Vehicular Access:
 - 1. When necessary or requested by owner of the street, highway, or other travelled way, when other traffic controls are removed while excavations remain open, provide temporary bridging over excavations by providing steel plates to allow unobstructed traffic flow.
 - 2. Size:
 - a. Cover entire length of trench or excavation unless suitable temporary barriers are provided. Each driving lane shall be 12 feet wide unless otherwise acceptable to the owner of the street, highway, or other travelled way.
 - b. Width: Plate shall extend for not less than one trench-width onto competent pavement on each side of the trench or excavation.
 - c. Thickness: Suitable for the traffic load.
 - 3. Anchorage:
 - a. Mechanically anchor each plate to competent pavement using appropriate quantity of railroad spikes or other suitable anchors.
 - b. Anchor not less than each corner of each plate.
 - c. Head of anchors shall not protrude above top surface of the plate.
 - d. Provide appropriate material to level each plate so that plate is not displaced, and does not wobble or rattle, under traffic loads. Provide additional anchors where necessary.
 - 4. Transition to and from Plates:
 - a. Provide asphalt concrete "cutback" placed around edges of plates as ramps for smooth transition from pavement to the plate. Ramps' angle of approach shall be not greater than 1 inch vertical to 12 inches horizontal.
 - 5. Excavation Support at Temporary Bridging:

- a. Provide temporary support of excavations, as necessary for proper support of temporary bridging and traffic loads. Excavation support shall be adequate for excavation depth, soils, groundwater conditions, vibration, and other pertinent considerations.
 - b. Obtain recommendation on type and extent of necessary excavation support from a qualified, experienced professional engineer licensed and registered in the same jurisdiction as the Site. Comply with recommendations of Contractor-hired professional engineer and requirements of owner of the street, highway, or other travelled way.
- B. Sidewalks, Bike Paths, and Other Pedestrian Areas:
1. In sidewalks, bike paths, and other pedestrian areas, provide temporary bridging over excavations of either 1/2 inches thick steel plate or plywood 1-1/8 inches thick.
 2. Length and Width: Same as required in this Article for steel plates for vehicle passage.
 3. Excavation Support: Same as required in this Article's provision for steel plates for vehicles.
 4. Transitions: Provide asphalt concrete "cutback" or other non-displaceable material as ramp for pedestrians and wheeled items such as handcars, bicycles, and wheelchairs. Angle of ramps shall comply with requirements in this Article for ramps for steel plates for vehicles.
 5. If plate is subject to displacement, wobbling, or rattling during use, provide suitable temporary mechanical anchors that do not extend above top surface of the plate.
- C. Vehicular travel over backfilled but unpaved excavations is not allowed, unless Contractor provides temporary surface suitable for vehicles, consisting of not less than 2 inches thick plant mix asphalt concrete paving over not less than 6 inches thick layer of either compacted [select fill] subbase or flowable fill (also known as "controlled low-strength material") completely cured, or plates installed over the excavation.
- D. Upon removal of temporary bridging plates, remove all anchors, ramps, and leveling material and completely fill, with non-shrink grout (or other material acceptable to Engineer and owner of street, highway, or other travelled way), all penetrations made for plate anchorages.

3.4 TRAFFIC CONTROL PERSONNEL

- A. Traffic Control Personnel – General:
1. When the Project's construction operations encroach on traffic lanes, furnish qualified, trained, suitably-equipped traffic control personnel as necessary and required for controlling traffic, in accordance with: requirements of authorities having jurisdiction, the referenced specifications indicated in Paragraph 1.2.B of this Section, and Section 6E of the MUTCD.
 2. Traffic control personnel shall use appropriate flags, hand signs or mobile signs.
 3. Equip traffic control personnel with appropriate personal protection equipment and appropriate communications devices. Traffic control personnel attire shall be highly-visible, suitable, and shall not create nuisances or distractions to vehicle occupants and pedestrians, and shall not give offense to vehicle occupants, pedestrians, and the public.
 4. Conduct of traffic control personnel shall be professional, appropriate, and courteous to vehicle occupants, pedestrians, and the public.

3.5 PARKING CONTROL

- A. Parking Control – General:
1. Provide appropriate temporary parking for the public, as necessary and required because of the Project's construction operations.
- B. Control parking of construction and private vehicles at the Site as follows:
1. Maintain free vehicular access to and through public and private parking areas.
 2. Prohibit parking on or adjacent to access roads, and in non-designated areas.
 3. Construction vehicles shall possess current vehicle registration and licensure. Do not park or store unregistered vehicles at or adjacent to the Site.

3.6 MAINTENANCE OF TRAFFIC CONTROLS

A. Maintenance of Traffic Controls – General:

1. Properly maintain traffic controls until removal.
2. Relocate traffic controls as the Work progresses.
3. Promptly replace or repair, as appropriate, damaged traffic controls.
4. Ensure adequate power supplies and fuel supplies for traffic controls.
5. Perform manufacturer's recommended routine and preventative maintenance on equipment used for temporary traffic control.
6. Where traffic controls have reduced efficacy or reduced visibility due to accumulations of dirt or foreign matter (including graffiti and vandalism), or exposure to the elements, promptly replace or remedy the subject traffic controls.
7. Maintain traffic controls in operation during adverse weather and climate conditions.

3.7 REMOVAL OF TRAFFIC CONTROLS

A. Duration of Traffic Controls:

1. Prior to Substantial Completion, provide traffic controls at the Site until no longer necessary or required due to the progress of the Work and the Project.
2. After Substantial Completion, provide appropriate traffic controls when Contractor is onsite to perform punch list Work, correction period work, or warranty work.

B. Prior to reopening to traffic, clean streets, highways, and travelled ways.

C. When traffic controls are no longer necessary or required, completely remove traffic controls and restore the Site to condition required by the Contract Documents or, when not indicated in the Contract Documents, restore the Site to pre-construction conditions.

D. Store unused traffic control items at an appropriate location that does not adversely affect public or private property or transportation.

E. Completely remove all traffic control items from the Site and adjacent areas prior to final inspection.

END OF SECTION

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SECTION 01 57 05
TEMPORARY CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Requirements for temporary controls during construction, including:
 - a. Temporary erosion and sediment controls.
 - b. Noise control.
 - c. Dust control.
 - d. Temporary pest and rodent controls.
 - e. Water control, including storm water, surface water, and groundwater.
 - f. Pollution control, including solid waste, water pollution, atmospheric pollution, and other types of pollution.
 - g. Odor control.

B. Scope:

1. Contractor shall provide and maintain materials, equipment, labor, services, and temporary construction as necessary and required to control environmental conditions at the Site and adjacent areas during construction.
2. Contractor shall pay all costs, including fines and civil penalties, if any, for failure to implement and maintain temporary controls in accordance with the Contract Documents and Laws and Regulations. Contractor is not eligible for increase in Contract Price or Contract Times due to failure to comply with requirements for temporary controls.
3. Maintain temporary controls until no longer necessary or required. Provide temporary controls at all times when Contractor is working at the Site.

C. Related Requirements:

1. Include, but are not necessarily limited to, the following:
2. Section 31 23 01 - Earth Moving.
3. Section 31 23 33 – Trenching, Backfilling, and Compacting for Utilities.

1.2 SUBMITTALS

A. Action Submittals:

1. Submit the following:
 - a. Shop Drawings:
 - 1) Plan for construction staging and maintenance of the Site relative to erosion and sediment controls. Indicate on a site plan approximate areas of planned disturbance of soils and soil cover over time during the Project. For areas not indicated in the Contract Documents as being disturbed and that Contractor proposes to disturb, Shop Drawing shall include proposed erosion and sediment control measures for the additional areas.
 - b. Product Data:
 - 1) Silt fencing materials.
 - 2) Other materials proposed for temporary erosion and sediment controls, when requested by Engineer.

B. Informational Submittals:

1. Submit the following:
 - a. Procedural Submittals:

- 1) Proposed dust control measure, when Submittal is requested by Engineer.
- b. Field Quality Control:
 - 1) When requested by Engineer, promptly obtain and submit results of field measurements and field test data substantiating compliance of Contractor's temporary controls with the Contract Documents.

PART 2 - PRODUCTS

2.1 MATERIALS FOR TEMPORARY EROSION AND SEDIMENT CONTROLS

- A. Materials for temporary erosion and sediment controls shall be as shown or indicated on the Drawings.

PART 3 - EXECUTION

3.1 NOISE CONTROL

- A. Noise Control – General:
 1. Contractor's vehicles, construction equipment, and machinery shall minimize noise emissions to greatest degree practicable. When necessary, provide mufflers and silencers on construction equipment, machinery, and vehicles, and provide temporary sound barriers sound-absorbing blankets, sound-reducing enclosures, modified backup alarms, and other mitigation measures when necessary.
 2. Noise threshold levels shall comply with Laws and Regulations, including (a) OSHA requirements and recommendations, and (b) local ordinances or other Laws or Regulations.
 3. Noise emissions shall not interfere with the work of Owner, facility manager (if other than Owner), or others. The use of noise-producing signals, including horns, whistles, alarms, and bells shall be for safety warning and emergency purposes only.
 4. Music or entertainment systems, including personal and vehicle radios, media players, and the like, when used, shall not be audible at the property line and shall not disturb others at the Site.
 5. Field Quality Control of Noise:
 - a. If Owner or Engineer believes potential exists that allowable noise levels are being exceeded, Contractor will be required to, and shall promptly perform, appropriate noise monitoring in presence of Owner or Engineer and shall submit written results to Engineer.
 - b. Owner and Engineer reserve the right to perform independent noise monitoring at any time during the Work.
 6. If noise level exceeds allowable maximum, Contractor shall immediately cease the activity emitting the excessive noise and promptly implement noise-mitigating measures to comply with noise limitations.

3.2 DUST CONTROL

- A. Dust Control – General:
 1. Control objectionable dust caused by Contractor's operation of vehicles and construction equipment and machinery, site clearing, demolition, cleaning, and other actions. To minimize airborne dust, apply water or use other methods subject to acceptance of Engineer and approval of authorities having jurisdiction.
 2. Contractor shall prevent blowing and movement of dust from exposed soil surfaces and access roads to reduce onsite and off-Site damage, inconvenience, nuisances, and health hazards associated with dust emissions from Contractor's activities.
 - 3.
- B. Dust Control Methods:
 1. Dust control may be accomplished by irrigation in which the dust-prone work activity or area of the Site is sprinkled with water until the surface is moist.

2. Apply dust controls as frequently as necessary or required without creating inconveniences, nuisances, or hazards, such as excessive mud and ponding of water at or adjacent to the Site. Do not use water for dust control when water will cause hazardous or objectionable conditions such as ice, mud, ponds, and pollution.
 3. Provide dust control that is non-polluting and does not contribute to tracking-out of dirt, mud, and dust onto pavement.
 4. Do not allow water used for dust control to discharge to storm water drainage system or surface waters.
 5. Where appropriate, reduce travel speed of construction vehicles and construction equipment to reduce the potential for dust emissions arising from vehicle and equipment passage.
 6. Where appropriate, apply gravel or other appropriate binder to access roads and parking areas.
- C. Removal of Dust and Dirt from Pavement and Other Travelled Ways:
1. Remove dust, mud, and dirt from roads, parking areas, and other travelled ways not less than once per week.
 2. Perform dust and dirt removal from travelled ways by mechanical wet vacuum sweeping or other method acceptable to Engineer.
 3. Remove mud from roads, parking areas, and other travelled ways by appropriate means, including scraping. Avoid damaging surface of travelled way. Remedy damage to roads, parking areas, and travelled ways resulting from mud removal activities.
- D. Removal of Dust and Dirt from Buildings and Structures:
1. When dust and dirt from Contractor's activities has accumulated to a noticeable or objectionable extent (compared with preconstruction conditions) on buildings or structures, remove the dust and dirt caused by Contractor's operations by appropriate methods, including power-washing using mild detergent. Remedy damage caused by dust, dirt, and power-washing.
 2. Dust in sensitive equipment, such as electrical and control panels, instruments, HVAC systems and other equipment shall be cleaned by a Subcontractor specializing in cleaning such items.
 3. During the Project, remove objectionable and noticeable dust, dirt, and mud in areas occupied by Owner or facility manager, and Contractor's work areas, resulting from Contractor's activities. Owner and facility manager will take reasonable measures to avoid tracking dust, dirt, and mud into their occupied areas.

3.3 PEST AND RODENT CONTROL

- A. Pest and Rodent Control – General:
1. Provide pest and rodent controls as necessary to prevent infestation of the Site, storage areas, and adjacent areas.
 2. Pests and rodents include, but are not limited to: flies, mosquitoes, gnats, midges, stinging insects, other insects and the like, worms, rats, mice, moles, voles, and similar animals, raccoons, skunks, objectionable numbers and species of birds, and others.
 3. Implement appropriate pest and rodent controls when pests, rodents, or both are apparent at the Site or offsite storage, staging, or laydown areas.
 4. Control or remove pests and rodents from adjacent properties when Contractor's activities have fostered or exacerbated pest or rodent problems. For example, ground vibration, such as that associated with horizontal directional drilling, may cause migrations of subterranean animals such as moles and voles. Coordinate with affected property owners regarding appropriate control methods, materials, equipment, and disposal techniques.
- B. Methods, Materials, and Equipment for Pest and Rodent Control during Construction:

1. Employ methods and use materials and equipment for pest and rodent control that do not adversely affect conditions at the Site or on adjacent and nearby properties.
2. Do not use control methods or poisons injurious to household pets or animals other than targeted pests and rodents.
3. Avoid control methods that present hazards to humans, including children.

C. Disposal of Pests and Rodents:

1. In accordance with Laws and Regulations, promptly and properly dispose of pests and rodents trapped or otherwise controlled. Do not bury or dispose of deceased animals at the Site or in adjacent areas.

3.4 WATER CONTROL

A. Water Control – General:

1. During the Project, provide methods to appropriately control storm water, surface water, water from excavations and structures, groundwater flows altered by Contractor's activities, and groundwater discharges from the Site, to prevent damage to the Work, the Site, adjacent properties, and downstream properties.
2. Control trenching, filling, and grading to direct water away from excavations, pits, tunnels and other construction areas, and prevent water from entering existing buildings and structures.
3. Properly manage and control storm water, surface water, and groundwater entering the Site from upstream, where such flows or discharges have potential to affect the Work or to be exacerbated by Contractor's activities.
4. Avoid ponding of water onsite, except in specially-designated, temporary settlement basins. Where water ponding occurs during construction, perform rough grading to eliminate ponding.
5. Prevent water from discharging onto roads, parking areas, paved or finished areas, and other travelled ways. Prevent storm water runoff from discharging across access roads and parking areas.

B. Materials, Equipment, and Facilities for Water Control:

1. Provide, operate, and maintain materials, equipment, and facilities of adequate size, materials, and capacity to control storm water, surface water, groundwater, and discharges from tanks.

C. Discharge and Disposal of Water during Construction:

1. Discharge storm water, surface water, and groundwater from the Site, and discharges of clean water from tanks, to proper discharge locations, in accordance with Laws and Regulations and the Contract Documents.
2. Prevent damage and nuisances arising from water discharges on the Site and discharges from the Site.
3. Dispose of water in manner that avoids flooding, erosion, sediment transport, and other damage, in accordance with Laws and Regulations.
4. Avoid overland discharges from the Site and construction activities to adjacent properties.
5. Water discharges from the Site and construction activities shall be via a storm water drainage route or conduit with sufficient capacity for the flow under associated weather and flow conditions and in accordance with requirements of authorities having jurisdiction.
6. Do not discharge storm water, surface water, groundwater, or clean water from tanks, into sanitary sewers. Obtain consent of sewerage system owner before discharging such flows into existing combined sewers.
7. Obtain sewerage system owner's consent and approval before discharging polluted water to sewerage system.

3.5 POLLUTION CONTROL

A. Pollution Control – General:

1. Provide means, methods, and facilities necessary and required to prevent contamination of soil, water, and atmosphere caused by accumulation or discharge of substances and materials that are either noxious, polluting, or both, from or caused by construction and related activities.
2. Construction equipment and machinery shall comply with Laws and Regulations.

B. Spills and Contamination:

1. Perform emergency containment, cleanup, and remedy of spills and contamination resulting from construction and related activities. Promptly remove and properly dispose of contaminated soils and liquids.
2. Excavate contaminated material and properly dispose of off-Site, and replace with suitable compacted fill and appropriate cover.
3. Comply with and facility manager's (if other than Owner) hazard control procedures as indicated in the Supplementary Conditions.

C. Protection of Surface Water and Groundwater:

1. Provide and maintain appropriate, temporary measures to prevent harmful substances from entering surface water, groundwater, and drinking water. Prevent disposal of wastes, effluents, chemicals, and the like into or adjacent to groundwater, surface water, drainage routes (including swales, ditches, and storm sewers) and drinking water.
2. Obtain sewerage system owner's consent and approval prior to discharging into sanitary sewers or combined sewers. Do not discharge pollutants not in accordance with Laws and Regulations into combined sewers, or sewers tributary to combined sewers, when wet weather overflows to receiving waters may occur.

D. Atmospheric Pollutants:

1. Provide and maintain temporary controls for atmospheric pollutants resulting from construction and related activities, whether to outdoor or indoor atmospheres.
2. Prevent harmful dispersal of pollutants into atmosphere.
3. Do not discharge exhaust from internal combustion engines or combustion operations into buildings, structures, or near ventilation intakes for buildings or structures.
4. Prevent toxic and noxious concentrations of chemicals, fumes, and vapors.

E. Solid Waste:

1. Provide and maintain temporary controls for managing solid waste related to the Work.
2. Prevent solid waste from:
 - a. Becoming airborne or blowing in the wind.
 - b. Being inadvertently transmitted to adjacent, offsite properties, and areas of the Site not part of the Project.
 - c. Being deposited in or discharging to surface waters and drainage routes.
3. Properly handle and dispose of solid waste. Burning or burying solid waste, including unused materials, at the Site or adjacent areas is prohibited.
4. Cleaning and Disposal of Debris: Comply with applicable requirements of the General Conditions, as may be modified by the Supplementary Conditions.
5. Do not mix or store in the same container solid waste containing Constituents of Concern (and constitutes, or may constitute, a Hazardous Environmental Condition) with solid waste that does not contain Constituents of Concern.
6. Store solid waste in appropriate, covered, containers.
7. Promptly, and at regular intervals, remove solid waste from the Site for transport and disposal in accordance with Laws and Regulations.

3.6 ODOR CONTROL DURING CONSTRUCTION

A. Odors – General:

1. Avoid discharges of unpleasant or noxious odors from construction and related activities. Whether nature of the Work is such that odor generation is unavoidable, provide appropriate temporary controls for odors.
2. Give priority to avoiding odor generation, followed by:
 - a. Counteracting (treating the cause of) odors.
 - b. Containing odors.
 - c. Odor masking as the last resort for odor control.

3.7 EROSION AND SEDIMENT CONTROLS

A. Installation and Maintenance of Temporary Erosion and Sediment Controls – General:

1. General Provisions:
 - a. Provide temporary erosion and sediment controls as shown and indicated on the Drawings and as indicated in this Section and elsewhere in the Contract Documents, and as necessary for compliance with Laws and Regulations.
 - b. Provide erosion and sediment controls as the Work progresses into areas where ground cover was previously undisturbed.
 - c. Use necessary and required methods to appropriately control erosion and sediment transport in storm water runoff, including using soil conservation-oriented construction practices (including scheduling and sequencing), vegetative measures, and temporary physical controls.
 - d. Use best management practices (BMP) in accordance with Laws and Regulations, and regulatory requirements indicated in this Section's "Quality Assurance" Article (unless more-stringent requirement are shown or indicated in the Contract Documents), to control erosion and sediment transport in storm water runoff during the Project.
 - e. Plan and execute disturbances of soils and soil cover, and earthwork by methods to control storm water runoff from exposed soil (including stockpiles, borrow areas, and spoil disposal areas), banks of surface waters affected by the Work, and discharges of groundwater, to prevent erosion and sediment transport.
 - f. Where areas must be cleared for storage of materials or equipment, or for temporary facilities, provide measures for regulating storm water discharges and controlling erosion and sediment transport. Where Owner is a co-permittee with Contractor for applicable permits, or when plans for temporary erosion and sediment controls were sealed and signed by Engineer, such methods are subject to Engineer's approval or acceptance, as applicable.
 - g. Provide erosion and sediment controls, including stabilization of soils, at the end of each workday.
2. Coordination:
 - a. Coordinate temporary erosion and sediment controls with this Section's requirements on water control.
 - b. Coordinate temporary erosion and sediment controls with construction of permanent drainage facilities, permanent erosion controls and soil stabilization (if any), and other Work, to the extent necessary for effective and continuous erosion and sediment controls.
3. Before commencing activities that will disturb soil or soil cover at the Site or other areas to be occupied by Contractor during the Project, provide all appropriate temporary erosion and sediment controls required by the Contract Documents for the areas where soil or soil cover will be disturbed.
4. Vegetation Removal and Disturbance:
 - a. Remove only those shrubs, grasses, trees, and other vegetation that must be removed for construction.

- b. Protect undisturbed vegetation. Do not wantonly or unnecessarily drive construction vehicles and equipment over undisturbed vegetation and soil cover.
 - c. Promptly stabilize exposed soil where vegetation or soil cover was unnecessarily disturbed. Fill and restore ruts and damage to vegetation and soil cover caused by wanton or unnecessary passage of construction vehicles and equipment.
5. Access Roads and Parking Areas:
- a. When possible, locate and construct temporary access roads and parking areas to avoid adverse effects on the environment.
 - b. Provide measures to regulate drainage, avoid erosion and sediment transport in storm water runoff, and minimize damage to vegetation and soil cover.
6. Earthwork and Temporary Controls:
- a. Perform excavation, fill, and related activities in accordance with Section 31 20 01 – Earth Moving and 31 23 33 - Trenching, Backfilling, and Compacting for Utilities.
 - b. Temporary erosion and sediment control measures may include, but are not limited to, using berms, swales and ditches, silt fencing, straw bale sediment barriers, gravel or crushed stone, mulching and soil stabilization, slope drains, and other methods. Apply such temporary measures to erodible soils and other erodible materials exposed by construction activities.
 - c. Minimize areas of bare soil exposed at one time. Provide fills and spoil areas by selectively placing fill and spoil materials to reduce or eliminate exposed erodible soils.
 - d. Exercise special care on and above steep slopes, where disturbance of vegetation and soil cover shall be minimized to greatest extent reasonably practicable.
 - e. Protect stockpile storage not in active use by providing suitable, durable covering prevent sediment transport in storm water runoff and windblown transport. Covering shall be suitable for outdoor exposure.
7. Inspection and Maintenance:
- a. Periodically inspect areas of non-stabilized, erodible soils, including all areas of soil cover disturbance and stockpiles, for evidence of start of erosion and sediment transport. Promptly implement corrective action as necessary and appropriate to control erosion and sediment transport. Continue inspections and corrective action until soils are permanently stabilized and permanent vegetation has been appropriately established.
 - b. Inspect not less often than once per week and after each precipitation event of 0.5 inches of water or greater.
 - c. Repair or replace damaged erosion and sediment controls within 24 hours of Contractor becoming aware of such damage.
 - d. Periodically remove sediment that has accumulated in or behind sediment and erosion controls. Remove sediment not less often than when sediment is at approximately one-half of storage capacity of associated control element, unless more-frequent interval is indicated elsewhere in the Contract Documents. Properly dispose of sediment.
8. Duration of Temporary Erosion and Sediment Controls:
- a. Maintain temporary erosion and sediment controls in effective, working condition until soil cover of the associated storm water drainage area has been permanently stabilized.
9. Work Stoppage:
- a. If the Work is temporarily stopped or suspended for any reason, Contractor shall provide additional temporary controls necessary to prevent environmental damage to the Site and adjacent areas while the Work is stopped or suspended.
 - b. When temporary erosion and sediment controls remain in place during periods of stopped or suspended Work, continue to perform Contractor's obligations relative to periodic inspection and maintenance of temporary erosion and sediment controls, including removal of accumulated sediment.

10. Failure to Provide Adequate Temporary Erosion and Sediment Controls:

- a. If Contractor repeatedly fails to satisfactorily control erosion and sediment transport in storm water runoff, Owner reserves the right to use Owner's own forces or employ a third-party contractors for temporary erosion and sediment control. Owner's costs for such work, including engineering and inspection costs, will be deducted from amounts due Contractor, as set-offs in accordance with the Contract Documents.

B. Silt Fencing:

1. Provide and maintain silt fencing in a vertical plane, at the locations shown or indicated in the Contract Documents and where necessary or required.
2. Locations of Temporary Silt Fencing:
 - a. Where possible, provide silt fencing along contour lines, so each run of silt fencing is at the same elevation.
 - b. On slopes, provide temporary silt fencing at intervals that do not exceed the maximum indicated in the following table:

Silt Fence Spacing on Slopes	
Slope (percent)	Maxim Allowable Length of Slope Above Each Silt Fence (feet)
2 and less	150
2.1 to 5	100
5.1 to 10	50
10.1 to 20	25
20.1 to 25	20
25.1 to 40	15
40.1 to 50	10

- c. Provide temporary silt fencing around perimeter of each stockpile of topsoil, general fill material, and excavated spoil material. Install silt fencing before expected soil is subject to precipitation. Maintain until stockpile is removed.
 - d. Do not install temporary silt fencing at the following types of locations:
 - 1) Area of concentrated storm water flows such as ditches, swales, or channels.
 - 2) Where rock or rocky soils prevent full and uniform anchoring of silt fencing.
 - 3) Across upstream or discharge ends of storm water conduits.
 3. Installation:
 - a. Securely fasten wire mesh to posts, and securely fasten filter cloth to wire mesh.
 - b. When two sections of filter cloth are adjacent to each other, fold over edges and overlap by not less than 6 inches and securely fasten to wire mesh.
 - c. Embed posts in the ground to the depth necessary for proper controls; embed posts to not less than 16 inches below ground.
 - d. Filter cloth and wire mesh shall extend not less than 8 inches below ground and not less than 16 inches above ground.
 - e. Remove accumulated sediment from behind silt fencing as necessary or required. Repair and reinstall silt fencing as necessary or required.
 4. Maintenance:
 - a. Do not allow formation of concentrated storm water flows on slopes above temporary silt fencing unless so shown or indicated in the Contract Documents. If unauthorized concentrated storm water flows occur, stabilize the slope via other appropriate

stabilization methods as necessary and required to prevent flow of concentrated storm water flows toward temporary silt fencing.

C. Protection of Storm Water Drainage Inlets and Catch Basins:

1. Protect each drainage inlet and catch basin that has potential to receive storm water runoff from exposed soils and does not discharge into a storm water settlement basin.
2. Provide temporary inlet filter bags inside of drainage inlet or catch basin in accordance with inlet filter bag manufacturer's instructions. Secure inlet filter bag with the structure's grate or by other acceptable means.
3. Inlet filter bags shall not pose any obstruction, above the preconstruction elevation of the drainage inlet or catch basin grate that would necessitate or require temporary barricades or warning lights.
4. When removing sediment from inlet filter bags, do not dump filter bag's contents into the drainage inlet or catch basin. Promptly remove from drainage inlets and catch basins sediment accidentally dumped into the structure.
5. Remove sediment from inlet filter bags, or replace inlet filter bags, when inlet filter bag is not more than half-full.

D. Temporary Stone Construction Entrance:

1. Where shown on the Drawings, and where construction vehicles will regularly transition to paved surfaces from unstabilized surfaces, provide temporary stone construction entrance. Contractor vehicles and mobile construction equipment and machinery shall use temporary stone construction entrances.
2. Provide temporary stone construction entrances of the width, length, and thickness shown or indicated on the Drawings. When not shown or indicated on the Drawings, temporary stone construction entrance shall be not less than 50 feet long, by 20 feet wide, by 8 inches deep.
3. Installation:
 - a. Ensure that subgrade under each temporary stone construction entrance is suitably dense for the intended purpose and dry. Suitably prepare subgrade as necessary for temporary stone construction entrance.
 - b. Provide on subgrade a layer of geotextile separation fabric, installed in accordance with geotextile separation fabric manufacturer's recommendations for separation.
 - c. Provide stone on installed geotextile separation fabric. Grade the stone for passage of vehicles.
4. Maintenance:
 - a. Maintain temporary stone construction entrance at not less than the minimum required thickness. Add stone as required to maintain thickness.
 - b. When upper layer of temporary stone construction entrance becomes contaminated with soil, mud, or other material, remove the contaminated material and replace with clean stone.
 - c. Using water to wash down temporary construction entrance or paved areas onto which soil material has been tracked is unacceptable.

3.8 REMOVAL OF TEMPORARY CONTROLS

A. Removals – General:

1. Unless otherwise indicated elsewhere in this Section in requirements for respective temporary controls, upon completion of the associated Work and when temporary controls are no longer necessary, remove temporary controls and restore the Site to condition in accordance with the Contract Documents; if condition is not shown or indicated, restore the Site to pre-construction condition.
2. After soils are permanently stabilized, remove from the Site temporary erosion and sediment controls.

END OF SECTION

SECTION 01 75 00
CHECKOUT AND START-UP PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Administrative and procedural requirements for checkout and startup of equipment, systems, and facilities.

B. Scope:

1. Contractor shall initially check out, start up, and place equipment and systems installed under the Contract into successful operation, in accordance with the material and equipment manufacturers' written instructions, Suppliers' recommendations at the Site, and the Contract Documents.
2. Provide the following:
 - a. All labor, tools, materials, and equipment required to complete equipment and system checkout and startup.
 - b. Chemicals, lubricants, and other required operating fluids necessary for checkout, startup, and initial operation of the Work.
 - c. Filters and other temporary or consumable items necessary for checkout, startup, and initial operation of the Work.
 - d. Fuel, electricity, water, and other temporary utilities and temporary facilities necessary for checkout and startup of equipment and systems, unless otherwise specified.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate checkout and startup with other contractors, as necessary.
2. Do not start up equipment or system(s) for continuous operation until all components of that equipment item or system, including instrumentation and controls, have been tested to the extent practicable and proven to be operable as intended by the Contract Documents.
3. Subject to the constraints of this Specifications section, Owner will furnish sufficient personnel to assist Contractor in starting up equipment and system(s), but responsibility for proper operation of the Work is Contractor's.
4. Supplier shall be present during checkout, startup, and initial operation, unless otherwise acceptable to Engineer or otherwise required by the Contract Documents.
5. For startup of heating equipment, air conditioning equipment, and other equipment and systems that provide temperature control, that are dependent upon the time of year, return to the Site at beginning of next heating or cooling season (as applicable) to recheck and start the appropriate equipment and system(s).
6. Do not start up equipment and system(s), without submitting acceptable preliminary operations and maintenance manuals by Contractor in accordance with the Contract Documents.

B. Checkout and Startup Planning Meeting:

1. Contractor, with appropriate Subcontractors and Suppliers, shall attend and participate in a meeting with Owner, facility manager, and Engineer to discuss planning, scheduling, and coordination of checkout and startup activities.
2. Upon mutual concurrence of Owner, facility manager, Engineer, and Contractor, meeting may be concurrent with the training scheduling planning meeting required in Section 01 79 23 – Instruction of Operations and Maintenance Personnel.

3. Meeting shall be held by the earlier of: (1) not less than 60 days prior to first scheduled training session for the equipment and system(s) to be checked out and started-up, and (2) not less than 60 days prior to the checkout and startup of the associated equipment and system(s).
 4. Attend meeting prepared to knowledgably and effectively discuss:
 - a. Status of the Work and schedule-to-complete for requirements prerequisite to checkout and startup.
 - b. Schedule for and status of training required for each equipment item and system.
 - c. Schedule for checkout, startup, and field quality control activities for the subject Work.
 - d. Status and quantities of required consumables, lubricants, and utility services necessary for checkout and startup.
 5. Meeting will be chaired by Engineer. Engineer will prepare and distribute a record of topics discussed and decisions made during the meeting.
 6. Comply with decisions made at the meeting and the Contract Documents.
- C. Scheduling:
1. Progress Schedule:
 - a. Clearly indicate in the Progress Schedule planned and actual dates for checkout, startup, and field quality control activities, including all demonstration testing activities addressed in this Specifications section and elsewhere in the Contract Documents. Separately indicate checkout, startup, and field quality control activities for each equipment item and system.
 - b. Perform startup and field quality control activities on the associated, scheduled dates, unless otherwise acceptable to Owner, facility manager, and Engineer.
 - c. Update and submit revise progress schedule minimally once per month.
 2. Restrictions for Scheduling:
 - a. Checkout of materials, equipment, and systems by Contractor that do not involve or require Owner's or facility manager's personnel may be performed at any time during normal working hours. Where required by the Contract Documents or requested by Engineer, perform checkout in the presence of Engineer or Resident Project Representative (RPR).
 - b. Startup, including initial operation of materials, equipment, and systems, shall not be initiated on: Monday, Friday, Saturday, Sunday, Owen's holidays, the day immediately prior to a holiday, or the day immediately following a holiday, unless otherwise acceptable to Owner, facility manager, and Engineer.
 - c. Unless otherwise indicated in the Contract Documents or acceptable to Owner, facility manager, and Engineer, perform all startup during normal working hours of the day shift.
 - d. To the extent practicable, where extended-duration startup or field quality control activities are required by the Contract, avoid having such activities extend into evening, night, weekend, or holiday hours.
 - e. Owner reserves the right to require a minimum seven days' notice of rescheduled startup when Contractor cannot perform the associated activities as scheduled.
 3. Operation and Maintenance Data:
 - a. A preliminary copy of all operation and maintenance manuals shall be received by Engineer prior to the start of the demonstration period.

1.3 QUALITY ASSURANCE

- A. Regulatory Requirements:
1. Do not start up equipment or systems or place into initial operation until required operating permits are obtained from authorities having jurisdiction.

2. Where Owner (with or without assistance of Engineer) has applied for and obtained initial approvals or permits necessary for operation, Contractor shall furnish information and assistance to Owner or Engineer for Owner to secure final approvals from authorities having jurisdiction for required operating permits.

1.4 DEFINITIONS

A. The following defined terms are used in this Specifications Section:

1. Instrumentation Supplier: Entity retained by Contractor, Subcontractor, or Supplier to furnish instrumentation or controls that will be part of the completed Work, including manufacturers, manufacturer representatives, wholesalers, retailers, and others, including entities retained to perform systems integration Work.
2. Project Classified System (PCS): An established, distinct part of the Project, consisting of an arrangement of items, such as equipment, structures, components, piping, cabling, materials, and incidentals, so related or connected to form an identifiable, unified, functional, operational, safe, and independent system. PCSs may be specifically indicated in this Specifications section or elsewhere in the Contract Documents.
3. Pre-Demonstration Period: The period of time, of unspecified duration after initial construction and installation activities during which Contractor, with assistance from manufacturer's representatives, performs in the following sequence:
 - a. Finishing type construction work to ensure the Project has reached a state of Substantial Completion.
 - b. Equipment start-up.
 - c. Personnel training.
4. Demonstration Period: A period of time, of specified duration, following the Pre-Demonstration Period, during which the Contractor initiates process flow through the facility and starts up and operates the facility, without exceeding specified downtime limitations, to prove the functional integrity of the mechanical and electrical equipment and components and the control interfaces of the respective equipment and components comprising the facility as evidence of Substantial Completion.

1.5 SUBMITTALS

A. Action Submittals: Submit the following:

1. Data collection and reporting log for each required Demonstration Period.

B. Informational Submittals: Submit the following:

1. Progress Schedules indicating dates for checkout, startup, and field quality control activities.
2. Completed checkout and startup log required in Paragraph 3.2.C of this Specifications section.
3. Manufacturer's installation check letters (also known as Manufacturer's Field Services Report) required in Paragraph 3.2.C of this Specifications section.
4. Instrumentation Supplier's Instrumentation Installation Certificate, required in Paragraph 3.2.C of this Specifications section.
5. Letter verifying completion of all pre-demonstration startup activities, required in Paragraph 3.2.C of this Specifications section.
6. Report of data collected during each required Demonstration Period.
7. Qualifications Statements:
 - a. Qualifications, including resume' and copy of license, of Contractor-retained licensed operator.

PART 2 - PRODUCTS - (NOT USED)

PART 3 - EXECUTION

3.1 CHECKOUT AND STARTUP – GENERAL

A. Facility Startup Divided into Two Periods:

1. Pre-Demonstration Period including:
 - a. Obtain Engineer's approval or acceptance (as applicable) of Submittals required prior to checkout and startup, including all Shop Drawings, Samples, source quality control (shop testing) Submittals, preliminary operation and maintenance manuals, and other Submittals required by the Contract Documents, other than Submittals that cannot be furnished until after startup.
 - b. Complete the Work to a point ready for checkout and startup, including operation available in all manual, automatic, and other modes.
 - c. Checkout and initial field quality control activities that can be performed prior to startup of the equipment or system.
 - d. Startup of the associated Work.
 - e. Field quality control activities for the subject Work as indicated elsewhere in the Specifications and other Contract Documents, other than this section.
 - f. Training of operations and maintenance personnel.
2. Demonstration Period, including:
 - a. Demonstration of functional integrity of equipment, system, or PCS.

3.2 PRE-DEMONSTRATION PERIOD

A. Prior to the Pre-Demonstration Period, complete the Work to the point where it is ready for checkout and startup.

B. Startup:

1. Comply with requirements for startup of materials, equipment, and systems indicated in the associated Specification sections and elsewhere in the Contract Documents.
2. Prepare the Work so it will operate properly and safely and be ready to demonstrate functional integrity during the Demonstration Period.
3. Perform startup to extent possible without introducing process flow.
4. Procedures include but are not necessarily limited to the following:
 - a. Test or check and correct deficiencies of:
 - 1) Power, control, and monitoring circuits for continuity prior to connection to power source.
 - 2) Voltage of all circuits.
 - 3) Phase sequence.
 - 4) Cleanliness of connecting piping systems.
 - 5) Alignment of connected machinery.
 - 6) Vacuum and pressure of all closed systems.
 - 7) Lubrication.
 - 8) Valve orientation and position status for manual operating mode.
 - 9) Pumping equipment using clean water.
 - 10) Instrumentation and control signal generation, transmission, reception, and response.
 - 11) Tagging and identification systems.
 - 12) Proper connections, alignment, calibration and adjustment.
 - b. Calibrate safety equipment.

- c. Manually rotate or move moving parts to assure freedom of movement.
- d. "Bump-start" electric motors to verify proper rotation.
- e. Perform other tests, checks, and activities required to make the Work ready for Demonstration Period.
- f. Checkout and Startup Log:
 - 1) Prepare a log showing each equipment item and system requiring checkout and startup. Indicate in the log activities to be accomplished during checkout and startup.
 - 2) Provide a place for Contractor to record date and person performing required checkout and startup. Indicate associated date(s), personnel, and employer of each.
 - 3) Submit completed checkout and startup log to Engineer and obtain Engineer's acceptance.
- 5. Obtain Suppliers' certifications of the installed and operational Work, without restrictions, and submit to Engineer:
 - a. Manufacturer's installation check letters (sometimes referred to as Manufacturer's Field Services Report).
 - b. Instrumentation Supplier's Instrumentation Installation Certificate.
- 6. Letter verifying completion of all pre-demonstration startup activities including receipt of all specified items from Suppliers as final item prior to initiation of Demonstration Period.
- 7. Personnel Training: Shall be coordinated with Meade County Water District.

3.3 DEMONSTRATION PERIOD

A. Demonstration Period – General:

- 1. Demonstrate the operation and performance of mechanical, electrical, instrumentation, and control interfaces of the Work undergoing the Demonstration Period, in accordance with the Contract Documents.
- 2. Duration of Demonstration Period: 168 consecutive hours at each station.
- 3. If, during the Demonstration Period, the aggregate time used for repair, alteration, or unscheduled adjustments to any part of the Work that renders the affected Work inoperative or operation outside of recommended ranges exceeds 10% of the Demonstration Period, the demonstration of operation and performance will be deemed unacceptable and Contractor shall provide appropriate adjustments and remedies and re-perform the Demonstration Test, at no additional cost to Owner or facility manager, until acceptable results are obtained. Re-performance of the Demonstration Period shall comply with the same requirements as the original Demonstration Period.
- 4. Perform the demonstration of operation and performance of the Work under full operational conditions.
- 5. Owner's or Facility Manager's Personnel:
 - a. Owner or facility manager (as applicable) will make available operations personnel to make process decisions affecting facility performance and compliance with applicable operating permits.
 - b. Owner's or facility manager's assistance will be available only for process decisions.
 - c. Contractor will perform all other functions associated with the Demonstration Period including but not limited to equipment operation and maintenance until successful completion of the Demonstration Period in accordance with the Contract Documents.
- 6. Owner or facility manager reserves the right to simulate operational variables, equipment failures, routine maintenance scenarios, and similar actions and events during the Demonstration Period to verify the operation and performance of the Work in automatic, manual, and other types of operating modes, backup systems, and alternate operating modes.
- 7. Prior to Starting Demonstration Period:

- a. Prepare data collection and reporting log for sampling, analytical data, and data to be obtained by manually recording data from field or panel indicators. Not less than 30 days prior to the start of the Demonstration Period, submit the data collection and reporting log to Engineer for acceptance.
8. Timing of Start and End of Demonstration Period:
 - a. Schedule the end of the Demonstration Period at a convenient time such as midnight, so the Owner or facility manager can assume operational responsibility on a new day beginning immediately after completion of the Demonstration Period.
 - b. Time of beginning and ending Demonstration Period shall be agreed upon by Contractor, Owner (and facility manager, if other than Owner), and Engineer in advance of initiating Demonstration Period.
- B. Demonstration Period, Evaluation, and Acceptance:
 1. Throughout the Demonstration Period, provide knowledgeable personnel to answer Owner's or facility manager's questions, provide final field instruction on select systems (where appropriate) and to respond to problems or failures of the Work.
 2. Responsibilities for Sampling and Data Collection:
 - a. Use the data collection and reporting log format accepted by Engineer. Indicate data clearly and legibly.
 3. Responsibilities for Data Reporting:
 - a. Submit data collected to Engineer for evaluation of acceptability of results.
 4. Data Evaluation:
 - a. Engineer, in consultation with Owner and facility manager (as applicable) as necessary, will evaluate the data collected during the Demonstration Period and other information obtained during the Demonstration Period for compliance with the Contract Documents.
 - b. Engineer will advise Contractor in writing of whether the data and information obtained indicate that the Demonstration Period was successfully completed.

END OF SECTION

SECTION 01 77 19
CLOSEOUT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Administrative and procedural requirements for:
1. Substantial Completion.
 2. Final inspection.
 3. Request for final payment and acceptance of the Work.

1.2 SUBSTANTIAL COMPLETION

- A. Substantial Completion – General:
1. Prior to requesting inspection for Substantial Completion, perform the following for the substantially completed Work:
 - a. Materials and equipment for which Substantial Completion is requested shall be fully ready for their intended use, including full operating and monitoring capability in automatic, manual, and other operating modes set forth in the Contract Documents.
 - b. Permanent provisions for safety and protection, shown and indicated in the Contract Documents and associated with the substantially completed Work or for personnel accessing and using the substantially completed Work, shall be in place and ready for their intended use.
 - c. Complete field quality control Work, including inspections and testing at the Site, indicated in Specifications sections for individual materials and equipment items and related Contract Documents. Submit results of, and obtain Engineer's acceptance of, field quality control tests and inspections required by the Contract Documents.
 - d. Complete checkout and startup in accordance with Section 01 75 00 - Checkout and Startup Procedures, requirements of the Specifications for the various materials and equipment in the substantially completed Work, and related Contract Documents.
 - e. Spare parts, tools, and extra materials shall be delivered and accepted in accordance with the Contract Documents and documentation of Owner's acceptance thereof has been submitted to Engineer in acceptable form.
 - f. Training of the facility's operations and maintenance personnel shall be completed in accordance with the Contract Documents.
 - g. Submit and obtain Engineer's acceptance of final operations and maintenance manuals in accordance with Section 01 78 23 - Operation and Maintenance Data.
 - h. Obtain and submit to Engineer all required permits, inspections, and approvals of authorities having jurisdiction for the substantially completed Work to be occupied and used by Owner.
 - i. Complete other tasks that the Contract requires be completed prior to Substantial Completion.
 2. Procedures for requesting and documenting Substantial Completion are in the General Conditions, as may be modified by the Supplementary Conditions.

3. Sample letter for Contractor's request for inspection for Substantial Completion is attached to this Specifications section. Use the model language of the sample letter, modified to suit the Project and the needs of Contractor's request.
4. Unless decided otherwise by Owner and Engineer, form of certificate of Substantial Completion will be EJCDC C-625, "Certificate of Substantial Completion" (2018 edition or later), prepared by Engineer.
5. Refer to the Agreement, for requirements regarding consent of surety to partial release of or reduction in retainage.

1.3 FINAL INSPECTION

A. Final Inspection – General:

1. Prior to requesting final inspection, verify that all the Work is fully complete and ready for final payment. Partial checklist for this purpose is attached to this Specifications section.
2. Sample letter for Contractor to request final inspection is attached to this Specifications section. Use the model language of the sample letter, modified to suit the Project.
3. Procedures for requesting and documenting the final inspection are in the General Conditions, as may be modified by the Supplementary Conditions, and as augmented in this Specifications section.

1.4 REQUEST FOR FINAL PAYMENT AND ACCEPTANCE OF THE WORK

A. Procedure:

1. After successful completion of the final inspection, submit request for final payment in accordance with the Agreement and General Conditions, as may be modified by the Supplementary Conditions, and this Specifications section.
2. Acceptance of the Work:
 - a. Upon Engineer's concurrence that the Work is complete and ready for final payment (as a result of the final inspection and other communications between the parties and Engineer) and receipt of the final Application for Payment, accompanied by other required Contract closeout documentation, all in accordance with the Contract Documents, Engineer will issue to Owner and Contractor a notice of acceptability of the Work, in accordance with the General Conditions, as may be modified by the Supplementary Conditions.
 - b. Unless decided otherwise by Owner and Engineer, form of acceptance will be EJCDC C-626, "Notice of Acceptability of Work", (2018 edition or later).
 - c. Nothing other than receipt of such notice of acceptability from Engineer constitutes acceptance of the Work.
 - d. Receipt of Engineer's notice of acceptability of the Work does not relieve Contractor of Contractor's continuing obligations under the Contract, including correction period obligations, warranty obligations, indemnification obligations, insurance requirements, and Contractor's other obligations following acceptance of the Work by Engineer and final payment. Such obligations shall commence and remain in effect as indicated elsewhere in the Contract Documents.

B. Request for final payment shall include:

1. Documents required in the General Conditions, as may be modified by the Supplementary Conditions.

2. List, on Contractor's letterhead, of all Change Proposals, Claims, and disputes that Contractor believes are unsettled. If there are no such Change Proposals, Claims, or disputes, so indicate in writing.
3. Consent of Surety to Final Payment:
 - a. Acceptable form includes AIA G707, "Consent of Surety to Final Payment" (1994 or later edition), or other form acceptable to Owner.
4. Releases of Liens:
 - a. Submit complete and legally effective releases (satisfactory to Owner) of all Liens filed in connection with the Work, regardless of whether such Lien was filed by Contractor, Subcontractor, or Supplier.
 - b. Each release of Lien shall be signed by an authorized representative of the entity submitting the release of Lien, and shall include Contractor's, Subcontractor's, or Supplier's (as applicable) corporate seal, when applicable.
5. Waivers of Lien Rights:
 - a. Submit legally-binding waivers of rights to file Liens, acceptable to Owner, as required in the General Conditions (as may be modified by the Supplementary Conditions) from Contractor and each Subcontractor and Supplier that furnished or provided labor, material, or equipment totaling \$1,000 or more for the Work.
 - b. Furnish final list of Subcontractors and Suppliers indicating final amount of the associated subcontract or purchase order for each. Include on the list all lower-tier Subcontractors and Suppliers retained by higher-tier Subcontractors and Suppliers.
 - c. Each waiver of Lien rights shall be signed by an authorized representative of the entity submitting waiver of Lien rights, and shall include Contractor's, Subcontractor's, or Supplier's (as applicable) corporate seal, when applicable.
 - d. Waiver of Lien rights may be conditional upon receipt of final payment.
 - e. Required Affidavits: Submit the following:
 - 1) Affidavit of payment of debts and claims, submitted by Contractor. Acceptable form includes AIA G706, "Contractor's Affidavit of Payment of Debts and Claims" (1994 or later edition), or other form acceptable to Owner, and;
 - 2) Affidavit of release of Liens, submitted by Contractor. Acceptable form includes AIA G706A, "Affidavit of Release of Liens" (1994 or later edition).
 - 3) Each affidavit shall be signed by an authorized representative of Contractor and shall bear Contractor's corporate seal, as applicable.
 - f. In the event Contractor is unable to obtain one or more required waivers of Lien rights, recourse is set forth [in the General Conditions, as may be modified by the Supplementary Conditions] [below].

PART 2 - PRODUCTS - (NOT USED)

PART 3 - EXECUTION

3.1 ATTACHMENTS

- A. The documents listed below, following this Specification section's "End of Section" designation, are part of this Specifications section:
 1. Sample letter for Contractor's use in requesting inspection for Substantial Completion (two pages).

2. Sample partial checklist to identify readiness for final inspection (four pages).
 3. Sample letter for Contractor's use in requesting final inspection (one page).
- B. In the model language of the attached sample letters for Contractor to request inspection for Substantial Completion and the final inspection, italicized language in brackets, e.g., "[insert date]" indicates instructions to the drafter of the letter and often indicates specific information to be inserted by Contractor; do not include bracketed, italicized text in the final version of the letter(s) prepared for the Project. Non-italicized language in brackets is optional language; use the appropriate language to complete the actual letter for the Project and edit where required to suit the specific circumstances.

END OF SECTION

**SAMPLE LETTER FOR CONTRACTOR'S USE IN
REQUESTING INSPECTION FOR SUBSTANTIAL COMPLETION**

SENT VIA E-MAIL AND U.S. CERTIFIED MAIL/RETURN RECEIPT REQUESTED

[Date]

[Name of Engineer's contact person]

HDR

[Street address]

[City, state, postal code]

Subject:

[Project name, Contract designation]

Request for Inspection for Substantial Completion

Dear [addressee]:

In our opinion, [all of] [or] [a portion of] the Work under the above-referenced Contract is substantially complete as of [insert month, day, year on which Substantial Completion was achieved]. [The specific portion of the Work that we believe is substantially complete is [insert identification of that portion of the Work that is substantially complete].]

Enclosed is our listing of uncompleted Work items ("punch list"). In accordance with Paragraph 15.03.A of the General Conditions, we hereby request: (1) That the Engineer schedule and perform the inspection for Substantial Completion as soon as possible, and (2) Issuance of the certificate of Substantial Completion.

In accordance with Paragraph 15.03.D of the General Conditions, upon Substantial Completion, we propose the following relative to apportionment of responsibilities between the Owner and the Contractor:

1. Security, Protection, Insurance:
 - a. Site Security: [insert proposal; address whether Owner or Contractor will be responsible for security of the Site].
 - b. Protection of the Substantially Completed Work: [insert proposal; address whether Owner or Contractor will be responsible for protection].
 - c. Property Insurance: [insert proposal; typically Owner assumes responsibility for property insurance upon Substantial Completion]
2. Operation and Maintenance:
 - a. Operation: [insert proposal; address whether Owner or Contractor will be responsible for operating the substantially completed Work].
 - b. Maintenance: [insert proposal; address whether Owner or Contractor will be responsible for maintaining the substantially completed Work].
3. Utilities: [for each of the following, indicate whether Owner or Contractor will be responsible for utilities and services, or whether responsibility will be shared; if shared, indicate proposed cost-sharing]
 - a. Electricity: [insert proposal].
 - b. Natural Gas/Fuel/Heating: [insert proposal].

- c. Water Supply: [insert proposal].
- d. Wastewater: [insert proposal].
- e. Communications (Telephone, Internet, Video): [insert proposal].

In accordance with Paragraph 15.08.A of the General Conditions, we understand that the Contract's correction period for the Work covered by the certificate of Substantial Completion commences on the Substantial Completion date documented in said certificate. [Drafter: Also see Paragraph 15.04 ("Partial Utilization") of the General Conditions and, where necessary, edit this paragraph of the letter accordingly.]

Should you have questions or comments regarding this notice, please contact [the undersigned] [or] [insert other contact person's name], at [insert telephone number and e-mail address].

Sincerely,

[Contractor's company name]

[Signatory name]

[Signatory's title]

Attachments:

Preliminary list of uncompleted Work items ("punch list"; [##] pages)

Copies:

[Owner's project manager]

SAMPLE PARTIAL CHECKLIST TO IDENTIFY READINESS FOR FINAL INSPECTION

Project: []
 Contract: []
 Contractor: []

Item No./Description	Completed/Date	In Progress	Not Started	Not Applicable	Target Date	Responsible Entity/Person
1. All Submittals, including all Shop Drawings and Samples, approved or accepted by Engineer	☐	☐	☐	☐		
Remarks:						
1. Final services completed by Suppliers, including submittal of "Manufacturer Field Service Report" in Section 01 61 03 Equipment - Basic Requirements	☐	☐	☐	☐		
Remarks:						
2. Final Work completed by Subcontractors	☐	☐	☐	☐		
Remarks:						
3. Permits closed out and regulatory compliance transitioned from construction to operations	☐	☐	☐	☐		
Remarks:						
4. All outstanding change issues are addressed and all Change Proposals submitted	☐	☐	☐	☐		
Remarks:						

Item No./Description	Completed/Date	In Progress	Not Started	Not Applicable	Target Date	Responsible Entity/Person
5. All Change Proposals and Claims are resolved	☐	☐	☐	☐		
<i>Remarks:</i>						
6. All defective Work of which Contractor is aware has been corrected in accordance with the Contract Documents	☐	☐	☐	☐		
<i>Remarks:</i>						
7. Issues related to Constituents of Concern and potential Hazardous Environmental Condition have been fully addressed	☐	☐	☐	☐		
<i>Remarks:</i>						
8. All spare parts, tools, and extra materials have been furnished in accordance with the Contract Documents, and documentation thereof submitted to Engineer	☐	☐	☐	☐		
<i>Remarks:</i>						
9. All final operations & maintenance manuals have been submitted and accepted by Engineer	☐	☐	☐	☐		
<i>Remarks:</i>						
10. Manufacturer warranties and software license(s) furnished	☐	☐	☐	☐		
<i>Remarks:</i>						

Item No./Description	Completed/Date	In Progress	Not Started	Not Applicable	Target Date	Responsible Entity/Person
11. Instruction and training of operations and maintenance personnel is complete and records of training submitted	☐	☐	☐	☐		
Remarks:						
12. MBE/WBE/DBE/VBE compliance report(s) submitted (when applicable)	☐	☐	☐	☐		
Remarks:						
13. All field engineering Submittals, including survey data, furnished	☐	☐	☐	☐		
Remarks:						
14. All Work on "punch list" is complete in accordance with the Contract Documents	☐	☐	☐	☐		
Remarks:						
15. All record documents submitted to and accepted by Engineer	☐	☐	☐	☐		
Remarks:						
16. Contractor is fully demobilized from the Site	☐	☐	☐	☐		
Remarks:						
17. All Site restoration is complete	☐	☐	☐	☐		
Remarks:						

Item No./Description	Completed/Date	In Progress	Not Started	Not Applicable	Target Date	Responsible Entity/Person
18. Final cleaning of all work areas is complete	☐	☐	☐	☐		
Remarks:						
19. Releases of Liens and waivers of Lien rights (or acceptable alternative) obtained from Subcontractors and Suppliers	☐	☐	☐	☐		
Remarks:						
20. Evidence of Contractor liability insurance furnished for correction period	☐	☐	☐	☐		
Remarks:						
21. All other required Contract closeout documents obtained	☐	☐	☐	☐		
Remarks:						
Remarks:						
22. All other Work and documentation required prior to final payment is complete and provided in accordance with the Contract Documents	☐	☐	☐	☐		
Remarks:						

SAMPLE LETTER FOR CONTRACTOR'S USE IN REQUESTING FINAL INSPECTION

SENT VIA E-MAIL AND U.S. CERTIFIED MAIL/RETURN RECEIPT REQUESTED

[Date]

[Name of Engineer's contact person]

HDR

[Street address]

[City, state, postal code]

Subject:

[Project name, Contract designation]

Request for Final Inspection

Dear [addressee]:

The Work under the above-referenced Contract is complete and ready for final payment as of [insert month, day, year on which final completion was achieved]. In accordance with Paragraph 15.05 of the General Conditions, we hereby request that the Engineer schedule and perform the final inspection as soon as possible. Upon successful completion of the final inspection, we will submit our final Application for Payment accompanied by the required Contract closeout documentation in accordance with the Contract Documents.

Should you have questions or comments regarding this notice, please contact [the undersigned] [or] [insert other contact person's name], at [insert telephone number and e-mail address].

Sincerely,

[Contractor's company name]

[Signatory name]

[Signatory's title]

Attachments:

None

Copies:

[Owner's project manager]

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SECTION 01 78 23
OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Requirements for Contractor-furnished, manufacturers' operation and maintenance (O&M) data, including:
 - a. Required operation and maintenance data groupings into operation and data manuals and timing of such Submittals.
 - b. Requirements for paper copies of operation and maintenance data and related Electronic Documents.
 - c. Content of operation and maintenance data Submittals.

B. Scope:

1. Contractor shall submit operation and maintenance data, and related information, in accordance with this Section and requirements elsewhere in the Contract Documents, as instructional and reference information for use by: (a) Owner's operation and maintenance personnel, and (b) others retained by or working for Owner.
2. In addition to operation and maintenance data expressly required elsewhere in the Contract Documents, also submit operation and maintenance data for:
 - a. All equipment and systems, including plumbing equipment, HVAC equipment, electrical equipment, communications equipment, electronic safety and security systems, utility equipment, process equipment, and other equipment.
 - b. Valves, gates, actuators, and related accessories.
 - c. Instrumentation and control devices and systems.
 - d. Building materials, systems, and finishes that need post-construction troubleshooting, cleaning, or maintenance, such as roofing, doors, flooring, paint and coatings, other finishes, and other items.

C. Related Requirements:

1. Section 01 33 00 - Submittal Procedures.
2. Section 01 75 00 - Checkout and Startup Procedures.

1.2 SUBMITTALS

A. Closeout Submittals: Submit the following:

1. Operation and Maintenance Data:
 - a. Submit operation and maintenance data, required by the Contract Documents, grouped into operation and maintenance manual Submittals indicated in Table 01 78 23-A.
 - b. Where operation and maintenance data required by the Contract Documents, is not expressly indicated in table 01 78 23-A, obtain written clarification or interpretation from Engineer prior to preparing and transmitting such Submittal.
 - c. For each required operation and maintenance manual Submittal, furnish preliminary Submittal and final Submittal. Timing of preliminary and final

operation and maintenance manual Submittals, and differences between preliminary and final Submittals, are indicated in this Section.

**Table 01 78 23-A
Required Groupings of Operation and Maintenance Data Submittals**

Name of O&M Manual/Data	For Materials or Equipment Specified in Section(s)

B. Timing of Submittals and Quantity Required:

1. Preliminary Operation and Maintenance Manual Submittals:
 - a. Paper Copies: None, exclusive of copies required for Contractor's use.
 - b. Submit to entity indicated in Section 01 33 00 – Submittal Procedures, by the earlier of: 90 days following approval of Shop Drawings and product data Submittals, or 14 days prior to starting training of operation and maintenance personnel, or 14 days prior to field quality control testing at the Site.
 - c. Do not perform checkout, startup, and training without Engineer's acceptance of preliminary operation and maintenance data Submittals for the associated Work.
2. Final Operation and Maintenance Manual Submittals: Furnish final Submittal prior to Substantial Completion of the associated Work, unless submittal is required prior to an interim Milestone.
 - a. Paper Copies: Three copies, exclusive of copies required for Contractor's use.
 - b. Work will not be eligible for Substantial Completion until associated, required final operation and maintenance data Submittals are accepted by Engineer.
 - c. If Contractor (whether or not via Subcontractor or Supplier), revises program code or configuration files between acceptance of Submittal by Engineer and end of the Contract's correction period and Contractor's general warranty obligation, furnish updated program code and configuration files to Owner. Before modifying program code and configuration files after Substantial Completion, verify with facility manager that Owner- or facility manager modifications of program code or configuration files were incorporated into the modified files, subject to the provisions of this Section.

1.3 PAPER COPIES OF O&M MANUALS

A. Binding and Cover:

1. Bind each operation and maintenance manual in durable, permanent, stiff-cover binder(s), comprising one or more volumes per copy, as necessary.
2. Binders shall be not less than one inch wide and maximum of three inches wide. Binders for each copy of each volume shall be same size and color.
3. Binders shall be locking three-ring ("D"-ring) type, or three-post type. Three-ring binders shall be riveted to back cover and include plastic sheet lifter (page guard) at front and back of each volume.

4. Do not overfill binders.
 5. Covers shall be oil-, moisture-, and wear-resistant, including identifying information on cover and spine of each volume.
 6. Indicate the following information on cover of each volume:
 - a. Title: "OPERATING AND MAINTENANCE INSTRUCTIONS". For submittal of preliminary operation and maintenance data, include the word, "PRELIMINARY" in the title.
 - b. Name or type of material or equipment covered in the manual.
 - c. Volume number, if more than one volume is submitted, listed as "Volume [] of []", with appropriate volume-designating numbers filled in.
 - d. Name of Project and, when applicable, Contract name and number.
 - e. Name of building or structure, as applicable.
 7. Provide the following information on spine of each volume:
 - a. Title: "OPERATING AND MAINTENANCE INSTRUCTIONS". For submittal of preliminary operation and maintenance data, include the word, "PRELIMINARY" in the title.
 - b. Name or type of material or equipment covered in the manual.
 - c. Volume number, when more than one volume is submitted, listed as "Volume [] of []", with appropriate volume-designating numbers filled in.
 - d. Project name and building or structure name.
- B. Pages:
1. Print pages in paper copies of operation and maintenance manuals on 30-pound (minimum) paper, 8.5-inch by 11-inch size.
 2. Reinforce binding holes in each individual paper sheet with plastic, cloth, or metal. When published, separately-bound booklets or pamphlets are part of manuals, reinforcing of pages within booklet or pamphlet is not required.
 3. Furnish each page with binding margin not less than 3/4-inch wide.
 4. Properly punch each paper page with holes suitable for associated binding. Provide not less than 3/8-inch of paper between outer edge of punched holes and edge of paper. Manuals with improperly punched holes will be returned to Contractor as unacceptable.
 5. In paper copies of manuals, each page in each copy shall be properly bound-through by the binder's rings or posts. Paper manuals where some pages are not so bound will be returned to Contractor as unacceptable.
- C. Drawings:
1. Bind into operation and maintenance manuals drawings, diagrams, and illustrations up to and including 11-inch by 17-inch size, with reinforcing and punched holes specified for paper pages.
 2. Drawings or sheets larger than 11-inch by 17-inch shall be:
 - a. Paper Copies: Neatly folded and inserted into clear plastic pockets bound into the manual. Neatly and permanently label each pocket with printed text indicating content and drawing numbers. Include not more than two drawings or sheets per pocket.
 - 1) Include 2 Full Sets of D Size Final / As-Built Drawings for each station.
 - b. Electronic Documents Copies: Included in electronic file at appropriate location.
- D. Copy Quality and Document Clarity:

1. Provide original-quality copies. Documents in operation and maintenance manuals shall be either original manufacturer-printed documents or first-generation photocopies indistinguishable from originals. If original is in color, copies shall be in color. Manuals with copies that are unclear, not completely legible, off-center, skewed, or where text or drawings are cut by binding holes, are unacceptable. Pages that contain approval or date stamps, comments, or other markings that cover text or drawing are unacceptable.
2. Clearly mark, using ink, to indicate all components of materials and equipment on catalog pages for ease of identification. In standard or pre-printed documents, indicate options furnished and cross out inapplicable content. Using highlighters to so indicate options furnished is unacceptable.

E. Organization:

1. Indexed tabs between major categories of information, such as operating instructions, preventive maintenance instructions, and other major subdivisions of data in each manual.

1.4 ELECTRONIC DOCUMENTS O&M MANUALS

A. Electronic Documents of Operation and Maintenance Manuals:

1. Each Electronic Document copy of operation and maintenance data shall include all information included in the corresponding paper copy.
2. Submit Electronic Documents operation and maintenance data in accordance with Section 01 33 00 - Submittal Procedures.
3. File Format:
 - a. Unless otherwise required by Section 01 33 00 - Submittal Procedures, operation and maintenance data Electronic Documents shall be "portable document format" (PDF) files.
 - b. Electronic Documents shall be electronically searchable upon delivery.
 - c. Electronic Documents shall not be password-protected and shall not be protected against Owner's or facility manager's copying and printing such files for Owner's or facility manager's use in operating and maintaining the facility.
 - d. Electronic Documents shall open to its first page.
 - e. Submit each operation and maintenance manual as a single Electronic Document file, unless file size is over-large, in which case divide into as few separate files, each with similar filename, as possible.
 - f. Within each Electronic Document, provide bookmarks for the following:
 - 1) Each chapter and subsection indicated in the corresponding printed copy document's table of contents.
 - 2) Each figure.
 - 3) Each table.
 - 4) Each appendix and attachment.

1.5 CONTENT OF OPERATION AND MAINTENANCE MANUALS

A. Operation and Maintenance Manual Content – General:

1. Prepare each operation and maintenance manual specifically for the Project. Include in each manual all pertinent instructions, as-constructed drawings as applicable, bills of materials, technical information, installation and handling requirements, maintenance and repair instructions, and other information required for complete, accurate, and comprehensive data for safe and proper operation, maintenance, and repair of materials and equipment furnished for the Project.

Include in manuals specific information required in the Specification Section for the material or equipment, data required by Laws and Regulations, and data required by authorities having jurisdiction.

2. Provisions of this Article were written for equipment. Where operation and maintenance data are required for building products, such as finishes, openings, thermal and moisture protection, and similar items, comply with this Article to the extent practical and reasonable for the associated item.
 3. Completeness and Accuracy:
 - a. Operation and maintenance manuals that include language stating or implying that the manual's content may be insufficient or stating that the manual's content is not guaranteed to be complete and accurate are unacceptable.
 - b. Operation and maintenance manuals shall be complete and accurate.
 - c. Operation and maintenance manuals shall indicate the specific alternatives and features furnished, and the specific operation and maintenance provisions for the material or equipment furnished.
 4. Provide dividers and Include manufacturer's information, diagrams, schematics, and equipment cutaways. Avoid submitting catalog excerpts unless they are the only document available showing identification or description of particular component of the equipment. Where published documents, included in operation and maintenance data, pertain to multiple models or types, mark the literature to indicate specific material or equipment supplied. Marking may be in the form of checking, arrows, or underlining to indicate pertinent information, or by crossing out or other means of obliterating information that does not apply to the materials and equipment furnished.
 5. Identify each equipment item consistent with names and identification numbers shown or indicated in the Contract Documents, rather than manufacturer's model numbers.
 6. Neatly type data not furnished in computer-printed text. Handwriting, except for strikeouts, arrows, and the like, is unacceptable.
 7. Include copy of warranty in accordance with the Contract Documents.
 8. Include copy of proposed service contract, when applicable.
 9. When copyrighted material is used in operation and maintenance manuals, obtain copyright holder's written permission to use such material in the operation and maintenance manual.
- B. Differences Between Preliminary and Final Operation and Maintenance Manuals:
1. In preliminary operation and maintenance manuals, include flysheet or placeholder for information to be included in final operation and maintenance manual Submittal.
 2. In final operation and maintenance manuals, include information such as the following, as applicable for the associated materials and equipment:
 - a. Equipment data that requires collection after startup, for example: (1) system and equipment balancing reports, including those for HVAC systems; and (2) final settings for electrical switchgear, automatic transfer switches, and circuit breakers; and (3) materials and equipment field testing results.
 - b. Equipment startup reports and Suppliers' field service reports (the latter on form in Section 01 75 00 - Checkout and Startup Procedures).
- C. Initial Documents in Operation and Maintenance Manuals:
1. Table of Contents:

- a. Provide table of contents in each volume of each operation and maintenance manual.
 - b. In table of contents and not less than once in each chapter or section, identify materials and equipment by their functional names. Thereafter, abbreviations and acronyms may be used if their meaning is clearly indicated in a table bound at or near beginning of each volume. Using material or equipment model or catalog designations for identifying items is unacceptable.
2. Equipment Record:
- a. Provide "Equipment Record" section of operation and maintenance manual immediately following the table of contents. "Equipment Record" section is not required for operation and maintenance data for other than equipment (such as building materials and finishes).
 - b. Provide "Equipment Record" on forms included as this Section's Attachments 1, 2, and 3.
 - c. For instrumentation and control equipment, International Society of Automation (ISA) data sheets are acceptable in lieu of the forms included as this Section's Attachments 1, 2, and 3.
 - d. This Section's Attachments 1, 2, and 3 are available from Engineer as "fillable PDF forms".
 - e. Complete in detail each section of "Equipment Record". Merely referencing the associated equipment's operation and maintenance data for nameplate, maintenance, spare parts, lubricants, or other required information, is unacceptable.
 - f. For equipment or systems with multiple, separate components (for example, motor and gearbox), fully completed "Equipment Record" is required for each component.
 - g. Operation and maintenance data Submittals without complete and accurate "Equipment Record" sheets are unacceptable.
3. Supplier's Field Service Reports:
- a. Include in final operation and maintenance manuals copies of associated Supplier's field services reports in accordance with Section 01 75 00 - Checkout and Startup Procedures.
 - b. Include Supplier's completed field service reports in operation and maintenance manual in section immediately following "Equipment Record" section.
- D. Operation and Maintenance Instructions:
1. Safety Considerations:
- a. Submit written descriptions of safety considerations relating to operation and maintenance procedures for materials and equipment.
 - b. Describe safety devices and alarms provided with materials and equipment and proper operation and use.
 - c. Indicate procedures for proper, safe operating and maintenance of materials and equipment furnished, including manufacturer's recommended personal protection equipment, apparatus, and devices not furnished under the Contract.
 - d. Describe recommended safety-related training for personnel operating and maintaining the subject materials or equipment.
 - e. Include in appendix to operation and maintenance manual manufacturers' relevant "safety data sheets" (SDS), formerly "material safety data sheets" (MSDS).

- f. Engineer's review of operation and maintenance data expressly does not extend to adequacy, completeness, and accuracy of SDS or other safety and protection practices and procedures indicated in the operation and maintenance data.
- 2. Operation:
 - a. Include in operation and maintenance data Submittals complete, detailed written operating instructions for each material or equipment item including: function; operating characteristics; limiting conditions; and regulation and control. Also include, as applicable, written descriptions of alarms generated by equipment and proper responses to such alarm conditions.
 - b. Include pre-startup instructions and checklists and complete startup instructions for each material and equipment item.
 - c. Indicate recommended operating instructions for all operating modes and conditions, with associated recommendations for safe operation.
 - d. Explain available controls and instrumentation and associated function(s).
 - e. Indicate required shutdown checklists and procedures for: normal shutdown, emergency shutdown, and long-term shutdowns.
 - f. Troubleshooting instructions.
- 3. Maintenance – General:
 - a. Include in operation and maintenance data complete, written instructions for necessary and recommended maintenance, including mechanical maintenance and electrical/instrumentation and controls maintenance, as applicable.
 - b. Include in operation and maintenance data complete instructions for necessary assembly, disassembly, installation, re-installation, storage, and shipping for materials and equipment.
 - c. Tools: Include list of required maintenance tools and equipment.
 - d. Spare Parts and Extra Materials:
 - 1) Submit complete instructions for ordering replaceable parts, including reference numbers (such as shop order number or serial number) that will expedite the ordering process.
 - 2) Submit manufacturer's recommended inventory levels for spare parts, extra stock materials, and consumable supplies for the initial two years of operation. Consumable supplies are items consumed or worn by operation of materials or equipment, and items used in maintaining the operation of material or equipment, including items such as lubricants, seals, reagents, and testing chemicals used for calibrating or operating the equipment. Include estimated delivery times, shelf life limitations, and special storage requirements.
 - 3) Also refer to this Article's provision, "Bills of Materials", below, for additional requirements regarding ordering replacement parts.
- 4. Routine and Preventative Maintenance:
 - a. Submit complete, detailed, written instructions for routine and preventive maintenance including all information and instructions to keep materials, equipment, and systems properly lubricated, adjusted, and maintained so that materials, equipment, and systems function economically throughout their expected service life. Instructions shall include:
 - 1) Written explanations with illustrations for each routine and preventive maintenance task such as inspection, adjustment, anchor bolt torque checks, lubrication, calibration, cleaning, replacement of filters, and the like.

- 2) Recommended schedule for each routine and preventive maintenance task.
- 3) Lubricants:
 - a) Provide lubrication charts indicating recommended types of lubricants, frequency of application or change, and where each lubricant is to be used or applied.
 - b) Table of alternative lubricants.
5. Major Maintenance:
 - a. Include detailed, written instructions and illustrations for required periodic (non-routine, non-preventative) maintenance.
 - b. Indicate relative level of training and expertise required to perform such maintenance and recommended tools and equipment.
6. Special Maintenance:
 - a. Include maintenance instructions for long-term shutdowns and storage.
- E. Bills of Materials:
 1. Include in operation and maintenance manuals complete bills of material or parts lists for materials and equipment furnished. Lists or bills of material may be furnished on a per-drawing or per-equipment assembly basis. Bills of material shall indicate:
 2. Manufacturer's name, physical address, telephone number, internet website address.
 3. Manufacturer's local service representative's or local parts supplier's name, physical address, telephone number, internet website address, and e-mail addresses.
 4. Manufacturer's shop order and serial number(s) for materials, equipment or assembly furnished.
 5. For each part or piece include the following information:
 - a. Parts cross-reference number. Cross-reference number shall be used to identify the part on assembly drawings, Shop Drawings, or other type of graphic illustration where the part is clearly shown or indicated.
 - b. Part name or description.
 - c. Manufacturer's part number.
 - d. Quantity of each part used in each assembly.
 - e. Current unit price of the part at the time the operation and maintenance manual is submitted. Price list shall be dated.
- F. Record Copy of Shop Drawings, Product data, and Other Previously Approved and Accepted Submittals:
 1. Submit original-quality copies of each approved and accepted (as applicable) Shop Drawing, product data Submittal, written results of source quality control activities, and other Submittals, updated to indicate as-installed condition. Do not include prior Submittals that were not approved or were not accepted. Reduced drawings are acceptable only when reduction is to not less than one-half original size and all lines, dimensions, lettering, and text are completely legible on the reduction.
- G. Electrical Schematics, Diagrams, and Information:
 1. Submit complete electrical schematics and wiring diagrams, including complete point-to-point wiring and wiring numbers or colors between all terminal points.

2. Include as-constructed drawings of layouts of electrical panels (such as switchgear and motor control centers) and control panels.
- H. NFPA 70 (National Electric Code) Documentation:
1. Include in operation and maintenance manuals for electrically-powered equipment documented calculations of: (1) arc-fault current, equipment available fault current and (2) short-circuit current rating (SCCR), provided as part of equipment Submittals.

PART 2 - PRODUCTS - (NOT USED)

PART 3 - EXECUTION

3.1 ATTACHMENTS

- A. The following, bound after this Section's "End of Section" designation, are part of this Section:
1. Attachment 1 - Equipment Data and Spare Parts Summary form (one page)
 2. Attachment 2 - Recommended Maintenance Summary form (one page)
 3. Attachment 3 - Lubrication Summary form (one page)

END OF SECTION



Equipment Data and Spare Parts Summary

Project Name			Specification Section:	
Equipment Name			Year Installed:	
Project Equipment Tag No(s).				
Equipment Manufacturer			Project/Order No.	
Address			Phone	
Website		Web Site		E-mail
Local Representative/Service Center				
Address			Phone	
Website		E-mail		

MECHANICAL NAMEPLATE DATA

Equip.			Serial No.	
Make			Model No.	
ID No.	Frame No.	HP	RPM	Cap.
Size	TDH	Imp. Size	CFM	PSI
Other:				

ELECTRICAL NAMEPLATE DATA

Equip.			Serial No.					
Make			Model No.					
ID No.	Frame No.	HP	V.	Amp.	Hertz	PH	RPM	SF
Duty	Code	Ins. Cl.	Type	NEMA	C Amb.	Temp. Rise	Rating	
Other:								

SPARE PARTS PROVIDED PER CONTRACT

Part No.	Part Name	Quantity

RECOMMENDED SPARE PARTS

Part No.	Part Name	Quantity

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Recommended Maintenance Summary

Equipment Description	Project Equip. Tag No(s).	

[illegible]

* D = Daily W = Weekly M = Monthly Q = Quarterly S = Semiannual A = Annual Hours = Run Time Interval

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Lubrication Summary

Equipment Description	Project Equip. Tag No(s).

Lubricant Point						
Lubricant Type		Manufacturer	Product	AGMA #	SAE #	ISO
	1					
	2					
	3					
	4					
	5					
Lubricant Point						
Lubricant Type		Manufacturer	Product	AGMA #	SAE #	ISO
	1					
	2					
	3					
	4					
	5					
Lubricant Point						
Lubricant Type		Manufacturer	Product	AGMA #	SAE #	ISO
	1					
	2					
	3					
	4					
	5					
Lubricant Point						
Lubricant Type		Manufacturer	Product	AGMA #	SAE #	ISO
	1					
	2					
	3					
	4					
	5					
Lubricant Point						
Lubricant Type		Manufacturer	Product	AGMA #	SAE #	ISO
	1					
	2					
	3					
	4					
	5					
Lubricant Point						
Lubricant Type		Manufacturer	Product	AGMA #	SAE #	ISO
	1					
	2					
	3					
	4					
	5					

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DIVISION 02

EXISTING CONDITIONS



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SECTION 02 41 00

DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. General provisions applicable to all demolition and removals.
2. Civil/site demolition and removals.
3. Architectural and structural demolition and removals.
4. Mechanical demolition and removals
5. Electrical demolition and removals.
6. Disposal of demolition debris, materials, and equipment.

B. Scope:

1. Contractor shall provide all labor, materials, equipment, tools, and incidentals as shown, specified and required for demolition, removals, and disposal Work.
2. The Work under this Specifications section includes, but is not necessarily limited to:
 - a. Demolition and removal of existing materials and equipment as shown or indicated in the Contract Documents. The Work includes demolition of, appurtenances, piping, electrical and mechanical systems and equipment, pavement, curbs, sidewalks, gutters, fencing, and similar existing materials, equipment, and items.
 - b. Demolition and removal of all above-grade piping and facilities and Underground Facilities underneath, building(s) and structures shown or indicated for demolition, unless the Underground Facilities or above-grade facilities are shown or indicated as to remain.
3. Demolitions and removals indicated in other Specifications sections shall comply with requirements of this Specifications section.
4. Perform demolition Work within areas shown or indicated.
5. Pay all costs associated with transporting and, as applicable, disposing of materials and equipment resulting from demolition and removals Work.

C. Related Requirements:

1. Section 31 10 00 - Site Clearing.

1.2 QUALITY ASSURANCE

A. Referenced Standards:

1. National Fire Protection Association (NFPA):
 - a. 241, Safeguarding Construction, Alteration, and Demolition Operations.

B. Regulatory Requirements:

1. Demolition, removals, and disposal Work shall be in accordance with 29 CFR 1926.850 through 29 CFR 1926.860 (Subpart T – Demolition), and all other Laws and Regulations.
2. Comply with requirements of authorities having jurisdiction.

C. Qualifications:

1. Electrical Removals: Entity and personnel performing electrical removals shall be electrician(s) legally qualified to perform electrical construction and electrical work in the jurisdiction where the Site is located.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Review procedures under this and other Specifications sections and coordinate the Work that will be performed with or before demolition and removals.

1.4 SUBMITTALS

A. Informational Submittals: Submit the following:

1. Procedure Submittals:
 - a. Demolition and Removal Plan: Not less than ten days prior to starting demolition Work, submit acceptable plan for demolition and removal Work, including:
 - 1) Plan for coordinating shut-offs, capping, temporary services, and continuing utility services.
 - 2) Other proposed procedures as applicable.
 - 3) Equipment proposed for use in demolition operations.
 - 4) Planned demolition operating sequences.
 - 5) Detailed schedule of demolition Work in accordance with the Schedule accepted by Engineer.

1.5 SITE CONDITIONS

- A. Owner makes no representation of condition or structural integrity of area(s) to be demolished or where removals are required by the Contract Documents.

PART 2 - PRODUCTS - (NOT USED)

PART 3 - EXECUTION

3.1 PREPARATION

A. Notification:

1. Not less than 48 hours prior to commencing demolition or removal, advise Engineer in writing of planned start of demolition Work. Do not start removals without permission of Engineer.
2. Where demolition or removals has potential to affect adjacent properties, occupants, streets, or other public thoroughfare, transportation facilities, and utilities, furnish required notices to owners and occupants of properties, buildings, and structures that may be affected by the demolition of removal.
3. In accordance with Laws and Regulations, furnish to authorities having jurisdiction, including emergency services as necessary, appropriate notices of planned demolition and removals.
4. Submit to Engineer copies of notices furnished to adjacent property owners, occupants, and authorities having jurisdiction.

B. Protection of Adjacent Areas and Facilities:

1. Perform demolition and removal Work in manner that prevents damage and injury to property, structures, occupants, the public, and facilities. Do not interfere with use of, and free and safe access to and from, structures and properties unless allowed by the Contract Documents otherwise allowed in writing by Owner.
2. Closing or obstructing of roads, drives, sidewalks, and passageways adjacent to the Work is not allowed unless indicated otherwise in the Contract Documents. Conduct the Work with minimum interference to vehicular and pedestrian traffic.
3. Provide temporary partitions between demolition work areas and (a) areas that will be occupied during demolition and removals, and (b) areas accessible to the public or visitors. Temporary partitions shall be sturdy, braced plywood in good condition, of dimensions sufficient to adequately screen demolition work from view of occupants, public, and visitors. Maintain temporary partitions in place until demolition and removals work in the subject area is complete or until other Work requires removal of temporary partitions.

4. Provide appropriate temporary barriers, lighting, sidewalk sheds, and other necessary protection.
 5. Repair damage to facilities that are to remain which such damages results from Contractor's operations.
- C. Existing Utilities: In addition to requirements of the General Conditions, Supplementary Conditions, and Division 01 Specifications, perform the following:
1. Should unforeseen, unknown, or incorrectly shown or indicated Underground Facilities be encountered, Contractor responsibilities shall be in accordance with the General Conditions as may be modified by the Supplementary Conditions. Cooperate with utility owners in keeping adjacent services and facilities in operation.
 2. Sanitary Sewerage: Before proceeding with demolition, locate and cap all sewer lines and service laterals discharging from the building or structure being demolished.
 3. Storm Water Sewerage: Existing storm water system shall remain in place until demolition of existing building or structure is complete. Upon completing demolition, cut and cap storm sewerage at locations shown on the Drawings. Remove existing storm water piping and related structures between points of cutting, and backfill, restore to grade, and stabilize the area over the removed facilities in accordance with the Contract Documents.
 4. Water Piping and Related Facilities: Before proceeding with demolition, locate and cap all potable and non-potable waterlines and service laterals serving the building or structure being demolished. Ensure compliance with Laws and Regulations regarding water quality.
 5. Other Utilities: Before proceeding with demolition, locate and cap as required all other utilities, such as fuel and gas; compressed air; heating, ventilating, and air conditioning; electric; and communications; and service laterals serving the building or structure being demolished.
 6. Shutdown of utility services shall be coordinated by Contractor, assisted by Owner as required relative to contacting utility owners.
- D. Remediation:
1. If unanticipated Hazardous Environmental Condition is believed to be encountered during demolition and removals, comply with requirements of the General Conditions, as may be modified by the Supplementary Conditions.

3.2 DEMOLITION - GENERAL

- A. Locate construction equipment used for demolition Work and remove demolished materials and equipment to avoid imposing excessive loading on supporting and adjacent walls, floors, framing, facilities, and Underground Facilities.
- B. Pollution Controls:
1. Use water sprinkling, temporary enclosures, and other suitable methods to limit emissions of dust and dirt to lowest practical level. Comply with Section 01 57 05 - Temporary Controls, and Laws and Regulations.
 2. Do not use water when water may create hazardous or objectionable conditions such as icing, flooding, or pollution.
 3. Clean adjacent structures, facilities, properties, and improvements of dust, dirt, and debris caused by demolition Work, in accordance with the General Conditions and Section 01 74 00 - Cleaning.
- C. Explosives:
1. Explosives are not allowed at the Site. Do not use explosives for demolition and removal Work.
- D. Comply with NFPA 241.
- E. Salvage and Ownership:
1. Materials and equipment to remain Owner's property shall be:

- a. Carefully removed and appropriately handled by Contractor to avoid damage and invalidation of warranties in effect. Brace motors attached to flexible mountings until reinstallation or delivery to Owner's storage location. Fully remedy to pre-construction condition or replace items damaged during removal or handling by Contractor.
 - b. Removed as functional units, together with all appurtenances required for operation.
 - c. Cleaned, listed, and tagged for storage.
 - d. Protected from damage.
 - e. Delivered to designated storage location at the Site or other site indicated in the Contract Documents, at place designated by Engineer or Owner.
2. Items to be and delivered to Owner are as indicated in Table 02 41 00-A.

Table 02 41 00-A – Items to be Salvaged

Equipment Name/ Designation	Equipment Location	Deliver to Owner's Location
Flaherty Pump Station Generator	Flaherty Pump Station Site	Payneville Pump Station Site

3. Preparation of Owner's existing equipment for storage:
 - a. Where appropriate, identify each component with markings or tags to indicate its position in the assembly and the assembly of which it is part.
 - b. Place small parts in appropriate, durable boxes and clearly mark contents on the outside of box or container.
 - c. Remove oil from oil-lubricated bearings and gear boxes and replace with storage oil.
 - d. Grease grease-lubricated bearings.
 - e. Replace breather plugs with solid plugs.
 - f. Megger-test motor windings: Attach report of the test results to the associated motor and submit copy to Engineer.
 - g. Attach unit to suitable crate bottom.
 - h. Enclose unit in polyethylene film and seal all seams and the film to the base of the unit with tape.
 - i. Construct crate of wood slats around top and sides of unit.
 - j. Attach permanent instruction tag to outside of crate stating "This unit has been prepared for storage. Replace oil, vent plugs, and lubricant in accordance with manufacturer's instructions before start-up."
- F. Finishing of Surfaces Exposed by Removals: Unless otherwise shown or indicated in the Contract Documents, surfaces of walls, floors, ceilings, and other areas exposed by removals, and that will remain as finished surfaces, shall be repaired and re-finished with materials that match existing adjacent surface, or as otherwise approved by Engineer.

3.3 STRUCTURAL REMOVALS

- A. Remove structures to lines and grades shown or indicated, unless otherwise directed by Engineer. Where limits are not shown or indicated, limits shall be four inches outside item to be installed. Removals beyond limits shown or indicated shall be at Contractor's risk and expense and such excess removals shall be reconstructed to satisfaction of Engineer without additional cost to Owner.
- B. Removal of Anchorages and Protruding Metals:
 1. Where equipment or material anchored to concrete or masonry are removed and anchors are not to be re-used, and where existing metals (and to be removed) protrude from concrete, remove the anchors and other metal to not less than 1.5 inches beneath surface

- of concrete or masonry member. Repair the resulting hole, using repair mortar for concrete and grout for masonry, to be flush with the surface.
2. Alternately, when the anchor is stainless steel, the anchor may be cut flush with the surface of the concrete or masonry, when so approved by Engineer.
- C. Jambs, sills and heads of windows, passageways, doors, or other openings (as applicable) cut-in to the Work or to existing construction shall be dressed with masonry, concrete, or metal to provide smooth, finished appearance.
- D. Where anchoring materials, including bolts, nuts, hangers, welds, and reinforcing steel, are required to attach the Work to existing construction, provide such materials under this Specifications section, unless specified elsewhere in the Contract Documents.

3.4 MECHANICAL REMOVALS

- A. Mechanical demolition and removal Work includes dismantling and removing existing:
1. Piping systems and ductwork systems.
 2. Mechanical equipment and appurtenances.
 3. Mechanical removals as required herein apply to systems exposed to view, hidden from view, and Underground Facilities. Mechanical removals may require work in spaces that may be classified confined spaces.
- B. Life-Safety Systems:
1. Retain existing life-safety systems, including but not limited to fire suppression systems, in place for as long as possible prior to performing associated demolition and removals.
 2. .
 3. Underground Facilities:
 - a. When Underground Facilities are altered or removed, properly cut and cap piping left in place, unless otherwise shown or indicated.
 4. Potable Water Piping; Plumbing; Fire Suppression Piping and Systems; Heating Piping:
 - a. All portions of potable water systems that have been modified or opened shall be hydrostatically tested and disinfected in accordance with the Contract Documents, and Laws and Regulations. Hydrostatically test other, normally-pressurized, plumbing and fire suppression piping and heating piping systems.
 5. Tanks and Equipment Containing Process Material:
 - a. When removing generators, remove associated fuel storage tanks unless otherwise indicated to remain.
 - b. Where contents of tank or equipment item may pose a potential hazard, such as hydrocarbon fuels or chemicals, properly dispose of contents in accordance with Laws and Regulations and the Contract Documents.
 - c. Where tank or equipment contains wastewater or liquid sludge, and the Site is a wastewater treatment facility, transport and dispose of stored contents onsite at location acceptable to Owner and facility manager (if other than Owner) unless otherwise indicated in the Contract Documents. If Site is other than a wastewater treatment facility, dispose of contents appropriately in accordance with Laws and Regulations.
 - d. Where tank or equipment contains solid or slurry-type material, remove, handle, and transport the contents and appropriately dispose of the materials offsite in accordance with Laws and Regulations, unless otherwise indicated in the Contract Documents.
 6. Remove equipment supports as applicable, anchorages, base, grout, and piping. Remove anchorage systems in accordance with the "Structural Removals" Article in this Specifications section.
 7. Remove small-diameter piping back to header unless otherwise indicated.
 8. Remove access platforms, ladders, and stairs related to equipment being removed, unless otherwise shown or indicated.
 9. Instrumentation and Control Systems Removal:

- a. Remove instrumentation and controls equipment in accordance with this Specifications section's requirements for mechanical removals and electrical removals.

3.5 ELECTRICAL REMOVALS

A. Electrical demolition Work includes removing existing:

1. Disconnecting cabling from motors, electrical sources, control panels, control stations, instrumentation and control items, and similar devices and equipment.
2. Conduits, raceways, cable trays, hangers and supports, cabling, and related items.
3. Switches, panelboards, control stations, and similar items.
4. Transformers, distribution switchboards, control panels, motors, starters, variable speed controllers, and similar items.
5. Lighting fixtures and related items.
6. Utility poles, site lighting standards, and overhead cabling.
7. Appurtenances and miscellaneous electrical equipment, as shown, specified, or required.

B. Electrical Removals – General:

1. Comply with Laws and Regulations, including the National Electric Code.
2. Lock Out and Tagging:
 - a. Contractor shall lock out and tag circuit breakers and switches operated by Owner and shall verify that affected cabling are de-energized to ground potential before commencing electrical removals Work.
 - b. Upon completion of electrical removals Work, remove the locks and tags and promptly advise Resident Project Representative (RPR) or Engineer and Owner that existing facilities are available for use.
3. Remove existing electrical equipment, fixtures, and systems to avoid damaging systems to remain, to keep existing systems in operation, and to maintain integrity of grounding systems.
4. Disconnect and remove motors, control panels, and other electrical gear where shown or indicated.
5. Store removed motors, microprocessors and electronics, and other electrical gear to be reused in accordance with its manufacturer's recommendations and requirements of the Contract Documents.

C. Motor Control Centers and Switchgear:

1. Remove or modify motor control centers and switchgear as shown or indicated.
2. Modified openings shall be cut square and dressed smooth to dimensions required for installation of equipment.

D. Removal of Cabling, Conduits, Raceways and Similar Items:

1. Verify the function of each cable before disconnecting and removing.
2. Remove cabling, conduits, hangers and supports, and similar items back to the power source or control panel, unless otherwise shown or indicated.
3. Remove cabling, conduits, and similar items where shown or indicated for removal. Abandoned conduits concealed in floor, ceiling slabs, or in walls shall be cut flush with the slab or wall (as applicable) at point of entrance, suitably capped, and the area repaired in a flush, smooth manner acceptable to Engineer.
4. Disassemble and remove exposed conduits, junction boxes, other electrical appurtenances, and their supports.
5. Repair all areas of the Work to prevent rusting on exposed surfaces.
6. Underground Electric:
 - a. Conduits in Underground Facilities not scheduled for reuse shall be suitably capped watertight where each enters building or structure to remain.

- b. Where shown or indicated, remove direct-burial cabling. Openings in buildings for entrance of direct-burial cabling shall be patched with repair mortar or other material approved by Engineer for such purpose, and made watertight.
- E. Electrical Service Entrances and Outdoor, Overhead Electrical Utilities:
 - 1. Existing poles and overhead cabling shall be removed or abandoned as shown and specified.
 - 2. Completely remove from the Site poles not owned by electric utility, including site lighting standards and appurtenances, shown or indicated for removal.
 - 3. Existing substation(s) and poles owned by electric utility will be removed by the electric utility.
 - 4. Make necessary arrangements with electric utility owner for removal of utility owner's transformers and metering equipment after new electrical system has been installed and energized.
- F. Lighting fixtures, wall switches, receptacles, starters, and other miscellaneous electrical equipment, not designated as remaining as Owner's property, shall be removed and properly disposed off-Site as required in accordance with Laws and Regulations.

3.6 DEMOLITION OF SITE IMPROVEMENTS

- A. Pavement, Sidewalks, Curbs, and Gutters:
 - 1. Demolition of asphalt or concrete pavement, sidewalks, curbs, and gutters, as applicable, shall terminate at cut edges. Edges shall be linear and have a vertical cut face.
 - 2. To cut pavement, sidewalks, curbs, and gutters, use machinery or tools that provides a smooth-cut edge, appropriate for the required. Where cut edges are not smooth, repair the cut edge to remain to provide a smooth, even appearance.
- B. Fencing, Guardrails, and Bollards:
 - 1. Remove to the limits shown or indicated on the Drawings.
 - 2. Completely remove below-grade posts and concrete.
- C. Manholes, Vaults, Chambers, and Handholes:
 - 1. Remove to the limits shown or indicated on the Drawings.
 - 2. If not shown or indicated on the Drawings, remove to not less than three feet below finished grade indicated on the Drawings.
- D. Underground Facilities Other than Manholes, Vaults, Chambers, and Handholes:
 - 1. Remove to the extent shown or indicated on the Drawings.
 - 2. Unless otherwise shown or indicated, cap ends of piping to remain in place in accordance with the "Mechanical Removals" Article in this Specifications section.
- E. Landscaping: Comply with Section 31 10 00 - Site Clearing.
- F. Other Site Improvements: When the Contract Documents require removal of other site improvements not addressed above, copy with Contract requirements for removal of buildings or structures.

3.7 DISPOSAL OF DEMOLITION DEBRIS

- A. Disposal – General:
 - 1. Promptly remove from the Site all debris, waste, rubbish, material, and equipment resulting from demolition and removal operations. Promptly upon completion of demolition and removal operations, remove from the Site construction equipment used in demolition Work.
 - 2. Do not sell at the Site demolition materials or removed equipment. If materials, equipment or debris will be sold by Contractor, remove the items from the Site and perform the sale or transaction elsewhere, in accordance with Laws and Regulations.

3. Cleaning and Removal of Debris: Comply with the General Conditions, Supplementary Conditions, and Section 01 74 00 - Cleaning.
- B. Transportation and Disposal:
1. Non-Hazardous Materials, Equipment, and Debris: Properly transport and dispose of non-hazardous demolition materials, equipment, and debris at appropriate landfill or other suitable location, in accordance with Laws and Regulations. Non-hazardous material does not contain Constituents of Concern such as (but not limited to) asbestos, PCBs, petroleum, hazardous waste, radioactive material, or other material designated as hazardous in Laws or Regulations.
 2. Hazardous Materials, Equipment, and Debris: When handling and disposal of items containing Constituents of Concern is included in the Work, properly transport and dispose of such items in accordance with the Contract Documents and Laws and Regulations.
- C. Submit to Engineer information required in this Specification Section on proposed facility(ies) where demolition materials, equipment, and debris will be recycled. Upon request, Engineer or Owner, shall be allowed to visit recycling facility(ies) to verify adequacy and compliance status. During such visits, recycling facility operator shall cooperate and assist Engineer and Owner.

END OF SECTION

SECTION 03 00 05
CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cast-in-place concrete and grout.

B. Related Specification Sections include but are not necessarily limited to:

1.2 QUALITY ASSURANCE

A. Referenced Standards:

1. American Concrete Institute (ACI):

- a. 117, Specification for Tolerances for Concrete Construction and Materials.
- b. 211.1, Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete.
- c. 212.3R, Chemical Admixtures for Concrete.
- d. 301, Specifications for Concrete Construction.
- e. 304R, Guide for Measuring, Mixing, Transporting, and Placing Concrete.
- f. 304.2R, Placing Concrete by Pumping Methods.
- g. 305.1, Hot Weather Concreting.
- h. 306.1, Cold Weather Concreting.
- i. 318, Building Code Requirements for Structural Concrete.
- j. 347, Guide to Formwork for Concrete.
- k. CT-13, Concrete Terminology.

2. ASTM International (ASTM):

- a. A82, Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
- b. A185, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
- c. A615, Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
- d. A1064, Standard Specification for Steel Wire and Welded Wire Replacement, Plain and Deformed, for Concrete.
- e. C31, Standard Practice for Making and Curing Concrete Test Specimens in the Field.
- f. C33, Standard Specification for Concrete Aggregates.
- g. C39, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
- h. C94/C94M, Standard Specification for Ready-Mixed Concrete.
- i. C138, Standard Method of Test for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete.
- j. C143, Standard Test Method for Slump of Hydraulic Cement Concrete.
- k. C150, Standard Specification for Portland Cement.
- l. C172, Standard Practice for Sampling Freshly Mixed Concrete.
- m. C173, Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
- n. C231, Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
- o. C260, Standard Specification for Air-Entraining Admixtures for Concrete.

- p. C309, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
- q. C494, Standard Specification for Chemical Admixtures for Concrete.
- r. C618, Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
- s. C1293, Standard Test Method for Determination of Length Change of Concrete Due to Alkali-Silica Reaction.
- t. C1315, Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
- u. D882, Standard Test Method for Tensile Properties of Thin Plastic Sheeting.
- v. D994, Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).
- w. D1056, Standard Specification for Flexible Cellular Materials-Sponge or Expanded Rubber.
- x. D1709, Standard Test Methods for Impact Resistance of Plastic Film by the Free-Falling Dart Method.
- y. D1751, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
- z. E96, Standard Test Methods for Water Vapor Transmission of Materials.
- aa. E329, Standard Specification for Agencies Engaged in Construction Inspection and/or Testing.
- 3. Corps of Engineers (COE):
 - a. CRD-C621, Standard Specification for Packaged, Dry, Hydraulic-Cement Grout (Nonshrink).
- 4. National Ready Mixed Concrete Association (NRMCA).
- 5. National Sanitation Foundation (NSF):
 - a. 61, Drinking Water System Components - Health Effects.
- B. Quality Control:
 - 1. Concrete testing agency:
 - a. Contractor to employ and pay for services of a testing laboratory to:
 - 1) Perform materials evaluation.
 - 2) Design concrete mixes.
 - b. Concrete testing agency to meet requirements of ASTM E329.
 - 2. Do not begin concrete production until proposed concrete mix design has been approved by Engineer.
 - a. Approval of concrete mix design by Engineer does not relieve Contractor of his responsibility to provide concrete that meets the requirements of this Specification.
 - 3. Adjust concrete mix designs when material characteristics, job conditions, weather, strength test results or other circumstances warrant.
 - a. Do not use revised concrete mixes until submitted to and approved by Engineer.
 - 4. Perform structural calculations as required to prove that all portions of the structure in combination with remaining forming and shoring system has sufficient strength to safely support its own weight plus the loads placed thereon.
- C. Qualifications:
 - 1. Ready mixed concrete batch plant certified by NRMCA.
 - 2. Formwork, shoring and reshoring for slabs and beams except where cast on ground to be designed by a professional engineer currently registered in the state where the Project is located.

1.3 DEFINITIONS

- A. Per ACI CT-13 except as modified herein:
1. Concrete fill: Non-structural concrete.
 2. Concrete Testing Agency: Testing agency employed to perform materials evaluation, design of concrete mixes or testing of concrete placed during construction.
 3. Exposed concrete: Exposed to view after construction is complete.
 4. Indicated: Indicated by Contract Documents.
 5. Nonexposed concrete: Not exposed to view after construction is complete.
 6. Required: Required by Contract Documents.
 7. Specified strength: Specified compressive strength at 28 days.
 8. Submitted: Submitted to Engineer.

1.4 SUBMITTALS

- A. Shop Drawings:
1. Concrete mix designs proposed for use.
 - a. Concrete mix design submittal to include the following information:
 - 1) Sieve analysis and source of fine and coarse aggregates.
 - 2) Test for aggregate organic impurities.
 - 3) Test for deleterious aggregate per ASTM C1293.
 - 4) Proportioning of all materials.
 - 5) Type of cement with mill certificate for cement.
 - 6) Type of fly ash with certificate of conformance to specification requirements.
 - 7) Slump.
 - 8) Air content.
 - 9) Brand, type, ASTM designation, and quantity of each admixture proposed for use.
 - 10) 28-day cylinder compressive test results of trial mixes per ACI 301 and as indicated herein.
 2. Product technical data including:
 - a. Acknowledgement that products submitted meet requirements of standards referenced.
 - b. Manufacturer's installation instructions.
 - c. Manufacturers and types:
 - 1) Joint fillers.
 - 2) Curing agents.
 - 3) Chemical sealer.
 - 4) Bonding and patching mortar.
 - 5) Construction joint bonding adhesive.
 - 6) Nonshrink grout with cure/seal compound.
 3. Reinforcing steel:
 - a. Show grade, sizes, number, configuration, spacing, location and all fabrication and placement details.
 - b. In sufficient detail to permit installation of reinforcing without having to make reference to Contract Drawings.
 - c. Obtain approval of Shop Drawings by Engineer before fabrication.
 - d. Mill certificates.
 4. Scaled (minimum 1/8 inches per foot) drawings showing proposed locations of construction joints, control joints, expansion joints (as applicable) and joint dimensions.

5. Strength test results of in place concrete including slump, air content and concrete temperature.
6. Certifications:
 - a. Certification of standard deviation value in psi for ready mix plant supplying the concrete.
 - b. Certification that the material and sources submitted in the mix design will be used in the concrete for this project.
7. Test reports:
 - a. Cement mill reports for all cement to be supplied.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Storage of Material:

1. Cement and pozzolan:
 - a. Store in moistureproof, weathertight enclosures.
 - b. Do not use if caked or lumpy.
2. Aggregate:
 - a. Store to prevent segregation and contamination with other sizes or foreign materials.
 - b. Obtain samples for testing from aggregates at point of batching.
 - c. Do not use frozen or partially frozen aggregates.
 - d. Do not use bottom 6 inches of stockpiles in contact with ground.
 - e. Allow sand to drain until moisture content is uniform prior to use.
3. Admixtures:
 - a. Protect from contamination, evaporation, freezing, or damage.
 - b. Maintain within temperature range recommended by manufacturer.
 - c. Completely mix solutions and suspensions prior to use.
4. Reinforcing steel: Support and store all rebars above ground.

B. Delivery:

1. Concrete:
 - a. Prepare a delivery ticket for each load for ready-mixed concrete.
 - b. Truck operator shall hand ticket to [Owner's Representative] [Engineer] at the time of delivery.
 - c. Ticket to show:
 - 1) Mix identification mark.
 - 2) Quantity delivered.
 - 3) Amount of each material in batch.
 - 4) Outdoor temp in the shade.
 - 5) Time at which cement was added.
 - 6) Numerical sequence of the delivery.
 - 7) Amount of water added.
2. Reinforcing steel:
 - a. Ship to jobsite with attached plastic or metal tags with permanent mark numbers.
 - b. Mark numbers to match Shop Drawing mark number.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following products and manufacturers are acceptable:

1. Nonshrink, nonmetallic grout:
 - a. Sika "SikaGrout 212."
 - b. Euclid Chemical "NS Grout."
 - c. Master Builders Solutions "Masterflow 713."
 - d. Or equal.
2. Expansion joint fillers:
 - a. Permaglaze Co.
 - b. Rubatex Corp.
 - c. Williams Products, Inc.
 - d. Or equal.
3. Form coating:
 - a. Richmond "Rich Cote."
 - b. Industrial Lubricants "Nox-Crete Form Coating."
 - c. Or equal.
4. Cementitious concrete coating:
 - a. Aquafin International.
 - b. Master Builders Solutions.
 - c. Euclid Chemical Company.
 - d. Or equal.
5. Chemical sealer:
 - a. L&M Construction Chemicals, Inc.
 - b. Euclid Chemical Company.
 - c. Dayton Superior.
 - d. Or equal.

2.2 MATERIALS

- A. Portland Cement: Conform to ASTM C150.
- B. Fly Ash:
 1. ASTM C618, Class F or Class C.
 2. Nonstaining.
 - a. Hardened concrete containing fly ash to be uniform light gray color.
 3. Maximum loss on ignition: 6%.
 4. Compatible with other concrete ingredients.
 5. Obtain proposed fly ash from a source approved by the State Highway Department in the state where the Project is located for use in concrete for bridges.
- C. Admixtures:
 1. Air entraining admixtures: ASTM C260.
 2. Water reducing, retarding, and accelerating admixtures:
 - a. ASTM C494 Type A through E.
 - b. Conform to provisions of ACI 212.3R.
 - c. Do not use retarding or accelerating admixtures unless specifically approved in writing by Engineer and at no cost to Owner.
 - d. Follow manufacturer's instructions.
 - e. Use chloride free admixtures only.
 3. Maximum total water soluble chloride ion content contributed from all ingredients of concrete including water, aggregates, cementitious materials and admixtures by weight percent of cement:

- a. 0.10 – all concrete.
- 4. Do not use calcium chloride.
- 5. Pozzolanic admixtures: ASTM C618.
- 6. Provide admixtures of same type, manufacturer and quantity as used in establishing required concrete proportions in the mix design.
- D. Water: Potable, clean, free of oils, acids and organic matter.
- E. Aggregates:
 - 1. Normal weight concrete: ASTM C33, except as modified below.
 - 2. Fine aggregate:
 - a. Clean natural sand.
 - b. No manufactured or artificial sand.
 - 3. Coarse aggregate:
 - a. Crushed rock, natural gravel, or other inert granular material.
 - b. Maximum amount of clay or shale particles: 1%.
 - 4. Gradation of coarse aggregate:
 - a. Lean concrete and concrete topping: Size #7.
 - b. All other concrete: Size #57 or #67.
- F. Concrete Grout:
 - 1. Nonshrink, nonmetallic grout:
 - a. Nonmetallic, noncorrosive, nonstaining, premixed with only water to be added.
 - b. Grout to produce a positive but controlled expansion.
 - c. Mass expansion not to be created by gas liberation.
 - d. Minimum compressive strength of nonshrink grout at 28 days: 6500 psi.
 - e. In accordance with COE CRD-C621.
 - 2. Epoxy grout:
 - a. 3-component epoxy resin system.
 - 1) Two liquid epoxy components.
 - 2) One inert aggregate filler component.
 - b. Each component packaged separately for mixing at jobsite.
- G. Reinforcing Steel:
 - 1. Reinforcing bars: ASTM A615, Grade 60.
 - 2. Welded wire reinforcement:
 - a. ASTM A185 or ASTM A1064.
 - b. Minimum yield strength: 60,000 psi.
 - 3. Column spirals: ASTM A82 or ASTM A1064.
- H. Forms:
 - 1. Prefabricated or job built.
 - 2. Wood forms:
 - a. 5/8 or 3/4 inches 5-ply structural plywood of concrete form grade.
 - b. Built-in-place or prefabricated type panel.
 - 3. Metal forms:
 - a. Metal forms may be used except for aluminum in contact with concrete.
 - b. Forms to be tight to prevent leakage, free of rust and straight without dents to provide members of uniform thickness.
 - 4. Chamfer strips: Clear white pine, surface against concrete planed.

I. Form Ties:

1. Commercially fabricated for use in form construction.
 - a. Field fabricated ties are unacceptable.
2. Constructed so that ends or end fasteners can be removed without causing spalling at surfaces of the concrete.
3. 3/4 inches minimum to 1 inch maximum diameter cones on both ends.
4. Embedded portion of ties to be not less than 1-1/2 inches from face of concrete after ends have been removed.
5. Cone size:
 - a. 3/4 inches minimum to 2 1/2 inches maximum diameter cones on both ends.
 - b. Depth of cone not to exceed the concrete reinforcing cover.
6. Form release: Nonstaining and shall not prevent bonding of future finishes to concrete surface.

J. Chairs, Runners, Bolsters, Spacers, and Hangers:

1. Stainless steel, epoxy coated, or plastic coated metal.
 - a. Plastic coated: Rebar support tips in contact with the forms only.

K. Chemical Floor Sealer:

1. Colorless low VOC water-based solution containing acrylic copolymers.
 - a. ASTM C1315, Class B, minimum 30% solids.
2. L&M Construction Chemicals Inc. Dress & Seal WB 30.

L. Cementitious Concrete Coating:

1. Polymer modified Portland cement based coating for concrete and masonry.
 - a. Waterproof.
 - b. Resistant to both positive and negative hydrostatic pressure.
 - c. Breathable.
2. Master Builders Solutions "Masterseal 581 Thoroseal".
 - a. Color:
 - 1) Interior surfaces: Standard gray.
 - 2) Exterior surfaces: Custom color to match concrete surface.
 - 3) Texture: Fine.

M. Membrane Curing Compound:

1. ASTM C309, Type 1D, Class A or B.
2. Fugitive dye shall dissipate over time and exposure.
3. Curing compound shall not prevent bonding of any future coverings, coatings or finishes.

N. Expansion Joint Filler:

1. In contact with water or sewage:
 - a. Closed cell neoprene.
 - b. ASTM D1056, Class SC (oil resistant and medium swell) of 2 to 5 psi compression deflection (Grade SCE41).
2. Exterior driveways, curbs and sidewalks:
 - a. Asphalt expansion joint filler.
 - b. ASTM D994.
3. Other use:
 - a. Fiber expansion joint filler.
 - b. ASTM D1751.

2.3 CONCRETE MIXES

A. General:

1. All concrete to be ready mixed concrete conforming to ASTM C94/C94M.
2. Provide concrete of specified quality capable of being placed without segregation and, when cured, of developing all properties required.
3. All concrete to be normal weight concrete, except where indicated on the Drawings.
4. Provide pozzolan content for all cast-in-place construction.

B. Strength:

1. Provide specified strength and type of concrete for each use in structure(s) as follows:

TYPE	WEIGHT	SPECIFIED STRENGTH*
All general use concrete	Normal weight	4000 PSI

* Minimum 28-day compressive strength.

C. Air Entrainment:

1. Provide air entrainment in all concrete resulting in a total air content percent by volume as follows:

MAX AGGREGATE SIZE	TOTAL AIR CONTENT PERCENT
1 inches or 3/4 inches	6 ±1-1/2
<3/4 inches	6-1/2 ±1-1/2

2. Air content to be measured in accordance with ASTM C231, ASTM C173, or ASTM C138.

D. Slump - 4 inches maximum, 1 inch minimum:

1. Measured at point of discharge of the concrete into the concrete construction member.
2. 8 inches maximum after addition of superplasticizer (if used).
3. Concrete of lower than minimum slump may be used provided it can be properly placed and consolidated.
4. Pumped concrete:
 - a. Provide additional water at batch plant to allow for slump loss due to pumping.
 - b. Provide only enough additional water so that slump of concrete at discharge end of pump hose does not exceed maximum slump specified and the maximum specified water-cement ratio is not exceeded.
5. Slump may be adjusted in the field through the use of water reducers.
 - a. Coordinate dosage and mixing requirements with concrete supplier.
6. Determine slump per ASTM C143.

E. Selection of Proportions:

1. General:
 - a. Proportion ingredients to:
 - 1) Produce proper workability, durability, strength, and other required properties.
 - 2) Prevent segregation and collection of excessive free water on surface.
2. Minimum cement contents and maximum water cement ratios for concrete to be as follows:

SPECIFIED STRENGTH	TARGET CEMENT, MAXIMUM AGGREGATE SIZE			MAXIMUM WATER CEMENT RATIO BY WEIGHT
	1/2 inches	3/4 inches	1 inches	
4000	564	564	564	0.45
4500	611	611	--	0.42

3. Fly ash:
 - a. For cast-in-place concrete only, a maximum of 25% by weight of Portland cement content per cubic yard may be replaced with fly ash at rate of 1 pound fly ash for 1 pound of cement.
 - b. When fly ash is used, the water to cementitious materials ratio shall not exceed the maximum value specified herein.
4. Concrete mix proportioning methods for normal weight concrete:
 - a. Proportion mixture to provide desired characteristics using one of methods described below:
 - 1) Method 1 (Trial Mix):
 - a) Per ACI 301, Chapter 4, except as modified herein.
 - b) Air content within range specified above.
 - c) Record and report temperature of trial mixes.
 - d) Proportion trial mixes per ACI 211.1.
 - 2) Method 2 (Field Experience):
 - a) Per ACI 301, except as modified herein:
 - b) Field test records must be acceptable to Engineer to use this method.
 - c) Test records shall represent materials, proportions and conditions similar to those specified.
5. Required average strength to exceed the specified 28-day compressive strength by the amount determined or calculated in accordance with the requirements of Chapter 5 of ACI 318 using the standard deviation of the proposed concrete production facility.

PART 3 - EXECUTION

3.1 FORMING AND PLACING CONCRETE

- A. Formwork:
 1. Contractor is responsible for design and erection of formwork.
 2. Construct formwork so that concrete members and structures are of correct size, shape, alignment, elevation and position.
 - a. Allowable tolerances: As recommended in ACI 347.
 3. Provide slabs and beams of minimum indicated depth when sloping foundation base slabs or elevated floor slabs to drains.
 - a. For slabs on grade, slope top of subgrade to provide floor slabs of minimum uniform indicated depth.
 - b. Do not place floor drains through beams.
 4. Openings:
 - a. Provide openings in formwork to accommodate work of other trades.
 - b. Accurately place and securely support items built into forms.
 5. Chamfer strips: Place 3/4 inches chamfer strips in forms to produce 3/4 inches wide beveled edges on permanently exposed corners of members.
 6. Clean and adjust forms prior to concrete placement.

7. Tighten forms to prevent mortar leakage.
 8. Coat form surfaces with form release agents prior to placing reinforcing bars in forms.
- B. Reinforcement:
1. Position, support and secure reinforcement against displacement.
 2. Locate and support with chairs, runners, bolsters, spacers and hangers, as required.
 3. Set wire ties so ends do not touch forms and are directed into concrete, not toward exposed concrete surfaces.
 4. Lap splice lengths: ACI 318 Class B top bar tension splices unless indicated otherwise on the Drawings.
 5. Extend reinforcement to within 2 inches of concrete perimeter edges.
 - a. If perimeter edge is earth formed, extend reinforcement to within 3 inches of the edge.
 6. Minimum concrete protective covering for reinforcement: As shown on Drawings.
 7. Do not weld reinforcing bars.
 8. Welded wire reinforcement:
 - a. Install welded wire reinforcement in maximum practical sizes.
 - b. Splice sides and ends with a splice lap length measured between outermost cross wires of each fabric sheet not less than:
 - 1) One spacing of cross wires plus 2 inches.
 - 2) 1.5 x development length.
 - 3) 6 inches.
 - c. Development length: ACI 318 basic development length for the specified fabric yield strength.
- C. Construction, Expansion, and Contraction Joints:
1. Locate joints as indicated on Contract Drawings or as shown on approved Shop Drawings.
 - a. Where construction joint spacing shown on Drawings exceeds the joint spacing indicated in Paragraph below, submit proposed construction joint location in conformance with this Specification Section.
 2. Unplanned construction joints will not be allowed.
 3. Locate wall vertical construction joints at 50 feet maximum.
 4. Locate construction joints in floor slabs and foundation base slabs so that concrete placements are approximately square and do not exceed 2500 SQFT.
 5. Locate construction joints in columns and walls:
 - a. At the underside of beams, girders, haunches, drop panels, column capitals, and at floor panels.
 - b. Haunches, drop panels, and column capitals are considered part of the supported floor or roof and shall be placed monolithically therewith.
 - c. Column based need not be placed monolithically with the floor below.
 6. Install construction joints perpendicular to main reinforcement with all reinforcement continued across construction joints.
 7. At least 48 hours shall elapse between placing of adjoining concrete construction.
 8. Thoroughly clean and remove all laitance and loose and foreign particles from construction joints.
 9. Before new concrete is placed, dampen concrete surfaces.
- D. Embedments:
1. Set and build in anchorage devices and other embedded items required for other work that is attached to, or supported by concrete.
 2. Use setting diagrams, templates and instructions for locating and setting.

E. Placing Concrete:

1. Place concrete in compliance with ACI 304R and ACI 304.2R.
2. Place in a continuous operation within planned joints or sections.
3. Begin placement when work of other trades affecting concrete is completed.
4. Place concrete by methods which prevent aggregate segregation.
5. Do not allow concrete to free fall more than 4 feet.
6. Where free fall of concrete will exceed 4 feet, place concrete by means of tremie pipe or chute.

F. Consolidation: Consolidate all concrete using mechanical vibrators supplemented with hand rodding and tamping, so that concrete is worked around reinforcement and embedded items into all parts of forms.

G. Protection:

1. Protect concrete from physical damage or reduced strength due to weather extremes.
2. In cold weather comply with ACI 306.1 except as modified herein.
 - a. Do not place concrete on frozen ground or in contact with forms or reinforcing bars coated with frost, ice or snow.
 - b. Do not place heated concrete that is warmer than 80 degrees F.
 - c. If freezing temperatures are expected during curing, maintain the concrete temperature at or above 50 degrees F for seven days or 70 degrees F for 3 days.
 - d. Do not allow concrete to cool suddenly.
3. In hot weather comply with ACI 305.1 except as modified herein.
 - a. At air temperature of 90 degrees F and above, keep concrete as cool as possible during placement and curing.
 - b. Do not allow concrete temperature to exceed 90 degrees F at placement.
 - c. Prevent plastic shrinkage cracking due to rapid evaporation of moisture.
 - d. Do not place concrete when the actual or anticipated evaporation rate equals or exceeds 0.2 pounds/SF/HR as determined from ACI 305.1, Figure 2.1.5.

H. Curing:

1. Begin curing concrete as soon as free water has disappeared from exposed surfaces.
2. Cure concrete by use of moisture retaining cover, burlap kept continuously wet or by membrane curing compound.
3. Provide protection as required to prevent damage to concrete and to prevent moisture loss from concrete during curing period.
4. Provide curing for minimum of 14 days.
5. Form materials left in place may be considered as curing materials for surfaces in contact with the form materials except in periods of hot weather.
6. In hot weather follow curing procedures outlined in ACI 305.1.
7. In cold weather follow curing procedures outlined in ACI 306.1.
8. Curing vertical surfaces with a curing compound:
 - a. Cover vertical surfaces with a minimum of two coats of the curing compound.
 - b. Allow the preceding coat to completely dry prior to applying the next coat.
 - c. Apply the first coat of curing compound immediately after form removal.
 - d. Vertical surface at the time of receiving the first coat shall be damp with no free water on the surface.
 - e. A vertical surface is defined as any surface steeper than 1 vertical to 4 horizontal.

I. Form Removal:

1. Remove forms after concrete has hardened sufficiently to resist damage from removal operations or lack of support.
2. Where no reshoring is planned, leave forms and shoring used to support concrete until it has reached its specified 28-day compressive strength.

3.2 CONCRETE FINISHES

A. Tolerances:

1. Class A: 1/8 inches in 10 feet.
2. Class B: 1/4 inches in 10 feet.

B. Surfaces Exposed to View:

1. Provide a smooth finish for exposed concrete surfaces and surfaces that are:
 - a. To be covered with a coating or covering material applied directly to concrete.
 - b. Scheduled for grout cleaned finish.
2. Remove fins and projections, and patch voids, air pockets, and honeycomb areas with cement grout.
3. Cementitious concrete coating:
 - a. Form facing material shall produce a smooth, hard, uniform texture.
 - 1) Use forms specified for surfaces exposed to view.
 - b. Prepare the surface in accordance with manufactures printed installation instructions.
 - c. Brush on coating to entire surface.
 - 1) As a mixing liquid for the coating, use bonding agent and water mixture as recommended by the manufacture.
 - 2) Apply two (2) coats at 2 pound/SQYD per coat.
 - d. When second coat is set, float to a uniform texture with a sponge coat.
 - e. Provide this finish at the following locations:
 - 1) Walls, columns, exposed to view.

C. Surfaces Not Exposed to View:

1. Patch voids, air pockets and honeycomb areas with cement grout.
2. Fill tie holes with nonshrink, nonmetallic grout.

D. Slab Float Finish:

1. After concrete has been placed, consolidated, struck off, and leveled, do no further work until ready for floating.
2. Do not use water to aid in finishing.
3. Begin floating when water sheen has disappeared and surface has stiffened sufficiently to permit operation.
4. During or after first floating, check planeness of entire surface with a 10 feet straightedge applied at not less than two different angles.
5. Cut down all high spots and fill all low spots during this procedure to produce a surface within Class B tolerance throughout.
6. Refloat slab immediately to a uniform sandy texture.

E. Troweled Finish:

1. Float finish surface.
2. Next power trowel, and finally hand trowel.
3. Do not use water to aid in finishing.
4. Produce a smooth surface which is relatively free of defects with first hand troweling.
5. Perform additional trowelings by hand after surface has hardened sufficiently.

6. Final trowel when a ringing sound is produced as trowel is moved over surface.
 7. Thoroughly consolidate surface by hand troweling.
 8. Leave finished surface essentially free of trowel marks, uniform in texture and appearance and plane to a Class A tolerance.
 9. On surfaces intended to support floor coverings remove any defects of sufficient magnitude that would show through floor covering by grinding.
- F. Broom Finish: Immediately after concrete has received a float finish as specified, give it a transverse scored texture by drawing a broom across surface.

3.3 GROUT

A. Preparation:

1. Nonshrinking, nonmetallic grout:
 - a. Clean concrete surface to receive grout.
 - b. Saturate concrete with water for 24 hours prior to grouting.

B. Application:

1. Nonshrinking, nonmetallic grout:
 - a. Mix in a mechanical mixer.
 - b. Use no more water than necessary to produce flowable grout.
 - c. Place in accordance with manufacturer's instructions.
 - d. Completely fill all spaces and cavities below the bottom of baseplates.
 - e. Provide forms where baseplates and bedplates do not confine grout.
 - f. Where exposed to view, finish grout edges smooth.
 - g. Except where a slope is indicated on Drawings, finish edges flush at the baseplate, bedplate, member, or piece of equipment.
 - h. Protect against rapid moisture loss by covering with wet rags or polyethylene sheets.
 - i. Wet cure grout for seven days, minimum.

3.4 FIELD QUALITY CONTROL

A. Owner will employ and pay for services of a concrete testing laboratory to perform testing of concrete placed during construction.

1. Contractor to cooperate with Owner in obtaining and testing samples.

B. Tests During Construction:

1. Strength test:
 - a. For each strength test, mold and cure cylinders from each sample in accordance with ASTM C31.
 - 1) Cylinder size: Per ASTM C31.
 - a) 4 inches cylinders may not be used for concrete mixes with concrete aggregate size larger than 1 inch.
 - 2) Quantity:
 - a) 6 inches diameter by 12 inches high: Four cylinders.
 - b) 4 inches diameter by 8 inches high: Six cylinders.
 - b. Field cure one (1) cylinder for the seven day test.
 - 1) Laboratory cure the remaining.
 - c. Test cylinders in accordance with ASTM C39.
 - 1) 6 inches diameter cylinders:
 - a) Test two cylinders at 28 days for strength test result and the one field cured sample at seven days for information.

- b) Hold remaining cylinder in reserve.
 - 2) 4 inches diameter cylinders:
 - a) Test three cylinders at 28 days for strength test result and the one field cured cylinder at seven days for information.
 - b) Hold remaining cylinders in reserve.
 - d. Strength test result:
 - 1) Average of strengths of two 6 inches diameter cylinders or three 4 inches diameter cylinders from the same sample tested at 28 days.
 - 2) If one cylinder in a test manifests evidence of improper sampling, molding, handling, curing, or testing, discard and test reserve cylinder(s); average strength of remaining cylinders shall be considered strength test result.
 - 3) Should all cylinders in any test show any of above defects, discard entire test.
 - e. Frequency of tests:
 - a) One strength test to be taken not less than once a day, nor less than once for each 60 cubic yards or fraction thereof placed in any one day.
 - b) Once for each 5000 square feet of slab or wall surface area placed each day.
 - c) If total volume of concrete on Project is such that frequency of testing required in above paragraph will provide less than five strength tests for each concrete mix, tests shall then be made from at least five randomly selected batches or from each batch if fewer than five batches are provided.
 - 2. Slump test:
 - a. Per ASTM C143.
 - b. Determined for each strength test sample.
 - c. Additional slump tests may be taken.
 - 3. Air content:
 - a. Per ASTM C231, ASTM C173, and ASTM C138.
 - b. Determined for each strength test sample.
 - 4. Temperature: Determined for each strength test sample.
- C. Evaluation of Tests:
- 1. Strength test results:
 - a. Average of 28-day strength of two cylinders from each sample.
 - 1) If one cylinder manifests evidence of improper sampling, molding, handling, curing or testing, strength of remaining cylinder will be test result.
 - 2) If both cylinders show any of above defects, test will be discarded.
- D. Acceptance of Concrete:
- 1. Strength level of each type of concrete shall be considered satisfactory if both of the following requirements are met:
 - a. Average of all sets of three consecutive strength tests equals or exceeds the required specified 28-day compressive strength.
 - b. No individual strength test falls below the required specified 28-day compressive strength by more than 500 psi.
 - 2. If tests fail to indicate satisfactory strength level, perform additional tests and/or corrective measures as directed by Engineer.
 - a. Perform additional tests and/or corrective measures at no additional cost to Owner.
- E. Concrete tolerances per ACI 117.

3.5 SCHEDULES

A. Form Types:

1. Surfaces exposed to view:
 - a. Prefabricated or job-built wood forms.
 - b. Laid out in a regular and uniform pattern with long dimensions vertical and joints aligned.
 - c. Produce finished surfaces free from offsets, ridges, waves, and concave or convex areas.
 - d. Construct forms sufficiently tight to prevent leakage of mortar.
 2. Surfaces normally submerged or not normally exposed to view: Wood or steel forms sufficiently tight to prevent leakage of mortar.
 3. Other types of forms may be used:
 - a. For surfaces not restricted to plywood or lined forms.
 - b. As backing for form lining.
- B. Grout:
1. Nonshrinking, nonmetallic grout: General use.
- C. Concrete:
1. Normal weight concrete: All concrete.
 2. General use concrete: All other locations.
- D. Concrete Finishes:
1. Slab finishes:
 - a. Use following finishes as applicable, unless otherwise indicated:
 - 1) Floated finish: Surfaces intended to receive roofing, concrete topping, lean concrete, concrete fill and waterproofing.
 - 2) Troweled finish: Interior floor slabs, exposed roof slabs and base slabs of structures, equipment bases, and column bases.
 - 3) Broom finish: Sidewalks, docks, concrete stairs, and ramps.

END OF SECTION

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SECTION 09 90 22
SURFACE PREPARATION & COATINGS FOR TANK PROJECTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pre-Application Meeting
2. Containmentment
3. Minimum Surface Preparation Requirements
4. Coating Application
5. Any other coating, thinner, accelerator, inhibitor, etc., specified or required as part of a complete System specified in this Specification Section.

1.2 RELATED WORK

A. Section 33 16 50 – Rehabilitation of Water Storage Tanks

1.3 QUALITY ASSURANCE

A. Referenced Standards:

1. American Water Works Association (AWWA)
 - a. D100 – Welded Steel Tanks for Water Storage
 - b. D102 – Coating Steel Water Storage Tanks
 - c. C652 – Disinfection of Water Storage Tanks
2. ASTM International (ASTM):
 - a. B499, Standard Test Method for Measurement of Coating Thicknesses by the Magnetic Method: Nonmagnetic Coatings on Magnetic Basis Metals.
 - b. D3359, Standard Test Methods for Rating Adhesion by Tape Test.
 - c. D4414, Standard Practice for Measurement of Wet Film Thickness by Notch Gages.
 - d. D4417, Standard Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel.
 - e. D4541, Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.
 - f. D6132, Standard Test Method for Nondestructive Measurement of Dry Film Thickness of Applied Organic Coatings Using an Ultrasonic Gage.
 - g. D6677, Standard Test Method for Evaluating Adhesion by Knife.
 - h. D7091, Standard Practice for Nondestructive Measurement of Dry Film Thickness of Nonmagnetic Coatings Applied to Ferrous Metals and Nonmagnetic, Nonconductive Coatings Applied to Non-Ferrous Metals.
 - i. E337, Standard Test Method for Measuring Humidity with a Psychrometer (the Measurement of Wet- and Dry-Bulb Temperatures).
3. Environmental Protection Agency (EPA).
4. NACE International (NACE).
5. NSF International (NSF).
 - a. 61, Drinking Water System Components - Health Effects.
6. The Society for Protective Coatings (SSPC):
 - a. PA 2, Procedure for Determining Conformance to Dry Coating Thickness Requirements.
 - b. SP 1, Solvent Cleaning.
 - c. SP 2, Hand Tool Cleaning.

- d. SP 3, Power Tool Cleaning.
 - e. SP 16, Brush-off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals.
- 7. The Society for Protective Coatings/ NACE International (SSPC/ NACE):
 - a. SP 6/ NACE No. 3, Commercial Blast Cleaning.
 - b. SP 10/ NACE No. 2, Near-White Blast Cleaning.
- B. Qualifications:
 - 1. Coating manufacturer's technical representative shall be a NACE Certified Coatings Inspector, Level 3 minimum.
 - 2. Applicators shall have minimum of 10 years of experience in application of similar products on similar project.
 - a. Provide references for minimum of three different projects completed in last five years with similar scope of work.
 - b. Include name and address of project, size of project in value (coating) and contact person.
 - 3. NACE inspector shall be NACE Certified Coatings Inspector Level 3 minimum and shall have minimum of five years of experience of conducting inspections and tests as indicated in this Specification Section.
- C. Miscellaneous:
 - 1. Furnish coating through one manufacturer unless noted otherwise.
- D. Deviation from specified MIL thickness or product type is not allowed without written authorization of Engineer.
- E. Material shall not be thinned unless approved, in writing, by coating manufacturer's technical representative.

1.4 DEFINITIONS

- A. Applicator: Applicator is the person actually installing or applying the product in the field, at the Project site, or at an approved shop facility.
- B. Approved Factory Finish: Finish on a product in compliance with the finish specified in the Specification Section where the product is specified or in Specification Section 01 61 03.
- C. Appurtenant Surface: Accessory or auxiliary surface attached to or adjacent to a surface indicated to be coated.
- D. Corrosive Environment:
 - 1. Immersion in or subject to:
 - a. Condensation, spillage or splash of a corrosive material such as water, wastewater or chemical solution.
 - b. Exposure to corrosive caustic or acidic agent, chemicals, chemical fumes, chemical mixture, or solutions.
 - c. For purposes of this Specification Section, corrosive environments include:
 - 1) Outdoor areas not otherwise identified as highly corrosive.
 - 2) Piping galleries.
 - 3) Surfaces within 2 feet of high water level.
- E. Outdoor Atmosphere or Surface: Outdoor atmosphere or surface exposed to weather and/or direct sunlight.
- F. Finished Area: A room or area that is listed in or has finish called for on Room Finish Schedule or is indicated on Drawings to be coated.
- G. Holiday:

1. A void, crack, thin spot, foreign inclusion, or contamination in the coating that significantly lowers the dielectric strength of the coating.
 2. May also be identified as a discontinuity or pinhole.
- H. HPIC: High performance industrial coatings.
1. Epoxies, urethanes, vinyl ester, waterborne vinyl acrylic emulsions, acrylates, silicones, alkyds, acrylic emulsions and any other coating listed as a HPIC.
- I. Indoor Atmosphere or Surface: Indoor atmosphere or surface not exposed to weather and/or direct sunlight.
- J. Immersion Service:
1. Any surface immersed in water or some other liquid.
 2. Surface of any pipe, valve, or any other component of the piping system subject to frequent wetting.
 3. Surfaces within two feet above high water level in water bearing structures.
- K. Piping System: Pipe, valves, fittings and accessories.
- L. Surface Hidden from View:
1. Within pipe chases.
 2. Between top side of ceilings and underside of floor or roof structures above.
- M. Vapor Space: Interior space within tankage, closed structures, or similar elements that is above the low liquid line and subject to the accumulation of fumes, vapor and/or condensation.

1.5 SUBMITTALS

- A. Blasting Media. Include statement from manufacturer representative that the resulting profile from submitted blasting media will create an acceptable profile for the paint system chosen.
- B. Containment Plan: Submit written containment procedure for exterior surface preparations. Submit design of containment structure, prepared by a Professional Structural Engineer. Submittal should include brackets, reinforcing pads, roof 'tree' for bonnets, cabling, anchors, tarp and shroud materials, other coverings, dust and climate control where applicable, and clearly show any items proposed to be left in place on the tank or structure. Include process water containment. Review by Owner does not imply or warrant structural integrity of the system, tank or emission control ability.
- C. Plan for Forced Air Ventilation, Dehumidification, and Air Monitoring. Plan shall include locations of equipment, air exchange calculations and monitoring schedule.
- D. Waste Disposal Plan. Plan shall include disposal of paint, thinner, cleaning solvents, power water, and blasting abrasive debris.
- E. Certifications:
1. Certification that High Performance Coating Systems proposed for use have been reviewed and approved by a NACE Certified Coatings Inspector employed by the coating manufacturer.
- F. Shop Drawings:
1. Product technical data including:
 - a. Acknowledgement that products submitted meet requirements of standards referenced.
 - b. Manufacturer's surface preparation instructions.
 - c. Manufacturer's application instructions.
 - d. If products being used are manufactured by Company other than listed in the MATERIALS Article of this Specification Section, provide complete individual data sheet comparison of proposed products with specified products including:
 - 1) Application procedure.

- 2) Coverage rates.
 - 3) Certification that product is designed for intended use and is equal or superior to specified product.
- 2. Manufacturer's statement regarding applicator instruction on product use.
- G. Samples:
 - 1. Manufacturer's full line of colors for Owner's color selection.
- H. Informational Submittals:
 - 1. Approval of application equipment.
 - 2. Applicator's daily records:
 - a. Submit daily records at end of each week in which coating work is performed unless requested otherwise by Engineer's on-site representative.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver in original containers, labeled as follows:
 - 1. Name or type number of material.
 - 2. Manufacturer's name and item stock number.
 - 3. Contents, by volume, of major constituents.
 - 4. Warning labels.
 - 5. VOC content.
- B. Store materials in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 degrees F.

1.7 PROJECT CONDITIONS

- A. Pre-application Conference:
 - 1. Prior to commencement of surface preparation or coating application, the Contractor shall convene a pre-application conference with the applicator, the Owner, Owner's NACE inspector, and Engineer's representative.
 - 2. The meeting shall discuss all aspects of the Project including but not limited to:
 - a. Schedule.
 - b. Material storage and handling.
 - c. Examination of surfaces to be coated.
 - d. Protection of surfaces not to be coated.
 - e. Surface preparation.
 - f. Coating application:
 - 1) Environmental conditions for application of coatings.
 - 2) Temporary environmental controls.
 - g. Field quality control requirements:
 - 1) Manufacturer's technical representative responsibilities.
 - 2) Contractor performed testing.
 - a) Instrumentation requirements.
 - b) Frequency of testing.
 - c) Record keeping.
 - 3) NACE inspector performed testing.
- B. Verify that atmosphere in area where coating is to take place is within coating manufacturer's acceptable temperature, humidity and sun exposure limits.
 - 1. Provide temporary heating, shade and/or dehumidification as required to bring area within acceptable limits.

- a. Provide temporary dehumidification equipment properly sized to maintain humidity levels required by coating manufacturer.
2. Do not apply coatings in snow, rain, fog or mist.

PART 2 - PRODUCTS

2.1 CONTAINMENT MATERIAL

- A. Tank Shroud: A containment system as defined by SSPC-Guide 6 shall include the cover panels, screens, tarps, scaffolds, supports, and shrouds used to enclose an entire work area or a paint removal tool. Tarps shall be very resistant or impermeable, solid, flame-resistant, reinforced with a fiber mesh and allow as much light as possible to pass through material.
- B. Ground within Tank Shroud: Minimum of two layers of impermeable poly- sheeting or similar, and covered with 3/8-inch plywood or particleboard panels.
- C. Equipment: Equipment and accessories shall be covered, contained or otherwise protected from the work including dust, abrasives, paint overspray, and the like. Material coverings selection shall be per equipment to be protected and hazard.
- D. Water Containment: Water used for high pressure water cleaning shall be routed and contained with minimum of two layers of impermeable poly-sheeting or similar, and covered with 3/8-inch plywood or particleboard panels. Where berms are utilized, they shall be covered similarly.

2.2 DEHUMIDIFICATION, HEATERS, AND CLIMATE CONTROL EQUIPMENT

- A. Dehumidification equipment shall be:
 1. Manufactured by Munters Corporation or approved equal
 2. Solid desiccant design
 3. Fully automatic and rated for continuous operation, single rotary wheel design
- B. Heaters shall be:
 1. Be electric or indirect fired combustion. No direct-fired space heaters or propane, or salamander-type allowed.
 2. Have heater controls that automatically turn heater off if airflow or internal temperature exceeds heater or ductwork design requirements.

2.3 DUST CONTROL EQUIPMENT

- A. Air and Dust systems shall:
 1. Be required for exterior abrasive blast cleaning.
 2. Have monitoring system, such as ExactAir manufactured by Munters Corporation or approved equal, to provide continuously monitored dry bulb temperature, relative humidity, steel temperature and lead or other particulate as necessary.
 3. Supply a minimum of one complete air exchange every 120 minutes
 4. Dust Collection systems at a minimum shall meet the requirements of a Type J1 air filtration system per SSPC Guide 6.

2.4 WATER CLEANING EQUIPMENT

- A. High pressure water cleaning equipment shall be a commercial unit mounted on a skid, trailer or truck with dedicated generator (or Contractor-provided temporary electric service) capable of performing work outlined for this project.
- B. All equipment shall be dedicated for relatively clean or potable water applications unless previously commercially steam cleaned prior to arriving on site. Provide proof of cleaning.
- C. Hoses shall be clean of any silt or sediment or blasting media.
- D. Hoses shall be in good condition with no punctures or leaking joints.

- E. Hoses shall be rated for a minimum of 2.5 times the capability of the maximum- rated operating pressure of the cleaning equipment.

2.5 SEALANT AND CAULK

- A. Seam Sealer shall be Tnemec Series 215 Surfacing Epoxy or equal.
- B. For interior applications, sealant and caulks shall be ANSI/NSF-61 approved for contact with potable water.
- C. For exterior applications sealant /caulk shall be clear or color matching.

2.6 MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
 - 1. High Performance Industrial Coatings:
 - a. Tnemec.
 - b. Or equal.

2.7 MATERIALS

- A. General Requirements:
 - 1. Coatings shall comply with the VOC limits of the EPA.
 - 2. All materials shall be lead-free as defined by the Consumer Product Safety Act, Part 1303.
 - 3. All zinc dust pigment contained in any zinc-rich material shall meet the requirements of ASTM D520 Type III with regard to zinc content and purity.
 - 4. All materials for the interior wetted portion of the tank shall be NSF 61 rated.
 - 5. For unspecified materials such as thinner, provide manufacturer's recommended products.

2.8 COATING SYSTEMS:

- A. Tank Interior (NSF for Immersion Service)
 - 1. Surface Preparation
 - a. SSPC-SP10 Near-White Metal Blast Cleaning.
 - 1) Angular anchor profile of 1.5 mils per ASTM D4417, Method C or NACE Standard SP0287 is required.
 - b. Surface shall be clean, dry, and free of contaminants.
 - 2. Coating System:
 - a. First Coat:
 - 1) Tnemec Series 93-H20 Hydro-Zinc, or equal.
 - a) Application thickness: 2.5 – 3.5 dry mils
 - b) Thin only with approved thinner: Tnemec 41-2 Thinner, or equal.
 - b. Stripe Coat:
 - 1) Tnemec Series 21-color Epoxoline, or equal.
 - a) Application method: brush or roller to all weld seams, edges, corners, bolts, nuts, and other difficult to coat areas.
 - b) Thin only with approved thinner: Tnemec 41-88 Thinner, or equal.
 - c. Second Coat:
 - 1) Tnemec Series 21 Epoxoline, or equal.
 - a) Application thickness: 6.0 – 8.0 dry mils.
 - b) Thin only with approved thinner: Tnemec 41-88 Thinner, or equal.
 - d. Third Coat:
 - 1) Tnemec Series 21 Epoxoline, or equal.

- a) Application thickness: 6.0 – 8.0 dry mils.
 - b) Thin only with approved thinner: Tnemec 41-88 Thinner, or equal.
 - e. Total dry film thickness: 14.5 mils minimum.
- B. Tank Exterior**
- 1. Surface Preparation
 - a. SSPC-SP6 Commercial Blast Cleaning.
 - 1) Angular anchor profile of 1.5 mils per ASTM D4417, Method C or NACE Standard SP0287 is required.
 - 2. Coatings
 - a. First Coat:
 - 1) Tnemec Series 93-H20 Hydro-Zinc, or equal.
 - a) Application thickness: 2.5 – 3.5 dry mils
 - b) Thin only with approved thinner: Tnemec 41-2 Thinner, or equal.
 - b. Second Coat:
 - 1) Tnemec Series 1095 Endura-Shield, or equal.
 - a) Application thickness: 2.0 – 3.0 dry mils.
 - b) Thin only with approved thinner: Tnemec 41-10 Thinner or equal.
 - c. Third Coat:
 - 1) Tnemec Series 700 Hydroflon, or equal.
 - a) Application thickness: 2.0 – 3.0 dry mils.
 - b) Thin only with approved liner: Tnemec 41-63 Thinner, or equal.
 - d. Logo(s):
 - 1) Tnemec Series 700 Hydroflon, or equal.
 - a) Application thickness: 2.0 – 3.0 dry mils.
 - b) Thin only with approved liner: Tnemec 41-63 Thinner, or equal.
 - e. Total dry film thickness: 6.5 mils minimum.

PART 3 - EXECUTION

3.1 PRE-APPLICATION MEETING

- A. A meeting shall be scheduled by Contractor a minimum of two working days prior to planned field painting activities.
- B. Meeting shall include the Owner, Owner's Inspector, Painting Contractor and Coating Manufacturer's representative.
- C. Meeting agenda shall include review of contract documents and shop drawings, environmental requirements, work day and hours, inspection requirements, application procedures, surface conditions and surface preparation and recoat and curing.

3.2 CONTAINMENT

- A. Contractor shall not cause or allow the discharge of visible fugitive dust emission beyond the property.
- B. Contractor shall adhere to all local, state and federal regulations for air pollution control.
- C. Containment system shall be designed for minimum 50 miles per hour.
- D. Adequate lighting, natural or electric, shall be included in the design of containment system.
- E. Provide water containment per plan.

3.3 SURFACE PREPARATION

- A. General:

1. Prepare surfaces to be coated in accordance with coating manufacturer's instructions and this Specification Section unless noted otherwise in this Specification Section.
 - a. Where discrepancy between coating manufacturer's instructions and this Specification Section exists, the more stringent surface preparation shall be provided unless approved otherwise, in writing, by the Engineer.
 2. Remove all dust, grease, oil, compounds, dirt and other foreign matter which would prevent bonding of coating to surface.
 3. Adhere to manufacturer's recoat time surface preparation requirements.
 - a. Surfaces that have exceeded coating manufacturer's published recoat time and/or have exhibited surface chalking shall be prepared prior to additional coating in accordance with manufacturer's published recommendations.
- B. Protection:
1. Protect surrounding surfaces not to be coated.
 2. Remove and protect hardware, accessories, plates, fixtures, finished work, and similar items; or provide ample in-place protection.
 3. Protect code labels, equipment identification or rating plates and similar labels, tagging and identification.
- C. Prepare and coat before assembly all surfaces which are inaccessible after assembly.
1. Complete fabrication, welding or burning before beginning surface preparation.
 - a. Chip or grind off flux, spatter, slag or other laminations left from welding.
 - b. Remove mill scale.
 - c. Grind smooth rough welds and other sharp projections.
 2. Solvent clean in accordance with SSPC-SP 1.
 3. Restore surface of field welds and adjacent areas to original surface preparation.
- D. Galvanized Steel and Non-ferrous Metals:
1. Solvent clean in accordance with SSPC-SP 1 followed by brush-off blast clean in accordance with SSPC-SP 16 to remove zinc oxide and other foreign contaminants.
 - a. Provide uniform 1 mil profile surface.

3.4 APPLICATION

- A. General:
1. Thin, mix and apply coatings by brush, roller, or spray in accordance with manufacturer's installation instructions.
 - a. Application equipment must be inspected and approved in writing by coating manufacturer.
 2. Temperature and weather conditions:
 - a. Do not coat surfaces when surface temperature is below 50 degrees F unless product has been formulated specifically for low temperature application and application is approved in writing by Engineer and coating manufacturer's technical representative.
 - b. Avoid coating surfaces exposed to hot sun.
 - c. Do not coat damp surfaces.
 - d. Apply coating to concrete or masonry surfaces in descending temperatures, in accordance with coating manufacturer's application instructions.
 3. Apply materials under adequate illumination.
 4. Provide complete coverage to MIL thickness specified.
 - a. Thickness specified is dry MIL thickness.
 5. Evenly spread to provide full, smooth coverage.
 - a. All coating systems are "to cover."

- 1) In situations of discrepancy between manufacturer's square footage coverage rates and MIL thickness, MIL thickness requirements govern.
- b. When color or undercoats show through, apply additional coats until coating is of uniform finish and color.
- c. Finished coating system shall be uniform and without voids, bugholes, holidays, laps, brush marks, roller marks, runs, sags or other imperfections.
6. If so directed by Owner's NACE Inspector or Engineer, do not apply consecutive coats until Owner's NACE Inspector has had an opportunity to observe and approve previous coats.
7. Work each application of material into corners, crevices, joints, and other difficult to work areas.
8. Provide coating manufacturer's recommended details at all terminations, penetrations, embedments, cracks, joints and changes in substrate direction.
9. Avoid degradation and contamination of blasted surfaces and avoid inter-coat contamination.
 - a. Clean contaminated surfaces before applying next coat.
 - b. Intercoat surface cleanliness shall be inspected and approved by the Engineer prior to application of each coat.
10. Smooth out runs or sags immediately, or remove and recoat entire surface.
11. Allow preceding coats to dry before recoating.
 - a. Recoat within time limits specified by coating manufacturer.
 - b. If recoat time limits have expired re-prepare surface in accordance with coating manufacturer's printed recommendations.
- B. Employ services of coating manufacturer's technical representative to ensure that field-applied coatings are compatible with factory-applied or existing coatings.
 1. Certify through material data sheets.
 2. Perform test patch.
 - a. Prepare existing coating surface to receive specified coating system.
 - b. Apply coating to a minimum 1 square foot area and allow to cure in accordance with manufacturer's recommendations.
 - c. Evaluate adhesion to existing coating:
 - 1) Concrete or Masonry substrates: ASTM D4541.
 - 2) All other substrates: ASTM D6677 and ASTM D3359 (X-cut method).
 3. If field-applied coating is found to be not compatible, require the coating manufacturer's technical representative to recommend, in writing, product to be used as barrier coat, thickness to be applied, surface preparation and method of application.
 - a. Perform test patch as described above.
 4. At Contractor's option, coatings may be removed, surface re-prepared, and new coating applied using appropriate coating system listed in the MATERIALS Article, Coating Systems paragraph of this Specification Section.
 - a. All damage to surface as result of coating removal shall be repaired to original condition or better by Contractor at no additional cost to Owner.
- C. Prime Coat Application:
 1. Apply structural steel and miscellaneous steel prime coat to exterior corrosion areas prepared by power washing (3,000 psi min).
 2. Prime all surfaces indicated to be coated.
 - a. Apply prime coat in accordance with coating manufacturer's written instructions and as written in this Specification Section.
 3. Prime ferrous metals embedded in concrete to minimum of 1 inch below exposed surfaces.

4. Brush or spray bolts, welds, edges and difficult access areas with primer prior to primer application over entire surface.
 5. Touch up damaged primer coats prior to applying finish coats.
 - a. Restore primed surface equal to surface before damage.
- D. Finish Coat Application:
1. Apply finish coats in accordance with coating manufacturer's written instructions and in accordance with this Specification Section; manufacturer instructions take precedent over these Specifications.
 2. Touch up damaged finish coats using same application method and same material specified for finish coat.
 - a. Prepare damaged area in accordance with the PREPARATION Article of this Specification Section.

3.5 COLOR CODING

- A. Match existing tank coating color. Contractor shall verify existing color before ordering new coating.

3.6 FIELD QUALITY CONTROL

- A. Application Deficiencies:
1. Surfaces showing runs, laps, brush marks, telegraphing of surface imperfections or other defects will not be accepted.
 2. Surfaces showing evidence of fading, chalking, blistering, delamination or other defects due to improper surface preparation, environmental controls or application will not be accepted.
 - a. Epoxy surfaces showing evidence of chalking or amine blush shall be prepared and recoated as follows:
 - 1) Solvent clean surfaces in accordance with SSPC-SP1 and abrasive blast in accordance with SSPC-SP7/ NACE No. 4.
 - 2) Recoat with intermediate and finish coats in accordance with coating system specified herein.
- B. Provide protection for coated surfaces.
1. Surfaces showing soiling, staining, streaking, chipping, scratches, or other defects will not be accepted.
- C. NACE inspection:
1. The Contractor will retain a NACE Level 3 coating inspector.
 - a. All work shall be done to the satisfaction of the Owner's inspector.
 - b. Any portion of the coating that does not satisfactorily pass the inspection and testing requirements shall be repaired or replaced by the Contractor at no additional cost to the Owner.
 - c. Additional testing and/or inspection may be done at the discretion of the Owner.
 - 1) The Contractor will provide all equipment, materials, and labor to perform the testing.
 2. Inspection, testing or observation by the Owner's inspector shall not relieve the Contractor of responsibility for surface preparation, inspection or quality control specified herein.
- D. Instrumentation:
1. Provide instrumentation as necessary to measure and record atmospheric and substrate conditions, including but not limited to:
 - a. Dry Film Thickness Gauge:
 - 1) Ultrasonic: ASTM D6132.
 - 2) Magnetic: ASTM B499.

- b. Wet Film Thickness Gauge: ASTM D4414.
 - c. Sling Psychrometer: ASTM E337.
 - d. Surface Temperature Gauge.
 - e. Anemometer.
 - f. Moisture Meter.
 - g. Adhesion test apparatus:
 - 1) Steel: ASTM D4541.
 - 2) Concrete: ASTM D7234.
- E. Maintain Daily Records:
- 1. Record the following information during application:
 - a. Date, starting time, end time, and all breaks taken by applicators.
 - b. Air temperature.
 - c. Relative humidity.
 - d. Dew point.
 - e. Moisture content and pH level of concrete or masonry substrates prior to coating.
 - f. Surface temperature of substrate.
 - g. For outdoor coating, also record:
 - 1) Sky condition.
 - 2) Wind speed and direction.
 - h. Record environmental conditions, substrate moisture content and surface temperature information not less than once every 4 hours during application.
 - 1) Record hourly when temperatures are below 50 degrees F or above 100 degrees F.
 - 2. Record the following information daily for the coating manufacturer's recommended curing period:
 - a. Date and start time of cure period for each item or area.
 - b. For outdoor coating, also record:
 - 1) Sky conditions.
 - 2) Wind speed and direction.
 - 3) Air temperature.
 - 4) Relative humidity.
 - 5) Dew point.
 - 6) Surface temperatures.
 - c. Record environmental conditions not less than once every 4 hours.
 - 1) Record hourly when temperatures are below 50 degrees F or above 100 degrees F.
 - d. Provisions utilized to protect each item or area and to maintain areas within manufacturer's recommended curing parameters.

3.7 SEALANT AND CAULK APPLICATION

- A. After cleaning and primer application, seam seal shall be applied to roof penetrations, as necessary to seal from moisture.
- B. After finish coat, apply sealant to all interior unwelded lap seams, connections, crevices and voids located above the overflow level to prevent corrosion and staining.
- C. Exterior openings between non-ferrous metal surfaces, and concrete be sealed with watertight caulk.

3.8 WASTE DISPOSAL

- A. Contractor shall adhere to the approved waste disposal plan.

3.9 CLEANING

- A. Clean coating spattered surfaces.
 - 1. Use care not to damage finished surfaces.
- B. Upon completion of coating, replace hardware, accessories, plates, fixtures, and similar items.
- C. Remove surplus materials, scaffolding, and debris.

END OF SECTION

SECTION 10 14 00
IDENTIFICATION DEVICES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Identification Tape for piping.
 - 2. Tag, tape and stenciling systems for equipment, piping, valves, pumps, ductwork and similar items.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Section 40 05 01 – Common Work Results for Process Piping

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. American Society of Mechanical Engineers (ASME):
 - a. A13.1, Scheme for the Identification of Piping Systems.
 - 2. National Electrical Manufacturers Association/American National Standards Institute (NEMA/ANSI):
 - a. Z535.1, Safety Color Code.
 - b. Z535.2, Environmental and Facility Safety Signs.
 - c. Z535.3, Criteria for Safety Symbols.
 - d. Z535.4, Product Safety Signs and Labels.
 - 3. Occupational Safety and Health Administration (OSHA):
 - a. 29 CFR 1910.145, Specification for Accident Prevention Signs and Tags.

1.3 SUBMITTALS

- A. Shop Drawings:
 - 1. Product technical data including:
 - a. Catalog information for all identification systems.
 - b. Acknowledgement that products submitted meet requirements of standards referenced.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
 - 1. W.H. Brady Co.
 - 2. Panduit.
 - 3. Seton.
 - 4. National Band and Tag Co.
 - 5. Carlton Industries, Inc.
 - 6. Or equal.

2.2 MANUFACTURED UNITS

A. Type F - Underground Warning Tape:

1. Materials: Polyethylene.
2. Size:
 - a. 6 inches wide (minimum).
 - b. Thickness: 3.5 mils.
3. Fabrication:
 - a. Legend: Preprinted and permanently imbedded.
 - b. Message continuous printed.
 - c. Tensile strength: 1750 psi.
4. Color: As specified.

B. Underground Tracer Wire:

1. Materials:
 - a. Wire:
 - 1) 12 GA AWG.
 - 2) Solid.
 - b. Wire nuts: Waterproof type.
 - c. Split bolts: Brass.

2.3 ACCESSORIES

A. Fasteners:

1. Bead chain: #6 brass, aluminum or stainless steel.
2. Plastic strap: Nylon, urethane or polypropylene.
3. Screws: Self-tapping, stainless steel.
4. Adhesive, solvent activated.

2.4 MAINTENANCE MATERIALS

- A. Where stenciled markers are provided, clean and retain stencils after completion and include in extra stock, along with required stock of paints and applicators.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION

- A. Install identification devices at specified locations.
- B. All identification devices to be printed by mechanical process, hand printing is not acceptable.
- C. Tracer Wire:
 1. Attach to pipe at a maximum of 10 feet intervals with tape or tie-wraps.
 2. Continuous pass from each valve box and above grade at each structure.
 3. Coil enough wire at each valve box to extend wire a foot above the ground surface.
 4. 1,000 feet maximum spacing between valve boxes.
 5. If split bolts are used for splicing, wrap with electrical tape.
 6. If wire nuts are used for splicing, knot wire at each splice point leaving 6 inches of wire for splicing.
 7. Use continuous strand of wire between valve box where possible.
 - a. Continuous length shall be no shorter than 100 feet.

END OF SECTION

DIVISION 26

ELECTRICAL



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SECTION 26 05 00
COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Basic requirements for electrical systems.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Division 03 - Concrete.
 - 2. Section 26 05 09 - Motors
 - 3. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables.
 - 4. Section 26 05 26 – Grounding and Bonding
 - 5. Section 26 05 33 - Raceways and Boxes.
 - 6. Section 26 08 13 – Acceptance Testing

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. Aluminum Association (AA):
 - a. ADM, Aluminum Design Manual.
 - 2. American Institute of Steel Construction (AISC):
 - a. Steel Construction Manual.
 - 3. American National Standards Institute (ANSI).
 - 4. ASTM International (ASTM):
 - a. A36/A36M, Standard Specification for Carbon Structural Steel.
 - b. A123/A123M, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - c. A153/A153M, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - 5. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
 - a. C2, National Electrical Safety Code (NESC).
 - 6. National Fire Protection Association (NFPA):
 - a. 70, National Electrical Code (NEC).
 - 7. National Electrical Manufacturers Association (NEMA):
 - a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
 - 8. Underwriters Laboratories, Inc. (UL).
- B. Products to be listed by a Nationally Recognized Testing Laboratory (NRTL) in accordance with applicable product standards.
 - 1. Applicable product standards including, but not limited to, ANSI, FM, IEEE, NEMA and UL.
 - 2. NRTL includes, but is not limited to, CSA Group Testing and Certification (CS), FM Approvals LLC (FM), Intertek Testing Services NA, Inc. (ETL), and Underwriters Laboratories, Inc. (UL).

1.3 DEFINITIONS

- A. For the purposes of providing materials and installing electrical work the following definitions shall be used.

1. Outdoor area: Exterior locations where the equipment is normally exposed to the weather and including below grade structures, such as vaults, manholes, handholes and in-ground pump stations.
2. Architecturally finished interior area: Offices, laboratories, conference rooms, restrooms, corridors and other similar occupied spaces.
3. Non-architecturally finished interior area: Pump, chemical, mechanical, electrical rooms and other similar process type rooms.
4. Shop fabricated: Manufactured or assembled equipment for which a UL test procedure has not been established.

1.4 SUBMITTALS

A. Shop Drawings:

1. See Specification Section 01 61 03 and individual specification sections for submittal requirements for products defined as equipment.
2. General requirements:
 - a. Provide manufacturer's technical information on products to be used, including product descriptive bulletin.
 - b. Include data sheets that include manufacturer's name and product model number.
 - 1) Clearly identify all optional accessories.
 - c. Acknowledgement that products are NRTL listed or are constructed utilizing NRTL recognized components.
 - d. Manufacturer's delivery, storage, handling and installation instructions.
 - e. Product installation details.
 - f. Short Circuit Current Rating (SCCR) nameplate marking per NFPA 70, include any required calculations.
 - g. See individual specification sections for any additional requirements.
3. Product technical data:
 - a. Provide submittal data for all products specified in PART 2 of this Specification Section.
 - b. Provide submittal data for the following items specified on the Drawings:
 - 1)
 - 2)
4. Fabrication and/or layout drawings:
 - a. Concrete and reinforcing steel, per Division 03 requirements.
 - b. Provide a conductor identification schedule for all power, control, communication and protective circuits.
 - 1) Schedule to include the following information:
 - a) Conductor identification number.
 - b) Conductor size.
 - c) Number of conductors.
 - d) Type of conductor.
 - e) Size of conductor.
 - f) Size of conductor usage descriptions.
 - g) Conductor run (to and from).
 - h) Conduit size and type.

B. Operation and Maintenance Manuals:

1. See Specification Section 01 78 23 for requirements for:
 - a. The mechanics and administration of the submittal process.
 - b. The content process of Operation and Maintenance Manuals.

- C. When a Specification Section includes products specified in another Specification Section, each Specification Section shall have the required Shop Drawing transmittal form per Specification Section 01 33 00 and all Specification Sections shall be submitted simultaneously.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect nameplates on electrical equipment to prevent defacing.

1.6 AREA DESIGNATIONS

- A. Designation of an area will determine the NEMA rating of the electrical equipment enclosures, types of conduits and installation methods to be used in that area.
1. Outdoor areas:
 - a. Wet.
 - b. Also, corrosive and/or hazardous when specifically designated on the Drawings or in the Specifications.
 2. Indoor areas:
 - a. Dry.
 - b. Also, wet, corrosive and/or hazardous when specifically designated on the Drawings or in the Specifications.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Contract Documents, refer to specific Electrical Specification Sections and specific material paragraphs below for acceptable manufacturers.
- B. Provide all components of a similar type by one (1) manufacturer.

2.2 MATERIALS

- A. Electrical Equipment Support Pedestals and/or Racks:
1. Manufacturers:
 - a. Modular strut:
 - 1) Unistrut Building Systems.
 - 2) B-Line by Eaton.
 - 3) Globe Strut.
 - 4) Superstrut by Thomas & Betts.
 2. Material requirements:
 - a. Modular strut:
 - 1) Galvanized steel: ASTM A123/123M or ASTM A153/A153M.
 - 2) Stainless steel: AISI Type 316.
 - 3) PVC coated galvanized steel: ASTM A123/A123M or ASTM A153/A153M and 20 mil PVC coating.
 - 4) Aluminum: AA Type 6063-T6.
 - b. Structural members (e.g., I beams, L and C channels):
 - 1) Galvanized steel: ASTM A36/A36M steel with galvanizing per ASTM A123/A123M.
 - 2) Aluminum: AA Type 6061-T6 or 6063-T6.
 - c. Mounting plates:
 - 1) Galvanized steel: ASTM A36/A36M steel with galvanizing per ASTM A123/A123M.
 - 2) Aluminum: AA Type 6063-T6.
 - d. Mounting hardware:
 - 1) Galvanized steel.
 - 2) Stainless steel.

- e. Anchorage per Specification Section 03 15 19.
 - f. Concrete and reinforcing steel: See Division 03 specifications.
- B. Equipment pads (interior and exterior):
 - 1. Concrete and reinforcing steel: See Division 03 specifications.
- C. Field touch-up of galvanized surfaces.
 - 1. Zinc-rich primer.
 - a. One coat, 3.0 mils, ZRC by ZRC Products.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install and wire all equipment, including prepurchased equipment, and perform all tests necessary to assure conformance to the Drawings and Specification Sections and ensure that equipment is ready and safe for energization.
- B. Install equipment in accordance with the requirements of:
 - 1. NFPA 70.
 - 2. IEEE C2.
 - 3. The manufacturer's instructions.
- C. In general, conduit routing is not shown on the Drawings.
 - 1. The Contractor is responsible for routing all conduits including those shown on one-line and control block diagrams and home runs shown on floor plans.
 - 2. Conduit routings and stub-up locations that are shown are approximate; exact routing to be as required for equipment furnished and field conditions.
- D. When complete branch circuiting is not shown on the Drawings:
 - 1. A homerun indicating panelboard name and circuit number will be shown and the circuit number will be shown adjacent to the additional devices (e.g., light fixture and receptacles) on the same circuit.
 - 2. The Contractor is to furnish and install all conduit and conductors required for proper operation of the circuit.
 - 3. The indicated home run conduit and conductor size shall be used for the entire branch circuit.
 - 4. See Section 26 05 19 for combining multiple branch circuits in a common conduit.
- E. Do not use equipment that exceed dimensions or reduce clearances indicated on the Drawings or as required by the NFPA 70.
- F. Install equipment plumb, square and true with construction features and securely fastened.
- G. Install electrical equipment, including pull and junction boxes, minimum of 6 inches from process, gas, air and water piping and equipment.
- H. Install equipment so it is readily accessible for operation and maintenance, is not blocked or concealed and does not interfere with normal operation and maintenance requirements of other equipment.
- I. Device Mounting Schedule:
 - 1. Unless indicated otherwise on the Drawings, mounting heights are as indicated below:
 - a. Light switch (to center): 46 inches.
 - b. Receptacle in architecturally finished areas (to center): 18 inches.
 - c. Receptacle on exterior wall of building (to center): 18 inches.
 - d. Receptacle in non-architecturally finished areas (to center): 46 inches.

- e. Telephone outlet in architecturally finished areas (to center): 18 inches.
 - f. Telephone outlet for wall-mounted phone (to center): 46 inches.
 - g. Safety switch (to center of operating handle): 54 inches.
 - h. Separately mounted motor starter (to center of operating handle): 54 inches.
 - i. Pushbutton or selector switch control station (to center): 46 inches.
 - j. Panelboard (to top): 72 inches.
- J. Avoid interference of electrical equipment operation and maintenance with structural members, building features and equipment of other trades.
 - 1. When it is necessary to adjust the intended location of electrical equipment, unless specifically dimensioned or detailed, the Contractor may make adjustments of up to 6 inches in equipment location with the Engineer's approval.
- K. Provide electrical equipment support system per the following area designations:
 - 1. Dry areas:
 - a. Galvanized system consisting of galvanized steel channels and fittings, nuts and hardware.
 - b. Field touch-up cut ends and scratches of galvanized components with the specified primer during the installation, before rust appears.
 - 2. Wet areas:
 - a. Galvanized system consisting of galvanized steel channels and fittings, nuts and hardware.
 - b. Field touch-up cut ends and scratches of galvanized components with the specified primer during the installation, before rust appears.
 - 3. Corrosive areas:
 - a. Aluminum system consisting of aluminum channels and fittings with stainless steel nuts and hardware.
- L. Provide all necessary anchoring devices and supports rated for the equipment load based on dimensions and weights verified from approved submittals, or as recommended by the manufacturer.
 - 1. See Specification Section 03 15 19.
 - 2. Do not cut, or weld to, building structural members.
 - 3. Do not mount safety switches or other equipment to equipment enclosures, unless enclosure mounting surface is properly braced to accept mounting of external equipment.
- M. Provide non-metallic corrosion resistant spacers to maintain 1/4 inches separation between metallic equipment and/or metallic equipment supports and mounting surface in wet areas, on below grade walls and on walls of liquid containment or processing areas such as Basins, Clarifiers, Digesters, Reservoirs, etc.
- N. Do not place equipment fabricated from aluminum in direct contact with earth or concrete.
- O. Screen or seal all openings into equipment mounted outdoors to prevent the entrance of rodents and insects.
- P. Do not use materials that may cause the walls or roof of a building to discolor or rust.
- Q. Identify electrical equipment and components in accordance with Specification Section 10 14 00.
- R. Provide field markings and/or documentation of available short-circuit current (available fault current) and related information for equipment as required by the NFPA 70 and other applicable codes.
- S. Provide equipment or control panels with Short Circuit Current Rating (SCCR) labeling as required by NFPA 70 and other applicable codes.

1. Determine the SCCR rating by one of the following methods:
 - a. Method 1: SCCR rating meets or exceeds the available fault current of the source equipment when indicated on the Drawings.
 - b. Method 2: SCCR rating meets or exceeds the source equipment's Amp Interrupting Current (AIC) rating as indicated on the Drawings.
2. The source equipment is the switchboard, panelboard, motor control center or similar equipment where the equipment or control panel circuit originates.

3.2 FIELD QUALITY CONTROL

- A. Verify exact rough-in location and dimensions for connection to electrified equipment, provided by others.
 1. See Specification Section 01 73 20 for openings and penetrations in structures.
- B. Replace equipment and systems found inoperative or defective and re-test.
- C. Cleaning:
 1. See Specification Section 01 74 00.
- D. The protective coating integrity of support structures and equipment enclosures shall be maintained.
 1. Repair galvanized components utilizing a zinc rich paint.
 2. Repair painted components utilizing touch up paint provided by or approved by the manufacturer.
 3. Repair PVC coated components utilizing a patching compound, of the same material as the coating, provided by the manufacturer of the component.
 4. Repair surfaces which will be inaccessible after installation prior to installation.
 5. See Specification Section 26 05 33 for requirements for conduits and associated accessories.
- E. Replace nameplates damaged during installation.

3.3 DEMONSTRATION

- A. Demonstrate equipment in accordance with Specification Section 01 75 00.

END OF SECTION

SECTION 26 05 09

MOTORS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Induction motors.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Section 01 61 03 - Equipment - Basic Requirements.
 - 2. Section 26 05 26 - Grounding.
 - 3. Section 26 08 13 - Acceptance Testing.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. American Bearing Manufacturers Association (ABMA).
 - 2. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
 - a. 841, Standard for Petroleum and Chemical Industry - Premium-Efficiency, Severe-Duty, Totally-Enclosed Fan-Cooled (TEFC) Squirrel Cage Induction Motors - Up To and Including 370 kW (500 hp).
 - 3. National Electrical Manufacturers Association (NEMA):
 - a. MG 1, Motors and Generators.
 - 4. National Fire Protection Association (NFPA):
 - a. 70, National Electrical Code (NEC).
- B. Miscellaneous:
 - 1. When motors are furnished with driven equipment, the driven equipment supplier shall be responsible for assembling the motor and driven equipment as a complete unit, correctly aligned and coupled with the coupling or sheave specified on the driven equipment data sheet, and designing for vibration, special, or unbalanced forces resulting from equipment operation.
 - a. See Specification Section 01 61 03 for requirements.
 - 2. Variable speed equipment applications: The driven equipment manufacturer shall have single source responsibility for coordination of the equipment and VFD system and ensure their compatibility.

1.3 DEFINITIONS

- A. Inverter Duty Motor: An AC induction motor complying with all requirements of NEMA MG 1 Part 31 for definite-purpose inverter-fed motors.
- B. Abbreviations:
 - 1. DPGF - Dripproof Fully Guarded.
 - 2. ODP - Open Dripproof.
 - 3. RTD - Resistance Temperature Detector.
 - 4. TEFC - Totally Enclosed Fan Cooled.
 - 5. WP-I - Weather Protected Type I.
 - 6. WP-II - Weather Protected Type II.
 - 7. Motor controllers:
 - a. FVNR - Full Voltage Non-Reversing.

- b. RVSS - Reduced Voltage Solid State.
- c. VFD - Variable Frequency Drive.

1.4 SUBMITTALS

A. Shop Drawings:

1. Product technical data:
 - a. Identify each motor by driven machine identification.
 - b. Motor manufacturer and model number.
 - c. Complete motor nameplate data.
 - d. Weight.
 - e. NEMA design type.
 - f. Enclosure type.
 - g. Frame size.
 - h. Winding insulation class and temperature rise.
 - i. Starts per hour.
 - j. Performance data:
 - 1) Motor speed-torque curve superimposed over driven machine speed-torque curve during start-up acceleration and at rated terminal voltage and minimum permissible or specified terminal voltage for all motors over 25HP.
 - 2) Time-current plots with acceleration verses current and thermal damage curves at the operating and ambient temperatures and at rated terminal voltage and minimum permissible or specified terminal voltage for all motors over 25HP.
 - 3) Guaranteed minimum efficiencies at 100%, 75% and 50% of full load.
 - 4) Guaranteed minimum power factor at 100%, 75% and 50% of full load.
 - 5) Locked rotor and full load current at rated terminal voltage and minimum permissible or specified terminal voltage.
 - 6) Starting, full load and breakdown torque at rated terminal voltage and minimum permissible or specified terminal voltage.
 - 7) Hot and cold stall time damage points all motors over 20HP.
 - k. Bearing data and lubrication system.
 - l. Thermal protection system including recommended alarm and trip settings for winding and bearing RTDs.
 - m. Recommended size of power factor correction capacitors to improve power factor to 0.95 lagging when operated at full load.
2. Fabrication and/or layout drawings:
 - a. Dimensioned outline Drawing.
 - b. Connection diagrams including accessories (strip heaters, thermal protection, etc.).
3. Certifications:
 - a. When utilized with a reduced voltage starter, certify that motor and driven equipment are compatible.
4. Test reports:
 - a. Motor test reports for all testing required in this Specification Section.

B. Contract Closeout Information:

1. Operation and Maintenance Data:
 - a. See Specification Section 01 78 23 for requirements for the mechanics, administration, and the content of Operation and Maintenance Manual submittals.
2. Installation instructions.
3. Operation and maintenance instructions.

4. Recommended spare parts list.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect equipment during shipment, handling, and storage by suitable boxes, crates, or other complete enclosures.
 1. Protect equipment from exposure to elements and keep thoroughly dry.
- B. Protect painted surfaces against impact, abrasion, discoloration, and other damage.
 1. Repaint damaged painted surfaces to satisfaction of Engineer.
- C. Store all motors in a clean and dry indoor location until final installation.
- D. Where space heaters are provided in motors, provide temporary electrical power and operate heaters during storage and after motors are installed in permanent location until equipment is placed in service.
- E. For storage longer than one month, see manufacturer's storage instructions.

1.6 SITE CONDITIONS

- A. Ambient air temperature: 104DEGF.
- B. Altitude: 500feet above sea level.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
 1. ABB Baldor-Reliance.
 2. General Electric.
 3. Hyundai Heavy Industries.
 4. Marathon.
 5. Siemens.
 6. TECO-Westinghouse Motor Company.
 7. Toshiba U.S.
 8. Toshiba Mitsubishi-Electric Industrial Systems Corporation (TMEIC).
 9. U.S. Motors by Nidec Motor Corporation.
 10. WEG.
 11. Or Engineer approved equal.

2.2 EQUIPMENT

- A. General Requirements:
 1. Standards: NEMA MG 1.
 2. Identify each motor by the driven machine identification.
 3. An embossed or engraved stainless steel nameplate, with the required NFPA 70 and NEMA data, to be permanently attached to the motor.
 4. Maximum motor loading shall not exceed motor nameplate horsepower rating, exclusive of service factor.
 5. All motors shall be sized to carry continuously all loads, which may be imposed through their full range of operation.
 6. Altitude: For applications above 3300 feet, motors to be specifically designed and certified for operation at the specified altitude.
 7. NEMA MG 1, Design B (unless otherwise required), constant speed squirrel-cage induction type having normal starting torque with low starting current.

8. Suitable for the starting method indicated (e.g., full voltage, autotransformer, solid state reduced voltage, VFD, etc.).
9. Where frequent starting occurs, design for frequent starting duty equivalent to duty service required by driven equipment.
10. Lifting devices: Motors weighing 265 pounds or more shall have suitable lifting eyes for installation and removal.
11. Grounding:
 - a. Lug suitable to terminate ground wire in terminal box, sized as indicated on the Drawings.
 - b. Frame ground pad on medium voltage induction motors.
12. Stator windings: Copper.
13. Rotor cage: Aluminum or copper.
14. Motor leads shall be non-wicking with permanent identifiers.
15. Totally enclosed motor to have one-way breather drains.
16. Efficiency:
 - a. Meet NEMA MG 1 (NEMA Premium) efficiencies.
 - b. If motor type, horsepower or speed is not included in the NEMA requirements for NEMA Premium, provide manufacturers "premium energy efficient" design.
17. Power factor:
 - a. Minimum of 80% lagging at full load, except on motors with speed slower than 900 rpm.
 - b. Power factor correction capacitors to be utilized when indicated on the Drawings.
18. Service factor:
 - a. 100 hp or less: 1.15.
 - b. Greater than 100 hp: 1.0 unless noted otherwise.
 - c. Inverter duty: 1.0.
19. Standards: NEMA MG 1 .

2.3 INDUCTION MOTORS, 600 VOLT AND LESS

A. Horizontal Shaft:

1. Electrical rating:
 - a. Appropriate for the voltage system indicated, 3 PH, 60 Hz.
2. Enclosure:
 - a. Cast iron (exception: fan covers can be steel).
 - b. Type: DPGF, TEFC.
3. Terminal box:
 - a. Gasketed.
 - b. Diagonally split.
 - c. Field adjustable in 90 degrees increments.
 - d. Oversized to accept the required conductors and conduits.
 - e. Located on "F1" side unless specifically indicated to be on the "F2" side.
 - f. Separate terminal box with terminal blocks for winding thermal protection devices (RTD and thermocouples). Condulets with terminal blocks at bearing thermal protection devices.
4. Bearings:
 - a. 5 hp and less: Lubricated-for-Life ball bearings.
 - b. Greater than 5 hp:
 - 1) Relubricatable.
 - 2) Antifriction.

- 3) Minimum rated ABMA L-10 life of 10 years or 100,000 hours.
5. Insulation:
 - a. Class F insulation with Class B temperature rise.
 - b. Dipped and baked with non-hydroscopic varnish or epoxy.
6. Accessories: See the ACCESSORIES Article in PART 2 and the SCHEDULES Article in PART 3.
7. Modifications:
 - a. Inverter duty:
 - 1) At a minimum, applied to motors connected to a VFD.
 - 2) Windings insulated for 1600 peak volts and voltage rise times of 0.1 microseconds.
 - 3) Nameplate identification of meeting NEMA MG 1 Part 31 requirements.
 - 4) Have the following minimum turndown ratio without the use of a blower to provide continuous supply of cooling air over the motor.
 - a) Variable torque: 10:1.
 - b) Constant torque: 6:1.
 - 5) Insulated drive end bearing on all motors.
 - 6) Motors 100 hp and larger, insulated non-drive and bearings.
 - 7) Shaft grounding ring on all motors:
 - a) Factory installed, maintenance free, circumferential, bearing protection ring with conductive microfiber shaft contacting material.
 - b) Electro Static Technology AEGIS SGR Bearing Protection Ring or approved equal.
 - b. Severe duty:
 - 1) Standard: IEEE 841.
 - 2) All cast iron enclosure.
 - 3) Terminal box threaded and gasketed.
 - 4) Internal and external epoxy base paint system.
 - 5) Drain and breather.

2.4 ACCESSORIES

- A. Thermal Protection:
 1. Thermostats:
 - a. One winding thermostat per phase for shutdown.
 - b. .
 - c. Snap action, bi-metallic, temperature-actuated switch type.
 - d. Normally closed, wired in series.
 - e. Automatic reset.
 - f. Switch point shall be pre-calibrated by the manufacturer.
- B. Space Heaters:
 1. Silicone rubber strip type, 120 V rated.
 2. Provided on:
 - a. All motors 10 hp and larger mounted outdoors.
 - b. Indoor motors in humid environments as indicated.

2.5 SOURCE QUALITY CONTROL

- A. Test motors in accordance with NEMA, IEEE and manufacturer procedures.
 1. The test shall include but not necessarily be limited to the following:

- a. Routine test:
 - 1) No-load current and speed at rated voltage and frequency.
 - 2) Locked rotor current.
 - 3) Winding resistance.
 - 4) Vibration check.
 - 5) High potential.
- b. Complete test (in addition to the routine tests):
 - 1) Rated load temperature rise.
 - 2) Winding resistance.
 - 3) Slip test, measured in percent slip.
 - 4) Locked rotor amperes (3 PH, full voltage).
 - 5) Locked rotor torque.
 - 6) Breakdown torque.
 - 7) Efficiencies tabulated at 100, 75, and 50% of full load.
 - 8) Power factor tabulated at 100, 75, and 50% of full load.
- B. Motors to be tested:
 - 1. As indicated in the schedule.
 - 2. All motors, at a minimum, to receive a routine test.
- C. The Owner reserves the right to select and have tested any motor included within the project.
 - 1. If motor passes testing requirements, the Buyer shall be responsible for any shipping and testing costs incurred.
 - 2. Costs shall be determined by current freight rates and manufacturer's published rates at the time of the test.
 - 3. If motor fails test, Supplier shall be responsible for all costs incurred.
 - 4. If two successive motors fail the test, the Owner has the right to reject any or all motors from that manufacturer.
 - 5. The Owner also reserves the right to witness any routine or complete tests at the [Buyer's] [Owner's] expense.
 - 6. Notify the Owner a minimum of 14 days in advance of the testing.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Ground all motors in accordance with Specification Section 26 05 26.

3.2 FIELD QUALITY CONTROL

- A. See Specification Section 26 08 13 for acceptance testing requirements.

END OF SECTION

SECTION 26 05 19

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Material and installation requirements for:
 - a. Building wire.
 - b. Control cable.
 - c. Instrumentation cable.
 - d. Wire connectors.
 - e. Insulating tape.
 - f. Pulling lubricant.

B. Related Specification Sections include but are not necessarily limited to:

1. Section 26 05 00 - Common Work Results for Electrical.
2. Section 26 08 13 - Acceptance Testing.

1.2 QUALITY ASSURANCE

A. Referenced Standards:

1. Insulated Cable Engineers Association (ICEA):
 - a. S-58-679, Standard for Control Cable Conductor Identification.
2. National Electrical Manufacturers Association (NEMA):
 - a. ICS 4, Industrial Control and Systems: Terminal Blocks.
3. National Electrical Manufacturers Association/Insulated Cable Engineers Association (NEMA/ICEA):
 - a. WC 57/S-73-532, Standard for Control Cables.
 - b. WC 70/S-95-658, Non-Shielded Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy.
4. National Fire Protection Association (NFPA):
 - a. 70, National Electrical Code (NEC).
 - b. 262, Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces.
5. Underwriters Laboratories, Inc. (UL):
 - a. 44, Standard for Safety Thermoset-Insulated Wires and Cables.
 - b. 83, Standard for Safety Thermoplastic-Insulated Wires and Cables.
 - c. 467, Standard for Safety Grounding and Bonding Equipment.
 - d. 486A, Standard for Safety Wire Connectors and Soldering Lugs for use with Copper Conductors.
 - e. 486C, Standard for Safety Splicing Wire Connections.
 - f. 510, Standard for Safety Polyvinyl Chloride, Polyethylene and Rubber Insulating Tape.
 - g. 1581, Standard for Safety Reference Standard for Electrical Wires, Cables, and Flexible Cords.
 - h. 2250, Standard for Safety Instrumentation Tray Cable.

1.3 DEFINITIONS

- A. Cable:** Multi-conductor, insulated, with outer sheath containing either building wire or instrumentation wire.

B. Instrumentation Cable:

1. Multiple conductor, insulated, twisted or untwisted, with outer sheath.
2. The following are specific types of instrumentation cables:
 - a. Analog signal cable:
 - 1) Used for the transmission of low current (e.g., 4-20mA DC) or low voltage (e.g., 0-10 VDC) signals, using No. 16 AWG and smaller conductors.
 - 2) Commonly used types are defined in the following:
 - a) TSP: Twisted shielded pair.
 - b) TST: Twisted shielded triad.
 - b. Digital signal cable: Used for the transmission of digital signals between computers, PLC's, RTU's, etc.

C. Control Cable: Multi-conductor, insulated, with outer sheath containing building wires, No. 14, No. 12 or No. 10 AWG.

D. Building Wire: Single conductor, insulated, with or without outer jacket depending upon type.

1.4 SUBMITTALS

A. Shop Drawings:

1. Product technical data:
 - a. Provide submittal data for all products specified in PART 2 of this Specification Section except:
 - 1) Wire connectors.
 - 2) Insulating tape.
 - 3) Cable lubricant.
 - b. See Section 26 05 00 for additional requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

A. See Section 26 05 00.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
1. Building wire, power and control cable and multiplex cable:
 - a. Aetna Insulated Wire.
 - b. Alphawire.
 - c. Cerrowire.
 - d. Encore Wire Corporation.
 - e. General Cable.
 - f. Okonite Company.
 - g. Southwire Company.
 - h. Or Engineer approved equal.
 2. Metal Clad (MC) cable:
 - a. Aetna Insulated Wire.
 - b. AFC Cable Systems.
 - c. Encore Wire Corporation.
 - d. Eastern Flexible Conduit Technologies.
 - e. General Cable.

- f. Or Engineer approved equal.
- 3. Instrumentation cable:
 - a. Analog cable:
 - 1) Alphawire.
 - 2) Belden Inc.
 - 3) General Cable.
 - 4) Or Engineer approved equal
- 4. Wire connectors:
 - a. Burndy Corporation.
 - b. Buchanan.
 - c. Ideal.
 - d. IlSCO.
 - e. 3M Co.
 - f. Teledyne Penn Union.
 - g. Thomas and Betts.
 - h. Phoenix Contact.
 - i. Or Engineer approved equal.
- 5. Insulating and color coding tape:
 - a. 3M Co.
 - b. Plymouth Bishop Tapes.
 - c. Red Seal Electric Co.
 - d. Or Engineer approved equal.

2.2 MANUFACTURED UNITS

- A. Building Wire:
 - 1. Conductor shall be copper with 600 V rated insulation.
 - 2. Conductors shall be stranded, except for conductors used in lighting and receptacle circuits which may be stranded or solid.
 - 3. Surface mark with manufacturer's name or trademark, conductor size, insulation type and UL label.
 - 4. Conform to NEMA/ICEA WC 70/S-95-658 and UL 83 for type THHN/THWN and THHN/THWN-2 insulation.
 - 5. Conform to NEMA/ICEA WC 70/S-95-658 and UL 44 for type XHHW-2 insulation.
- B. Electrical Equipment Control Wire:
 - 1. Conductor shall be copper with 600 V rated insulation.
 - 2. Conductors shall be stranded.
 - 3. Surface mark with manufacturer's name or trademark, conductor size, insulation type and UL label.
 - 4. Conform to UL 44 for Type SIS insulation.
 - 5. Conform to UL 83 for Type MTW insulation.
- C. Metal Clad (MC) Cable:
 - 1. Sheath: Galvanized steel interlocked armor.
 - 2. Conductors: Building wire as specified herein.
 - 3. Quantity and size of conductors: As indicated on the Drawings, including a ground wire.
 - 4. Individual conductor color coding as specified in PART 3 of this Specification Section.
 - 5. Conform to NFPA 70 Type MC, UL 1569.

D. Instrumentation Cable:

1. Surface mark with manufacturer's name or trademark, conductor size, insulation type and UL label.
2. Analog cable:
 - a. Tinned copper conductors.
 - b. 300 V or 600 V PVC insulation with PVC jacket.
 - c. Twisted with 100% foil shield coverage with drain wire.
 - d. Six (6) twists per foot minimum.
 - e. Individual conductor color coding: ICEA S-58-679, Method 1, Table E-2.
 - f. Conform to IEEE 1202 or CSA FT-4 or NFPA 262, UL 2250, UL 1581 and NFPA 70 Type ITC.

E. Wire Connectors:

1. Twist/screw on type:
 - a. Insulated pressure or spring type solderless connector.
 - b. 600 V rated.
 - c. Ground conductors: Conform to UL 486C and/or UL 467 when required by local codes.
 - d. Phase and neutral conductors: Conform to UL 486C.
2. Compression and mechanical screw type:
 - a. 600 V rated.
 - b. Ground conductors: Conform to UL 467.
 - c. Phase and neutral conductors: Conform to UL 486A.
3. Terminal block type:
 - a. High density, screw-post barrier-type with white center marker strip.
 - b. 600 V and ampere rating as required, for power circuits.
 - c. 600 V, 20 ampere rated for control circuits.
 - d. 300 V, 15 ampere rated for instrumentation circuits.
 - e. Conform to NEMA ICS 4 and UL 486A.

F. Insulating and Color Coding Tape:

1. Pressure sensitive vinyl.
2. Premium grade.
3. Heat, cold, moisture, and sunlight resistant.
4. Thickness, depending on use conditions: 7, 8.5, or 10 mil.
5. For cold weather or outdoor location, tape must also be all-weather.
6. Color:
 - a. Insulating tape: Black.
 - b. Color coding tape: Fade-resistant color as specified herein.
7. Comply with UL 510.

- G. Pulling Lubricant: Cable manufacturer's standard containing no petroleum or other products which will deteriorate insulation.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Permitted Usage of Insulation Types:

1. Type XHHW-2:

- a. Building wire and power and control cable in architectural and non-architectural finished areas.
 - b. Building wire and power and control cable in conduit in outdoor areas and below grade.
- 2. Type THHN/THWN and THHN/THWN-2:
 - a. Building wire and power and control cable No. 8 AWG and smaller in architectural and non-architectural finished areas.
- 3. Type SIS and MTW:
 - a. For the wiring of control equipment within control panels and field wiring of control equipment within switchgear, switchboards, motor control centers.
- B. MC Cable:
 - 1. Within stud framed walls of architecturally finished areas.
 - 2. Above acoustical tile ceiling of architecturally finished areas.
- C. Conductor Size Limitations:
 - 1. Feeder and branch power conductors shall not be smaller than No. 12 AWG unless otherwise indicated on the Drawings.
 - 2. Control conductors shall not be smaller than No. 14 AWG unless otherwise indicated on the Drawings.
 - 3. Instrumentation conductors shall not be smaller than No. 18 AWG unless otherwise indicated on the Drawings.
- D. Color Code All Wiring as Follows:
 - 1. Building wire:

	240 V, 208 V, 240/120 V, 208/120 V	480 V, 480/277 V
Phase 1	Black	Brown
Phase 2	Red *	Orange
Phase 3	Blue	Yellow
Neutral	White	White or Gray
Ground	Green	Green

* Orange when it is a high leg of a 120/240 V Delta system.

- a. Conductors No. 6 AWG and smaller: Insulated phase, neutral and ground conductors shall be identified by a continuous colored outer finish along its entire length.
 - b. Conductors larger than No. 6 AWG:
 - 1) Insulated phase and neutral conductors shall be identified by one of the following methods:
 - a) Continuous colored outer finish along its entire length.
 - b) 3 inches of colored tape applied at the termination.
 - 2) Insulated grounding conductor shall be identified by one of the following methods:
 - a) Continuous green outer finish along its entire length.
 - b) Stripping the insulation from the entire exposed length.
 - c) Using green tape to cover the entire exposed length.
 - 3) The color coding shall be applied at all accessible locations, including but not limited to: Junction and pull boxes, wireways, manholes and handholes.
- E. Install all wiring in raceway unless otherwise indicated on the Drawings.
- F. Feeder, branch, control and instrumentation circuits shall not be combined in a raceway, cable tray, junction or pull box, except as permitted in the following:

1. Where specifically indicated on the Drawings.
 2. Where field conditions dictate and written permission is obtained from the Engineer.
 3. Control circuits shall be isolated from feeder and branch power and instrumentation circuits but combining of control circuits is permitted.
 - a. The combinations shall comply with the following:
 - 1) 12 VDC, 24 VDC and 48 VDC may be combined.
 - 2) 125 VDC shall be isolated from all other AC and DC circuits.
 - 3) AC control circuits shall be isolated from all DC circuits.
 4. Instrumentation circuits shall be isolated from feeder and branch power and control circuits but combining of instrumentation circuits is permitted.
 - a. The combinations shall comply with the following:
 - 1) Analog signal circuits may be combined.
 - 2) Digital signal circuits may be combined but isolated from analog signal circuits.
 5. Multiple branch circuits may be combined in a common raceway only for multiple lighting circuits or multiple receptacle circuits. Do not combine lighting and receptacle circuits.
 - a. Do not combine control device circuits with lighting or receptacle circuits.
 - b. Contractor is responsible for making the required adjustments in conductor and raceway size, in accordance with all requirements of the NFPA 70, including but not limited to:
 - 1) Up sizing conductor size for required ampacity de-ratings for the number of current carrying conductors in the raceway.
 - 2) The neutral conductors may not be shared.
 - 3) Up sizing raceway size for the size and quantity of conductors.
- G. Ground the drain wire of shielded instrumentation cables at one end only.
1. The preferred grounding location is at the load (e.g., control panel), not at the source (e.g., field mounted instrument).
- H. Splices and terminations for the following circuit types shall be made in the indicated enclosure type using the indicated method.
1. Feeder and branch power circuits:
 - a. Device outlet boxes:
 - 1) Twist/screw on type connectors.
 - b. Junction and pull boxes and wireways:
 - 1) Twist/screw on type connectors for use on No. 8 and smaller wire.
 - 2) Compression, mechanical screw or terminal block or terminal strip type connectors for use on No. 6 AWG and larger wire.
 - c. Motor terminal boxes:
 - 1) Twist/screw on type connectors for use on No. 10 AWG and smaller wire.
 - 2) Insulated mechanical screw type connectors for use on No. 8 AWG and larger wire.
 - d. Manholes or handholes:
 - 1) Twist/screw on type connectors pre-filled with epoxy for use on No. 8 AWG and smaller wire.
 - 2) Watertight compression or mechanical screw type connectors for use on No. 6 AWG and larger wire.
 2. Control circuits:
 - a. Junction and pull boxes: Terminal block type connector.
 - b. Manholes or handholes: Twist/screw on type connectors pre-filled with epoxy.
 - c. Control panels and motor control centers: Terminal block or strips provided within the equipment or field installed within the equipment by the Contractor.

3. Instrumentation circuits can be spliced where field conditions dictate and written permission is obtained from the Engineer.
 - a. Maintain electrical continuity of the shield when splicing twisted shielded conductors.
 - b. Junction and pull boxes: Terminal block type connector.
 - c. Control panels and motor control centers: Terminal block or strip provided within the equipment or field installed within the equipment by the Contractor.
 4. Non-insulated compression and mechanical screw type connectors shall be insulated with tape or hot or cold shrink type insulation to the insulation level of the conductors.
- I. Insulating Tape Usage:
1. For insulating connections of No. 8 AWG wire and smaller: 7 mil vinyl tape.
 2. For insulating splices and taps of No. 6 AWG wire or larger: 10 mil vinyl tape.
 3. For insulating connections made in cold weather or in outdoor locations: 8.5 mil, all weather vinyl tape.
- J. Color Coding Tape Usage: For color coding of conductors.

3.2 FIELD QUALITY CONTROL

- A. Acceptance Testing:
1. See Specification Section 26 08 13.

END OF SECTION

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SECTION 26 05 26

GROUNDING AND BONDING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Material and installation requirements for grounding and bonding system(s).
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Section 26 05 00 - Common Work Results for Electrical.
 - 2. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables.
 - 3. Section 26 05 33 - Raceways and Boxes.
 - 4. Section 26 08 13 - Acceptance Testing.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. ASTM International (ASTM):
 - a. B8, Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft.
 - 2. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
 - a. 837, Standard for Qualifying Permanent Connections Used in Substation Grounding.
 - 3. National Fire Protection Association (NFPA):
 - a. 70, National Electrical Code (NEC).
 - 4. Underwriters Laboratories, Inc. (UL):
 - a. 467, Grounding and Bonding Equipment.
- B. Assure ground continuity is continuous throughout the entire Project.

1.3 SUBMITTALS

- A. Shop Drawings:
 - 1. Product technical data.
 - a. Provide submittal data for all products specified in PART 2 of this Specification Section.
 - b. See Section 26 05 00 for additional requirements.
 - 2. Fabrication and/or layout drawings:
 - a. Plan drawing(s) showing type, size and locations of all grounding system components.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
 - 1. Ground rods and bars and grounding clamps, connectors and terminals:
 - a. ERICO by Pentair.
 - b. Harger Lightning & Grounding.
 - c. Heary Bros. Lightning Protection Co. Inc..
 - d. Burndy by Hubbell.
 - e. Robbins Lightning, Inc.
 - f. Blackburn by Thomas & Betts.

- g. Thompson Lightning Protection, Inc.
- h. Or Engineer approved equal.
- 2. Exothermic weld connections:
 - a. ERICO by Pentair - Cadweld.
 - b. Harger Lightning & Grounding - Ultraweld.
 - c. Burndy by Hubbell - Thermoweld.
 - d. FurseWELD by Thomas & Betts.
 - e. Or Engineer approved equal.
- 3. Prefabricated composite test stations:
 - a. Armorcast Products Company.
 - b. MacLean Highline.
 - c. Quazite by Hubbell
 - d. Or Engineer approved equal.

2.2 COMPONENTS

- A. Wire and Cable:
 - 1. Bare conductors: Soft drawn stranded copper meeting ASTM B8.
 - 2. Insulated conductors: Color coded green, per Section 26 05 19.
- B. Conduit: As specified in Section 26 05 33.
- C. Ground Bars:
 - 1. Solid copper:
 - a. 1/4 inches thick.
 - b. 2 or 4 inches wide.
 - c. 24 inches long minimum in main service entrance electrical rooms, 12 inches long elsewhere.
 - 2. Predrilled grounding lug mounting holes.
 - 3. Stainless steel or galvanized steel mounting brackets.
 - 4. Insulated standoffs.
- D. Ground Rods:
 - 1. 5/8 inches x 10 feet.
 - 2. Copper-clad:
 - a. 10 mil minimum uniform coating of electrolytic copper molecularly bonded to a rigid steel core.
 - b. Corrosion resistant bond between the copper and steel.
 - c. Hard drawn for a scar-resistant surface.
- E. Grounding Clamps, Connectors and Terminals:
 - 1. Mechanical type:
 - a. Standards: UL 467.
 - b. High copper alloy content.
 - 2. Compression type for interior locations:
 - a. Standards: UL 467.
 - b. High copper alloy content.
 - c. Non-reversible.
 - d. Terminals for connection to bus bars shall have two bolt holes.
 - 3. Compression type suitable for direct burial in earth or concrete:

- a. Standards: UL 467, IEEE 837.
 - b. High copper alloy content.
 - c. Non-reversible.
 - d. Factory filled with oxide inhibiting compound.
- F. Exothermic Weld Connections:
 - 1. Copper oxide reduction by aluminum process.
 - 2. Molds properly sized for each application.
- G. Prefabricated Composite Material Test Stations:
 - 1. Body and cover: Fiberglass reinforced polymer concrete conforming to all test provisions of SCTE 77.
 - 2. Minimum load ratings: SCTE 77 Tier 15.
 - 3. Open bottom.
 - 4. Stackable design as required for 3 feet depth.
 - 5. Cover:
 - a. Engraved legend of "GROUND".
 - b. Lay-in non-bolt down.
 - 6. Size: 12 inches round or 12 inches square.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General:
 - 1. Install products in accordance with manufacturer's instructions.
 - 2. Size grounding conductors and bonding jumpers in accordance with NFPA 70, Article 250, except where larger sizes are indicated on the Drawings.
 - 3. Remove paint, rust, or other non-conducting material from contact surfaces before making ground connections. After connection, apply manufacturers approved touch-up paint to protect metallic surface from corrosion.
 - 4. Where ground conductors pass through floor slabs or building walls provide nonmetallic sleeves and install sleeve per Specification Section 01 73 20.
 - a. Seal the sleeve interior to stop water penetration.
 - 5. Do not splice grounding electrode conductors except at ground rods.
 - 6. Install ground rods and grounding electrode conductors in undisturbed, firm soil.
 - a. Provide excavation required for installation of ground rods and conductors.
 - b. Use driving studs or other suitable means to prevent damage to threaded ends of sectional rods.
 - c. Unless otherwise specified, connect conductors to ground rods with compression type connectors or exothermic weld.
 - d. Provide sufficient slack in conductor to prevent conductor breakage during backfill or due to ground movement.
 - e. Backfill excavation completely, thoroughly tamping to provide good contact between backfill materials and ground rods and conductors.
 - 7. Do not use exothermic welding if it will damage the structure the grounding conductor is being welded to.
- B. Grounding Electrode System:
 - 1. Provide a grounding electrode system in accordance with NFPA 70, Article 250 and as indicated on the Drawings.

- a. All grounding electrode conductors terminate on a main ground bar located adjacent to the service entrance equipment.
2. Grounding electrode conductor terminations:
 - a. Ground bars mounted on wall: Use a two-hole compression type conductor terminal and bolt it to the ground bar with two bolts.
 - b. Ground bars in electrical equipment: Use compression type conductor terminal and bolt it to the ground bar or manufacture's provided mechanical type termination device.
 - c. Piping systems: Use mechanical type connections.
 - d. Building steel, below grade and encased in concrete: Use compression type connector or exothermic weld.
 - e. Building steel, above grade: Use a two-hole compression type conductor terminal and bolt to the steel with two bolts or exothermic weld.
 - f. Ground rod: Compression type or exothermic weld, unless otherwise specified.
 - g. At all above grade terminations, the conductors shall be labeled per Specification Section 10 14 00.
3. Ground ring grounding system:
 - a. Ground ring consists of ground rods and a conductor looped around the structure.
 - b. Placed at a minimum of 10 feet from the structure foundation and 2 feet-6 inches below grade.
 - c. Provide a minimum of four ground rods placed at the corners of the structure and additional rods so that the maximum distance between ground rods does not exceed 50 FT.
 - d. Building/Structure grounding:
 - 1) Bond building/structure metal support columns to the ground ring at all corners of the structure.
 - e. Grounding conductor: Bare conductor, size as indicated on the Drawings.
 - f. Ground rod test stations:
 - 1) Provided where indicated on the Drawings.
 - 2) Grounding conductors connected to ground rod with removable ground clamps.
- C. Supplemental Grounding Electrode:
 1. Provide the following grounding in addition to the equipment ground conductor supplied with the feeder conductors whether or not shown on the Drawings.
 - a. See Grounding Electrode System paragraph for conductor termination requirements.
 2. Metal light poles:
 - a. Connect metal pole and pole base reinforcing steel to a ground rod.
 - b. Grounding conductor: Bare #6 AWG minimum.
 3. Equipment support rack and pedestals mounted outdoors:
 - a. Connect metallic structure to a ground rod.
 - b. Grounding conductor: #6 AWG minimum.
 4. Engine generator:
 - a. Connect generator frame to the ground ring at two locations (opposite corners of frame).
 - b. Grounding conductor: Bare conductor, size as indicated on the Drawings.
- D. Other Bonding Requirements:
 1. Lightning protection system:
 - a. Connect to ground ring.
 - b. See Specification Section 26 41 13.
- E. Transformer Separately Derived Grounding System:

1. Install the System Bonding Jumper at the transformer. At the first disconnect, ensure the neutral is isolated from ground.
 2. Structures with a single electrical room/area:
 - a. Connect grounding electrode conductor to the Grounding Electrode System main ground bar.
 3. Structures with multiple electrical rooms/areas:
 - a. Provide a ground bar mounted in each electrical room/area.
 - b. Interconnect all ground bars in a daisy chain or radial fashion to the main ground bar as indicated on the Drawings.
 - c. Connect grounding electrode conductor to the electrical room/area ground bar.
 4. See Grounding Electrode System paragraph for conductor termination requirements.
- F. Raceway Bonding/Grounding:
1. Install all metallic raceway so that it is electrically continuous.
 2. Provide an equipment grounding conductor in all raceways with insulation identical to the phase conductors, unless otherwise indicated on the Drawings.
 3. NFPA 70 required grounding bushings shall be of the insulating type.
 4. Provide double locknuts at all panels.
 5. Bond all conduits, at entrance and exit of equipment, to the equipment ground bus or lug.
 6. Provide bonding jumpers if conduits are installed in concentric knockouts.
 7. Make all metallic raceway fittings and grounding clamps tight to ensure equipment grounding system will operate continuously at ground potential to provide low impedance current path for proper operation of overcurrent devices during possible ground fault conditions.
- G. Equipment Grounding:
1. Ground all utilization equipment with an equipment grounding conductor.
- H. Manhole and Handhole Grounding:
1. Provide a ground rod and ground bar, when indicated or as needed, in each manhole and handhole with exposed metal parts.
 - a. Expose a minimum of 4 inches of the rod above the floor for field connections to the rod.
 2. Connect all exposed metal parts (e.g., conduits and cable racks) to the ground rod.

3.2 FIELD QUALITY CONTROL

- A. Leave grounding system uncovered until observed by Owner.
- B. Acceptance testing:
1. See Specification Section 26 08 13.

END OF SECTION

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SECTION 26 05 33
RACEWAYS AND BOXES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Material and installation requirements for:
 - a. Conduits.
 - b. Conduit fittings.
 - c. Conduit supports.
 - d. Wireways.
 - e. Outlet boxes.
 - f. Pull and junction boxes.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Section 26 05 00 - Common Work Results for Electrical.
 - 2. Section 26 05 19 - Wire and Cable - 600 Volt and Below.
 - 3. Section 26 05 43 - Electrical - Exterior Underground.
 - 4. Section 26 27 26 - Wiring Devices.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. Aluminum Association (AA).
 - 2. American Iron and Steel Institute (AISI).
 - 3. ASTM International (ASTM):
 - a. A123/A123M, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - b. A153/A153M, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - c. D2564, Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems.
 - 4. National Electrical Manufacturers Association (NEMA):
 - a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
 - b. RN 1, Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
 - c. TC 2, Electrical Polyvinyl Chloride (PVC) Tubing and Conduit.
 - d. TC 3, Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing.
 - e. TC 14.AG, Aboveground Reinforced Thermosetting Resin Conduit and Fittings.
 - f. TC 14.BG, Belowground Reinforced Thermosetting Resin Conduit and Fittings.
 - 5. National Electrical Manufacturers Association/American National Standards Institute (NEMA/ANSI):
 - a. C80.1, Electric Rigid Steel Conduit (ERSC).
 - b. C80.6, Intermediate Metal Conduit (EIMC).
 - c. OS 1, Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
 - 6. National Fire Protection Association (NFPA):
 - a. 70, National Electrical Code (NEC).
 - 7. Underwriters Laboratories, Inc. (UL):

- a. 1, Standard for Flexible Metal Conduit.
- b. 6, Electrical Rigid Metal Conduit - Steel.
- c. 50, Enclosures for Electrical Equipment, Non-Environmental Considerations.
- d. 360, Standard for Liquid-Tight Flexible Metal Conduit.
- e. 467, Grounding and Bonding Equipment.
- f. 514A, Metallic Outlet Boxes.
- g. 514B, Conduit, Tubing, and Cable Fittings.
- h. 651, Standard for Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings.
- i. 870, Standard for Wireways, Auxiliary Gutters, and Associated Fittings.
- j. 1242, Standard for Electrical Intermediate Metal Conduit - Steel.
- k. 2515, Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings.

1.3 SUBMITTALS

A. Shop Drawings:

- 1. Product technical data:
 - a. Provide submittal data for all products specified in PART 2 of this Specification Section except:
 - 1) Conduit fittings.
 - 2) Support systems.
 - b. See Section 26 05 00 for additional requirements.
- 2. Fabrication and/or layout drawings:
 - a. Proposed location and details of construction for openings in slabs and walls for raceway runs.
 - b. Identify dimensional size of pull and junction boxes to be used.

1.4 DELIVERY, STORAGE, AND HANDLING

A. See Section 26 05 00.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
 - 1. Rigid metal conduits and electrical metallic tubing:
 - a. Allied Tube and Conduit.
 - b. Western Tube and Conduit Corporation.
 - c. Wheatland Tube.
 - d. Patriot Aluminum Products, LLC.
 - e. Or Engineer approved equal.
 - 2. PVC coated rigid metal conduits:
 - a. Robroy Industries.
 - b. Atkore – Calbond
 - c. Or Engineer approved equal.
 - 3. Rigid nonmetallic conduit:
 - a. Prime Conduit.
 - b. Cantex, Inc.
 - c. Osburn Associates, Inc.
 - d. Or Engineer approved equal.

4. Flexible conduit:
 - a. AFC Cable Systems.
 - b. Anamet, Inc.
 - c. Electri-Flex Company.
 - d. International Metal Hose Company.
 - e. Southwire Company, LLC.
 - f. Or Engineer approved equal.
5. Wireway:
 - a. Hoffman Engineering.
 - b. Wiegmann by Hubbell.
 - c. Square D by Schneider Electric.
 - d. Or Engineer approved equal.
6. Conduit fittings and accessories:
 - a. Appleton by Emerson Electric Co.
 - b. Carlon by Thomas & Betts.
 - c. Cantex, Inc.
 - d. Crouse-Hinds by Eaton.
 - e. Killark by Hubbell.
 - f. Osburn Associates, Inc.
 - g. O-Z/Gedney by Emerson Electric Co.
 - h. Raco by Hubbell.
 - i. Steel City by Thomas & Betts.
 - j. Thomas & Betts.
 - k. Or Engineer approved equal.
7. Support systems:
 - a. Unistrut by Atkore International, Inc.
 - b. B-Line by Eaton.
 - c. Kindorf by Thomas & Betts.
 - d. Minerallac Company.
 - e. CADDY by Pentair.
 - f. Superstrut by Thomas & Betts.
 - g. Or Engineer approved equal.
8. Outlet, pull and junction boxes:
 - a. Appleton by Emerson Electric Co.
 - b. Crouse-Hinds by Eaton
 - c. Killark by Hubbell.
 - d. O-Z/Gedney by Emerson Electric Co.
 - e. Steel City by Thomas & Betts.
 - f. Raco by Hubbell
 - g. Bell by Hubbell.
 - h. Hoffman Engineering.
 - i. Wiegmann by Hubbell.
 - j. B-Line by Eaton.
 - k. Adalet.
 - l. RITTAL North America LLC.
 - m. Stahlin by Robroy Enclosures.

- n. Or Engineer approved equal.

2.2 RIGID METAL CONDUITS

A. Rigid Galvanized Steel Conduit (RGS):

1. Mild steel with continuous welded seam.
2. Metallic zinc applied by hot-dip galvanizing or electro-galvanizing.
3. Threads galvanized after cutting.
4. Internal coating: Baked lacquer, varnish or enamel for a smooth surface.
5. Standards: NFPA 70 Type RMC, NEMA/ANSI C80.1, UL 6.

B. PVC-Coated Rigid Steel Conduit (PVC-RGS):

1. Nominal 40 mil Polyvinyl Chloride Exterior Coating:
 - a. Coating: Bonded to hot-dipped galvanized rigid steel conduit conforming to NEMA/ANSI C80.1.
 - b. The bond between the PVC coating and the conduit surface: Greater than the tensile strength of the coating.
2. Nominal 2 mil, minimum, urethane interior coating.
3. Urethane coating on threads.
4. Conduit: Epoxy prime coated prior to application of PVC and urethane coatings.
5. Female Ends:
 - a. Have a plastic sleeve extending a minimum of one pipe diameter or 2 inches, whichever is less beyond the opening.
 - b. The inside diameter of the sleeve shall be the same as the outside diameter of the conduit to be used with it.
6. Standards: NFPA 70 Type RMC, NEMA/ANSI C80.1, UL 6, NEMA RN 1.

C. Intermediate Metal Conduit (IMC):

1. Mild steel with continuous welded seam.
2. Metallic zinc applied by hot-dip galvanizing or electro-galvanizing.
 - a. Threads galvanized after cutting.
3. Internal coating: Baked lacquer, varnish or enamel for a smooth surface.
4. Standards: NFPA 70 Type IMC, NEMA/ANSI C80.6, UL 1242.

2.3 RIGID NONMETALLIC CONDUIT

A. Schedules 40 (PVC-40) and 80 (PVC-80):

1. Polyvinyl-chloride (PVC) plastic compound which includes inert modifiers to improve weatherability and heat distribution.
2. Rated for direct sunlight exposure.
3. Fire retardant and low smoke emission.
4. Shall be suitable for use with 90 degrees C wire and shall be marked "maximum 90 degrees C".
5. Standards: NFPA 70 Type PVC, NEMA TC 2, UL 651.

2.4 FLEXIBLE CONDUIT

A. Flexible Galvanized Steel Conduit (FLEX):

1. Formed of continuous, spiral wound, hot-dip galvanized steel strip with successive convolutions securely interlocked.
2. Standard: NFPA 70 Type FMC, UL 1.

B. PVC-Coated Flexible Galvanized Steel (liquid-tight) Conduit (FLEX-LT):

1. Core formed of continuous, spiral wound, hot-dip galvanized steel strip with successive convolutions securely interlocked.
2. Extruded PVC outer jacket positively locked to the steel core.
3. Liquid and vaportight.
4. Standard: NFPA 70 Type LFMC, UL 360.

2.5 WIREWAY

A. General:

1. Suitable for lay-in conductors.
2. Designed for continuous grounding.
3. Covers:
 - a. Hinged or removable in accessible areas.
 - b. Non-removable when passing through partitions.
4. Finish: Rust inhibiting primer and manufacturer's standard paint inside and out except for stainless steel type.
5. Standards: UL 870, NEMA 250.

B. Dusttight (NEMA 12 rated) Wireway:

1. 14 GA steel bodies and covers without knockouts and 10 GA steel flanges.
2. Cover: Fully gasketed and held in place with captive clamp type latches.
3. Flanges: Fully gasketed and bolted.

2.6 CONDUIT FITTINGS AND ACCESSORIES

A. Fittings for Use with RGS and IMC:

1. Locknuts:
 - a. Threaded steel or malleable iron.
 - b. Gasketed or non-gasketed.
 - c. Grounding or non-grounding type.
2. Bushings:
 - a. Threaded, insulated metallic.
 - b. Grounding or non-grounding type.
3. Hubs: Threaded, insulated and gasketed metallic for raintight connection.
4. Couplings:
 - a. Threaded straight type: Same material and finish as the conduit with which they are used on.
 - b. Threadless type: Gland compression or self-threading type, concrete tight.
5. Unions: Threaded galvanized steel or zinc plated malleable iron.
6. Conduit bodies (ells and tees):
 - a. Body: Zinc plated cast iron or cast copper free aluminum with threaded hubs.
 - b. Standard and mogul size.
 - c. Cover:
 - 1) Clip-on type with stainless steel screws.
 - 2) Gasketed or non-gasketed galvanized steel, zinc plated cast iron or cast copper free aluminum.
7. Conduit bodies (round):
 - a. Body: Zinc plated cast iron or cast copper free aluminum with threaded hubs.
 - b. Cover: Threaded screw on type, gasketed, galvanized steel, zinc plated cast iron or cast copper free aluminum.

8. Sealing fittings:
 - a. Body: Zinc plated cast iron or cast copper free aluminum with threaded hubs.
 - b. Standard and mogul size.
 - c. With or without drain and breather.
 - d. Fiber and sealing compound: UL listed for use with the sealing fitting.
 9. Service entrance head:
 - a. Malleable iron, galvanized steel or copper free aluminum.
 - b. Insulated knockout cover for use with a variety of sizes and number of conductors.
 10. Expansion couplings:
 - a. 2 inches nominal straight-line conduit movement in either direction.
 - b. Galvanized steel with insulated bushing.
 - c. Gasketed for wet locations.
 - d. Internally or externally grounded.
 11. Expansion/deflection couplings:
 - a. 3/4 inches nominal straight-line conduit movement in either direction.
 - b. 30 degrees nominal deflection from the normal in all directions.
 - c. Metallic hubs, neoprene outer jacket and stainless steel jacket clamps.
 - d. Internally or externally grounded.
 - e. Watertight, raintight and concrete tight.
 12. Standards: UL 467, UL 514B, UL 1203.
- B. Fittings for Use with FLEX:
1. Connector:
 - a. Zinc plated malleable iron.
 - b. Squeeze or clamp-type.
 2. Standard: UL 514B.
- C. Fittings for Use with FLEX-LT:
1. Connector:
 - a. Straight or angle type.
 - b. Metal construction, insulated and gasketed.
 - c. Composed of locknut, grounding ferrule and gland compression nut.
 - d. Liquid tight.
 2. Standards: UL 467, UL 514B.
- D. Fittings for Use with Rigid Nonmetallic PVC Conduit:
1. Coupling, adapters and conduit bodies:
 - a. Same material, thickness, and construction as the conduits with which they are used.
 - b. Homogeneous plastic free from visible cracks, holes or foreign inclusions.
 - c. Bore smooth and free of blisters, nicks or other imperfections which could damage the conductor.
 2. Solvent cement for welding fittings shall be supplied by the same manufacturer as the conduit and fittings.
 3. Standards: ASTM D2564, NEMA TC 3, UL 651, UL 514B.
- E. Weather and Corrosion Protection Tape:
1. PVC based tape, 10 mils thick.
 2. Protection against moisture, acids, alkalis, salts and sewage and suitable for direct bury.
 3. Used with appropriate pipe primer.

2.7 ALL RACEWAY AND FITTINGS

A. Mark Products:

1. Identify the nominal trade size on the product.
2. Stamp with the name or trademark of the manufacturer.

2.8 OUTLET BOXES

A. Metallic Outlet Boxes:

1. Hot-dip galvanized steel.
2. Conduit knockouts and grounding pigtail.
3. Styles:
 - a. 2 inches x 3 inches rectangle.
 - b. 4 inches square.
 - c. 4 inches octagon.
 - d. Masonry/tile.
4. Accessories:
 - a. Flat blank cover plates.
 - b. Barriers.
 - c. Extension, plaster or tile rings.
 - d. Box supporting brackets in stud walls.
 - e. Adjustable bar hangers.
5. Standards: NEMA/ANSI OS 1, UL 514A.

B. Cast Outlet Boxes:

1. Zinc plated cast iron or die-cast copper free aluminum with manufacturer's standard finish.
2. Threaded hubs and grounding screw.
3. Styles:
 - a. "FS" or "FD".
 - b. "Bell".
 - c. Single or multiple gang and tandem.
 - d. "EDS" or "EFS" for hazardous locations.
4. Accessories: 40 mil PVC exterior coating and 2 mil urethane interior coating.
5. Standards: UL 514A, UL 1203.

C. See Specification Section 26 27 26 for wiring devices, wallplates and coverplates.

2.9 PULL AND JUNCTION BOXES

A. NEMA 4 Rated:

1. Body and cover: 14 GA steel finished with rust inhibiting primer and manufacturers standard paint inside and out.
2. Seams continuously welded and ground smooth.
3. No knockouts.
4. External mounting flanges.
5. Hinged or non-hinged cover held closed with stainless steel screws and clamps.
6. Cover with oil resistant gasket.

B. NEMA 4X Rated (metallic):

1. Body and cover: 14 GA Type 304 or 316 stainless steel.
2. Seams continuously welded and ground smooth.
3. No knockouts.

4. External mounting flanges.
 5. Hinged door and stainless steel screws and clamps.
 6. Door with oil-resistant gasket.
- C. NEMA 12 Rated:
1. Body and cover:
 - a. 14 GA steel finished with rust inhibiting primer and manufacturers standard paint inside and out.
 - b. Type 5052 H-32 aluminum, unpainted.
 2. Seams continuously welded and ground smooth.
 3. No knockouts.
 4. External mounting flanges.
 5. Non-hinged cover held closed with captivated cover screws threaded into sealed wells or hinged cover held closed with stainless steel screws and clamps.
 6. Flat door with oil resistant gasket.
- D. Miscellaneous Accessories:
1. Rigid handles for covers larger than 9 square feet or heavier than 25 pounds.
 2. Split covers when heavier than 25 pounds.
 3. Weldnuts for mounting optional panels and terminal kits.
 4. Terminal blocks: Screw-post barrier-type, rated 600 volt and 20 ampere minimum.
- E. Standards: NEMA 250, UL 50.

2.10 SUPPORT SYSTEMS

- A. Multi-conduit Surface or Trapeze Type Support and Pull or Junction Box Supports:
1. Material requirements.
 - a. Galvanized steel: ASTM A123/A123M or ASTM A153/A153M.
 - b. Stainless steel: AISI Type 316.
 - c. PVC coat galvanized steel: ASTM A123/A123M or ASTM A153/A153M and 20 mil PVC coating.
- B. Single Conduit and Outlet Box Support Fasteners:
1. Material requirements:
 - a. Zinc plated steel.
 - b. Stainless steel.
 - c. Malleable iron.
 - d. PVC coat malleable iron or steel: 20 mil PVC coating.
 - e. Steel protected with zinc phosphate and oil finish.

2.11 OPENINGS AND PENETRATIONS IN WALLS AND FLOORS

- A. Sleeves, smoke and fire stop fitting through walls and floors:
1. See Specification Section 01 73 20.

PART 3 - EXECUTION

3.1 RACEWAY INSTALLATION - GENERAL

- A. Shall be in accordance with the requirements of:
1. NFPA 70.
 2. Manufacturer instructions.

- B. Size of Raceways:
 - 1. Raceway sizes are shown on the Drawings, if not shown on the Drawings, then size in accordance with NFPA 70.
 - 2. Unless specifically indicated otherwise, the minimum raceway size shall be:
 - a. Conduit: 3/4 inches.
 - b. Wireway: 2-1/2 inches x 2-1/2 inches.
- C. Field Bending and Cutting of Conduits:
 - 1. Utilize tools and equipment recommended by the manufacturer of the conduit, designed for the purpose and the conduit material to make all field bends and cuts.
 - 2. Do not reduce the internal diameter of the conduit when making conduit bends.
 - 3. Prepare tools and equipment to prevent damage to the PVC coating.
 - 4. Degrease threads after threading and apply a zinc rich paint.
 - 5. Debur interior and exterior after cutting.
- D. Male threads of conduit systems shall be coated with an electrically conductive anti-seize compound.
- E. The protective coating integrity of conduits, fittings, outlet, pull and junction boxes and accessories shall be maintained.
 - 1. Repair galvanized components utilizing a zinc rich paint.
 - 2. Repair painted components utilizing touch up paint provided by or approved by the manufacturer.
 - 3. Repair PVC coated components utilizing a patching compound, of the same material as the coating, provided by the manufacturer of the conduit; or a self-adhesive, highly conformable, cross-linked silicone composition strip, followed by a protective coating of vinyl tape.
 - a. Total nominal thickness: 40 mil.
 - 4. Repair surfaces which will be inaccessible after installation prior to installation.
- F. Remove moisture and debris from conduit before wire is pulled into place.
 - 1. Pull mandrel with diameter nominally 1/4 inches smaller than the interior of the conduit, to remove obstructions.
 - 2. Swab conduit by pulling a clean, tight-fitting rag through the conduit.
 - 3. Tightly plug ends of conduit with tapered wood plugs or plastic inserts until wire is pulled.
- G. Only nylon or polyethylene rope shall be used to pull wire and cable in conduit systems.
- H. Where portions of a raceway are subject to different temperatures and where condensation is known to be a problem, as in cold storage areas of buildings or where passing from the interior to the exterior of a building, the raceway shall be sealed to prevent circulation of warm air to colder section of the raceway.
- I. Fill openings in walls, floors, and ceilings and finish flush with surface.
 - 1. See Specification Section 01 73 20.

3.2 RACEWAY ROUTING

- A. Raceways shall be routed in the field unless otherwise indicated.
 - 1. Conduit and fittings shall be installed, as required, for a complete system that has a neat appearance and is in compliance with all applicable codes.
 - 2. Run in straight lines parallel to or at right angles to building lines.
 - 3. Do not route conduits:
 - a. Through areas of high ambient temperature or radiant heat.
 - b. In suspended concrete slabs.

- c. In concrete members including slabs, slabs on grade, beams, walls, and columns unless specifically located and detailed on structural Drawings..
- 4. Locate sleeves or conduits penetrating floors, walls, and beams so as not to significantly impair the strength of the construction. Do not place conduit penetrations in columns.
- 5. Conduit shall not interfere with, or prevent access to, piping, valves, ductwork, or other equipment for operation, maintenance and repair.
- 6. Provide pull boxes or conduit bodies as needed so that there is a maximum of 360 degrees of bends in the conduit run or in long straight runs to limit pulling tensions.
- B. All conduits within a structure shall be installed exposed except as follows:
 - 1. As indicated on the Drawings.
 - 2. Concealed above gypsum wall board or acoustical tile suspended ceilings.
 - 3. Conduits in architecturally finished areas shall be concealed.
- C. Maintain minimum spacing between parallel conduit and piping runs in accordance with the following when the runs are greater than 30 feet:
 - 1. Between instrumentation and telecommunication: 1 inch.
 - 2. Between instrumentation and 125 V, 48 V and 24 VDC, 2 inches.
 - 3. Between instrumentation and 600 V and less AC power or control: 6 inches.
 - 4. Between instrumentation and greater than 600 VAC power: 12 inches.
 - 5. Between telecommunication and 125 V, 48 V and 24 VDC, 2 inches.
 - 6. Between telecommunication and 600 V and less AC power or control: 6 inches.
 - 7. Between telecommunication and greater than 600 VAC power: 12 inches.
 - 8. Between 125 V, 48 V and 24 VDC and 600 V and less AC power or control: 2 inches.
 - 9. Between 125 V, 48 V and 24 VDC and greater than 600 VAC power: 2 inches.
 - 10. Between 600 V and less AC and greater than 600 VAC: 2 inches.
 - 11. Between process, gas, air and water pipes: 6 inches.
- D. Conduits shall be installed to eliminate moisture pockets.
 - 1. Where water cannot drain to openings, provide drain fittings in the low spots of the conduit run.
- E. Conduit shall not be routed on the exterior of structures except as specifically indicated on the Drawings.
- F. Where sufficient room exists within the housing of roof-mounted equipment, the conduit shall be stubbed up inside the housing.
- G. Provide all required openings in walls, floors, and ceilings for conduit penetration.
 - 1. See Specification Section 01 73 20.

3.3 RACEWAY APPLICATIONS

- A. Permitted Raceway Types Per Wire or Cable Types:
 - 1. Power wire or cables: All raceway types.
 - 2. Control wire or cables: All raceway types.
 - 3. Instrumentation cables: Metallic raceway except nonmetallic may be used underground.
 - 4. Motor leads from a VFD: RGS, RNCor shielded VFD cables in all other raceways.
 - 5. Telecommunication cables: All raceway types.
- B. Permitted Raceway Types Per Area Designations:
 - 1. Dry areas:
 - a. RGS.
 - b. IMC.

2. Wet areas:
 - a. RGS.
 - b. IMC.
- C. Permitted Raceway Types Per Routing Locations:
 1. In stud framed walls:
 - a. IMC.
 2. In concrete block or brick walls:
 - a. PVC-40.
 3. Above acoustical tile ceilings:
 - a. IMC.
 - b. NEMA 1 rated wireway.
 4. Beneath floor slab-on-grade:
 - a. PVC-40.
 - b. RGS.
 5. Through floor penetrations, see Specification Section 01 73 20:
 - a. RGS wrapped with factory applied weather and corrosion protection tape when emerging from concrete into areas designated as dry, wet, corrosive or highly corrosive.
 6. Direct buried conduits and ductbanks:
 - a. PVC-40.
 - b. PVC-80.
 - c. 90 degrees elbows for transitions to above grade:
 - 1) RGS wrapped with factory applied weather and corrosion protection tape.
 - d. Long sweeping bends greater than 15 degrees:
 - 1) RGS wrapped with factory applied weather and corrosion protection tape.
 7. Concrete encased ductbanks:
 - a. PVC-40.
 - b. 90 degree elbows for transitions to above grade:
 - 1) RGS wrapped with factory applied weather and corrosion protection tape.
 - c. Long sweeping bends greater than 15 degrees:
 - 1) RGS for sizes 2 inches and larger.
- D. FLEX conduits shall be installed for connections to light fixtures, HVAC equipment and other similar devices above the ceilings.
 1. The maximum length shall not exceed:
 - a. 6 feet to light fixtures.
 - b. 3 feet to all other equipment.
- E. FLEX-LT conduits shall be installed as the final conduit connection to light fixtures, dry type transformers, motors, electrically operated valves, instrumentation primary elements, and other electrical equipment that is liable to vibrate.
 1. The maximum length shall not exceed:
 - a. 6 feet to light fixtures.
 - b. 3 feet to motors.
 - c. 2 feet to all other equipment.
- F. NEMA 12 Rated Wireway:
 1. Surface mounted in areas designated as dry in architecturally and non-architecturally finished areas.

G. Underground Conduit: See Specification Section 26 05 43.

3.4 CONDUIT FITTINGS AND ACCESSORIES

A. Rigid nonmetallic conduit and fittings shall be joined utilizing solvent cement.

1. Immediately after installation of conduit and fitting, the fitting or conduit shall be rotated 1/4 turn to provide uniform contact.

B. Install Expansion Fittings:

1. Where conduits are exposed to the sun and conduit run is greater than 200 feet.
2. Elsewhere as identified on the Drawings.

C. Install Expansion/Deflection Fittings:

1. Where conduits enter a structure.
 - a. Except electrical manholes and handholes.
 - b. Except where the ductbank is tied to the structure with rebar.
2. Where conduits span structural expansions joints.
3. Elsewhere as identified on the Drawings.

D. Threaded connections shall be made wrench-tight.

E. Conduit joints shall be watertight:

1. Where subjected to possible submersion.
2. In areas classified as wet.
3. Underground.

F. Terminate Conduits:

1. In metallic outlet boxes:
 - a. RGSand IMC:
 - 1) Conduit hub and locknut.
 - 2) Insulated bushing and two locknuts.
 - 3) Use grounding type locknut or bushing when required by NFPA 70.
2. In NEMA 12 rated enclosures:
 - a. Watertight, insulated and gasketed hub and locknut.
 - b. Use grounding type locknut or bushing when required by NFPA 70.
3. In NEMA 4 rated enclosures:
 - a. Watertight, insulated and gasketed hub and locknut.
4. When stubbed up through the floor into floor mount equipment:
 - a. With an insulated grounding bushing on metallic conduits.
 - b. With end bells on nonmetallic conduits.

G. Threadless couplings shall only be used to join new conduit to existing conduit when the existing conduit end is not threaded and it is not practical or possible to cut threads on the existing conduit with a pipe threader.

3.5 CONDUIT SUPPORT

A. Permitted multi-conduit surface or trapeze type support system per area designations and conduit types:

1. Dry or wet and/or hazardous areas:
 - a. Galvanized system consisting of: Galvanized steel channels and fittings, nuts and hardware and conduit clamps.
 - b. Aluminum system consisting of: Aluminum channels, fittings and conduit clamps with stainless steel nuts and hardware.

2. Conduit type shall be compatible with the support system material.
 - a. Galvanized steel system may be used with RGS and IMC.
 - b. Stainless steel system may be used with RGS and IMC.
 - c. PVC coated galvanized steel system may be used with PVC-RGS and PVC-40.
- B. Permitted single conduit support fasteners per area designations and conduit types:
 1. Dry or wet and/or hazardous areas:
 - a. Material: Zinc plated steel, stainless steel and malleable iron.
 - b. Types of fasteners: Straps, hangers with bolts, clamps with bolts and bolt on beam clamps.
 2. Conduit type shall be compatible with the support fastener material.
 - a. Zinc plated steel, steel protected with zinc phosphate and oil finish and malleable iron fasteners may be used with RGS and IMC.
 - b. Stainless steel system may be used with RGS and IMC and RAC.
 - c. Nonmetallic fasteners may be used with PVC-40 and PVC-80.
- C. Conduit Support General Requirements:
 1. Maximum spacing between conduit supports per NFPA 70.
 2. Support conduit from the building structure.
 3. Do not support conduit from process, gas, air or water piping; or from other conduits.
 4. Provide hangers and brackets to limit the maximum uniform load on a single support to 25 LBS or to the maximum uniform load recommended by the manufacturer if the support is rated less than 25 pounds.
 - a. Do not exceed maximum concentrated load recommended by the manufacturer on any support.
 - b. Conduit hangers:
 - 1) Continuous threaded rods combined with struts or conduit clamps: Do not use perforated strap hangers and iron bailing wire.
 - c. Do not use suspended ceiling support systems to support raceways.
 - d. Hangers in metal roof decks:
 - 1) Utilize fender washers.
 - 2) Not extend above top of ribs.
 - 3) Not interfere with vapor barrier, insulation, or roofing.
 5. Conduit support system fasteners:
 - a. Use sleeve-type expansion anchors as fasteners in masonry wall construction.
 - b. Do not use concrete nails and powder-driven fasteners.

3.6 OUTLET, PULL AND JUNCTION BOX INSTALLATION

- A. General:
 1. Install products in accordance with manufacturer's instructions.
 2. See Section 26 05 00 and the Drawings for area classifications.
 3. Fill unused punched-out, tapped, or threaded hub openings with insert plugs.
 4. Size boxes to accommodate quantity of conductors enclosed and quantity of conduits connected to the box.
- B. Outlet Boxes:
 1. Permitted uses of metallic outlet boxes:
 - a. Housing of wiring devices:
 - 1) Recessed in all stud framed walls and ceilings.

- 2) Recessed in poured concrete, concrete block and brick walls of architecturally finished areas and exterior building walls.
 - b. Pull or junction box:
 - 1) Above gypsum wall board or acoustical tile ceilings.
 - 2) Above 10 feet in an architecturally finished area where there is no ceiling.
 2. Permitted uses of cast outlet boxes:
 - a. Housing of wiring devices surface mounted in non-architecturally finished dry, wet, corrosive, highly corrosive and hazardous areas.
 - b. Pull and junction box surface mounted in non-architecturally finished dry, wet, corrosive and highly corrosive areas.
 3. Mount device outlet boxes where indicated on the Drawings and at heights as scheduled in Section 26 05 00.
 4. Set device outlet boxes plumb and vertical to the floor.
 5. Outlet boxes recessed in walls:
 - a. Install with appropriate stud wall support brackets or adjustable bar hangers so that they are flush with the face of the wall.
 - b. Locate in ungrouted cell of concrete block with bottom edge of box flush with bottom edge of block and flush with the face of the block.
 6. Place barriers between switches in boxes with 277 V switches on opposite phases.
 7. Back-to-back are not permitted.
 8. When an outlet box is connected to a PVC coated conduit, the box shall also be PVC coated.
- C. Pull and Junction Boxes:
1. Install pull or junction boxes in conduit runs where indicated or required to facilitate pulling of wires or making connections.
 - a. Make covers of boxes accessible.
 2. Permitted uses of NEMA 4 enclosure:
 - a. Pull or junction box surface mounted in areas designated as wet.
 3. Permitted uses of NEMA 12 enclosure:
 - a. Pull or junction box surface mounted in areas designated as dry.

END OF SECTION

SECTION 26 05 43
ELECTRICAL - EXTERIOR UNDERGROUND

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Material and installation requirements for:
 - a. Manholes.
 - b. Handhole.
 - c. Underground conduits and ductbanks.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Division 03 - Concrete.
 - 2. Section 03 00 05 - Concrete.
 - 3. Section 10 14 00 - Identification Devices.
 - 4. Section 26 05 26 - Grounding.
 - 5. Section 26 05 33 - Raceways and Boxes.
 - 6. Section 31 23 33 - Trenching and Backfilling.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. American Association of State Highway and Transportation Officials (AASHTO):
 - a. HB-17, Standard Specifications for Highway Bridges.
 - 2. ASTM International (ASTM):
 - a. A536, Standard Specification for Ductile Iron Castings.
 - 3. National Fire Protection Association (NFPA):
 - a. 70, National Electrical Code (NEC).
 - 4. Society of Cable Telecommunications Engineers (SCTE):
 - a. 77, Specifications for Underground Enclosure Integrity.

1.3 DEFINITIONS

- A. Direct-Buried Conduit(s):
 - 1. Individual (single) underground conduit.
 - 2. Multiple underground conduits, arranged in one or more planes, in a common trench.
- B. Concrete Encased Ductbank: An individual (single) or multiple conduit(s), arranged in one or more planes, encased in a common concrete envelope.

1.4 SUBMITTALS

- A. Shop Drawings:
 - 1. Product technical data:
 - a. Provide submittal data for all products specified in PART 2 of this Specification Section.
 - b. Provide signed and sealed design computations for manholes and handholes indicating compliance with design load rating.
 - 2. Fabrication and/or layout drawings:
 - a. Provide dimensional drawings of each manhole and handhole indicating all specified accessories and conduit entry locations.
 - b. Provide cross-sectioned sketch of each concrete encased ductbank.

- 1) Dimension spacing between conduits.
- 2) Dimension concrete envelope and reinforcing, where applicable.
- c. Provide cross-section sketch of each direct-buried ductbank.
 - 1) Dimension from grade to direct buried ductbank.
 - 2) Dimension from direct buried ductbank to other utilities in the route.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
1. Prefabricated composite handholes:
 - a. Armorcast Products Company.
 - b. Quazite by Hubbell.
 - c. Synertech by Oldcastle Enclosure Solutions.
 - d. Or Engineer approved equal.
 2. Precast manholes and handholes:
 - a. Lister Industries Ltd.
 - b. Oldcastle Enclosure Solutions.
 - c. Jensen Precast and Utility Concrete Products.
 - d. Or Engineer approved equal.
 3. Manhole and handhole and ductbank accessories:
 - a. Cantex, Inc.
 - b. Condux International, Inc.
 - c. Neenah Enterprises, Inc.
 - d. Prime Conduit.
 - e. Thomas and Betts.
 - f. Underground Devices, Inc.
 - g. Unistrut by Atkore International, Inc.
 - h. Or Engineer approved equal.

2.2 MANHOLES AND HANDHOLES

- A. Prefabricated Composite Material Handholes:
1. Handhole body and cover: Fiberglass reinforced polymer concrete conforming to all test provisions of SCTE 77.
 2. Minimum load ratings: SCTE 77 Tier 5.
 3. Solid bottom.
 4. Stackable design as required for specified depth.
 5. Cover:
 - a. Engraved legend of "ELECTRIC" or "COMMUNICATIONS".
 - b. Non-gasketed bolt down with stainless steel penta head bolts.
 - c. Lay-in non-bolt down, when cover is over 100 pounds.
 - d. One or multiple sections so the maximum weight of a section is 125 pounds.
 6. Cover lifting hook: 24 inches minimum in length.
- B. Precast Manholes and Handholes:
1. Fiberglass reinforced polymer concrete or steel reinforced cement concrete structures:
 2. AASHTO live load rating: H-20 for full deliberate vehicle traffic.

3. Mating edges: Tongue and groove type.
4. Solid bottom with a 12 inches x 12 inches or 12 inches diameter french drain in the bottom of each manhole.
5. Cable pulling eyes opposite all conduit entrances.
 - a. Coordinate exact location with installation contractor.

2.3 CONCRETE MANHOLE AND HANDHOLE ACCESSORIES

A. Cover and Frame:

1. Cast ductile iron: ASTM A536.
2. AASHTO live load rating: H-20.
3. Diameter: 30 inches.
4. Cast the legend "ELECTRICAL" or "COMMUNICATIONS" into manhole and handhole covers.

B. Cable Racks and Hooks:

1. Material: Heavy-duty nonmetallic (glass reinforced nylon).
2. Hook loading capacity: 400 pounds minimum.
3. Rack loading capacity: Four hooks maximum.
4. Hook deflection: 0.25 inches maximum.
5. Hooks: Length, as required, with positive locking device to prevent upward movement.
6. Mounding hardware: Stainless steel.

C. Cable Pulling Irons:

1. 7/8 inches diameter hot-dipped galvanized steel.
2. 6000 pound minimum pulling load.

D. Ground Rods and Grounding Equipment: See Specification Section 26 05 26.

2.4 UNDERGROUND CONDUIT AND ACCESSORIES

A. Concrete and reinforcing steel: See Division 03 Specifications.

B. Conduit: See Specification Section 26 05 33.

C. Duct Spacers/Supports:

1. High density polyethylene or high impact polystyrene.
2. Interlocking web or mesh design.
3. Provide 3 inches minimum spacing between conduits.
4. Accessories, as required:
 - a. Hold down bars.
 - b. Ductbank strapping.

PART 3 - EXECUTION

3.1 GENERAL

- A. Drawings indicate the intended location of manholes and handholes and routing of precast cable trench, ductbanks and direct buried conduit.
 1. Field conditions may affect actual routing.
- B. Manhole and Handhole Locations:
 1. Approximately where shown on the Drawings.
 2. As required for pulling distances.
 3. As required to keep pulling tensions under allowable cable tensions.

4. As required for number of bends in ductbank routing.
 5. Shall not be installed in a swale or ditch.
 6. Determine the exact locations after careful consideration has been given to the location of other utilities, grading, and paving.
 7. Locations are to be approved by the Engineer prior to excavation and placement or construction of manholes and handholes.
- C. Install products in accordance with manufacturer's instructions.
- D. Install manholes and handholes in conduit runs where indicated or as required to facilitate pulling of wires or making connections.
- E. Comply with Specification Section 31 23 33 for trenching, backfilling and compacting.

3.2 MANHOLES AND HANDHOLES

A. Prefabricated Composite Material Handholes:

1. For use in areas subjected to occasional non-deliberate vehicular traffic.
2. Place handhole on a foundation of compacted 1/4 to 1/2 inches crushed rock or gravel a minimum of 8 inches thick and 6 inches larger than handholes footprint on all sides.
3. Provide concrete encasement ring around handhole per manufacturers installation instructions (minimum of 10 inches wide x 12 inches deep).
4. Install so that the surrounding grade is 1 inch lower than the top of the handhole.
5. Size: As indicated on the Drawings or as required for the number and size of conduits.
6. Provide cable rails and pulling eyes as needed.

B. Precast Manholes and Handholes:

1. For use in vehicular and non-vehicular traffic areas.
2. Construction:
 - a. Grout or seal all joints, per manufacturer's instructions.
 - b. Support cables on walls by cable racks:
 - 1) Provide a minimum of two racks, install symmetrically on each wall of manholes and handholes.
 - a) Provide additional cable racks, as required, so that both ends of cable splices will be supported horizontally.
 - 2) Equip cable racks with adjustable hooks: Quantity of cable hooks as required by the number of conductors to be supported.
 - c. In each manhole and handhole, drive 3/4 inches x 10 feet long copper clad ground rod into the earth with approximately 6 inches exposed above finished floor.
 - 1) Drill opening in floor for ground rod.
 - 2) Connect all metallic components to ground rod by means of #8 AWG minimum copper wire and approved grounding clamps.
 - 3) Utilize a ground bar in the manhole or handhole if the quantity of ground wires exceeds three.
 - a) Connect ground bar to ground rod with a #2/0 AWG minimum copper wire.
3. Place manhole or handhole on a foundation of compacted 1/4 to 1/2 inches crushed rock or gravel a minimum of 8 inches thick and 6 inches larger than manholes or handholes footprint on all sides.
4. Install so that the top of cover is 1 inch above finished grade.
 - a. Where existing grades are higher than finished grades, install sufficient number of courses of curved segmented concrete block between top of handhole and manhole frame to temporarily elevate manhole cover to existing grade level.
5. After installation is complete, backfill and compact soil around manholes and handholes.
6. Handhole size:

- a. As indicated on the Drawings or as required for the number and size of conduits entering or as indicated on the Drawings.
- 7. Manhole size:
 - a. As indicated on the Drawings or as required for the number and size of conduits entering or as indicated on the Drawings.

3.3 UNDERGROUND CONDUITS

A. General Installation Requirements:

1. Ductbank types per location:
 - a. Concrete encased ductbank:
 - 1) Under roads.
 - 2) Pad mounted transformer secondaries.
 - 3) As indicated in the Drawings.
 - b. Direct-buried conduit(s):
 - 1) Area/Roadway lighting.
 - 2) As indicated in the Drawings.
2. Do not place concrete or soil until conduits have been observed by the Engineer.
3. Ductbanks shall be sloped a minimum of 4 inches per 100 feet or as detailed on the Drawings.
 - a. Low points shall be at manholes or handholes.
4. During construction and after conduit installation is complete, plug the ends of all conduits.
5. Provide conduit supports and spacers.
 - a. Place supports and spacers for rigid nonmetallic conduit on maximum centers as indicated for the following trade sizes:
 - 1) 1 inches and less: 3 feet.
 - 2) 1-1/4 to 3 inches: 5 feet.
 - 3) 3-1/2 to 6 inches: 7 feet.
 - b. Place supports and spacers for rigid steel conduit on maximum centers as indicated for the following trade sizes:
 - 1) 1 inches and less: 10 feet.
 - 2) 1-1/4 to 2-1/2 inches: 14 feet.
 - 3) 3 inches and larger: 20 feet.
 - c. Securely anchor conduits to supports and spacers to prevent movement during placement of concrete or soil.
6. Stagger conduit joints at intervals of 6 inches vertically.
7. Make conduit joints watertight and in accordance with manufacturer's recommendations.
8. Accomplish underground changes in direction of runs exceeding a total of 15 degrees by long sweep bends having a minimum radius of 10 feet.
 - a. Sweep bends may be made up of one or more curved or straight sections or combinations thereof.
9. Furnish manufactured elbows at end of runs as the conduit transitions to above grade.
 - a. Minimum radius of 18 inches for conduits less than 3 inches trade size and 36 inches for conduits 3 inches trade size and larger.
10. Field cuts requiring tapers shall be made with the proper tools and shall match factory tapers.
11. After the conduit run has been completed:
 - a. Prove joint integrity and test for out-of-round duct by pulling a test mandrel through each conduit.
 - 1) Test mandrel:

- a) Length: Not less than 12 inches.
 - b) Diameter: Approximately 1/4 inches less than the inside diameter of the conduit.
- b. Clean the conduit by pulling a heavy duty wire brush mandrel followed by a rubber duct swab through each conduit.
- 12. Pneumatic rodding may be used to draw in lead wire.
 - a. Install a heavy nylon cord free of kinks and splices in all unused new ducts.
 - b. Extend cord 3 feet beyond ends of conduit.
- 13. Transition from rigid nonmetallic conduit to rigid metallic conduit, per Specification Section 26 05 33, prior to entering a structure or going above ground.
 - a. Except rigid nonmetallic conduit may be extended directly to manholes, handholes, pad mounted transformer boxes and other exterior pad mounted electrical equipment where the conduit is concealed within the enclosure.
 - b. Terminate rigid PVC conduits with end bells.
 - c. Terminate steel conduits with insulated bushings.
- 14. Place warning tape in trench directly over ductbanks, direct-buried conduit, and direct-buried wire and cable in accordance with Specification Section 10 14 00.
- 15. Placement of conduits stubbing into handholes and manholes shall be located to allow for proper bending radiuses of the cables.
- B. Concrete Encased Ductbank:
 - 1. Ductbank system consists of conduits completely encased in minimum 3 inches of concrete and with separations between different cabling types as required in Specification Section 26 05 33 or as detailed on the Drawings.
 - 2. Install so that top of concrete encased duct, at any point:
 - a. Is not less than 24 inches below grade.
 - b. Is below pavement sub-grading.
 - 3. Conduit supports shall provide a uniform minimum clearance of 3 inches between the bottom of the trench and the bottom row of conduit.
 - 4. Conduit separators shall provide a uniform minimum clearance of 3 inches between conduits or as required in Specification Section 26 05 33 for different cabling types.
- C. Direct-Buried Conduit(s):
 - 1. Install so that the top of the uppermost conduit, at any point:
 - a. Is not less than 30 inches below grade.
 - b. Is below pavement sub-grading.
 - 2. Provide a uniform minimum clearance of 3 inches between conduits or as required in Specification Section 26 05 33 for different cabling types.
 - a. Maintain the separation of multiple planes of conduits by one of the following methods:
 - 1) Install multilevel conduits with the use of conduit supports and separators to maintain the required separations, and backfill with flowable fill (100 psi) per Specification Section 31 23 33 or concrete per Division 03 specifications.
 - 2) Install the multilevel conduits one level at a time.
 - a) Each level is backfilled with the appropriate amount of soil and compaction, per Specification Section 31 23 33, to maintain the required separations.
- D. Do not route conduits embedded in concrete structure (e.g., sidewalks, bridge decks) unless specifically located and detailed on Structural Drawings.

END OF SECTION

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SECTION 26 08 13
ACCEPTANCE TESTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Basic requirements for acceptance testing.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Section 26 05 00 - Common Work Results for Electrical.
 - 2. Section 26 32 14 - Engine Generator - Diesel.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. InterNational Electrical Testing Association (NETA):
 - a. ATS, Standard for Acceptance Testing Specifications for Electric Power Equipment and Systems.
 - 2. Nationally Recognized Testing Laboratory (NRTL).
- B. Qualifications:
 - 1. Testing firm:
 - a. An independent firm performing, as the sole or principal part of its business for a minimum of 10 years, the inspection, testing, calibration , and adjusting of systems.
 - b. Must have an established monitoring and testing equipment calibration program with accuracy traceable in an unbroken chain, according to NIST.
 - 2. Field personnel:
 - a. Minimum of one year field experience covering all phases of electrical equipment inspection, testing, and calibration.
 - b. Relay test technician having previous experience with testing and calibration of relays of the same manufacturer and type used on project and proficient in setting and testing the types of protection elements used.
 - c. Supervisor certified by NETA or NICET.
 - 1) As an alternative, supervising technician may be certified by the equipment manufacturer
 - 3. Analysis personnel:
 - a. Minimum three years combined field testing and data analysis experience.
 - b. Supervisor certified by NETA or NICET.
 - 1) As an alternative, supervising technician may be certified by the equipment manufacturer.
- C. Phasing Diagram:
 - 1. Coordinate with Utility Company for phase rotations and Phase A, B and C markings.
 - a. Create a phasing diagram showing the coordinated phase rotations with generators and motors through the transformers.

1.3 SUBMITTALS

- A. Shop Drawings:
 - 1. Equipment Monitoring and Testing Plan.
- B. Informational Submittals:

1. Prior to energizing equipment:
 - a. Coordinated phasing diagram.
 - b. Photocopies of grounding continuity tests.
2. Within two weeks after successful completion of Demonstration Period (Commissioning Period):
 - a. Single report containing information including:
 - 1) Summary of Project.
 - 2) Information from pre-energization testing.
 - 3) Testing and monitoring reports.

PART 2 - PRODUCTS

2.1 FACTORY QUALITY CONTROL

- A. Provide Electrical equipment with all factory tests required by the applicable industry standards or NRTL.
- B. Factory testing will not be accepted in lieu of specified field acceptance testing requirements.

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

- A. General:
 1. Complete electrical testing in three phases:
 - a. Pre-energization testing phase.
 - b. Equipment energized with no load.
 - c. Equipment energized under load.
 2. Perform testing in accordance with this Specification Section and NETA ATS.
 3. Provide field setting and programming of all adjustable protective devices and meters to settings [provided by the Engineer.] [as determined by the approved coordination study.]
 4. Equip testing and analysis personnel with all appropriate project related reference material required to perform tests, analyze results, and provide documentation including, but not limited to:
 - a. Contract Drawings and Specifications.
 - b. Related construction change documentation.
 - c. Approved Shop Drawings.
 - d. Approved Operation and Maintenance Manuals.
 - e. Other pertinent information as required.
- B. Equipment Monitoring and Testing Plan:
 1. Approved in accordance with Shop Drawing submittal schedule.
 2. Included as a minimum:
 - a. Qualifications of firm, field personnel, and analysis personnel doing the Work.
 - b. List and description of testing and analysis equipment to be utilized.
 - c. List of all equipment to be testing, including:
 - 1) Name and tag numbers identified in the Contract Documents.
 - 2) Manufacturer's serial numbers.
 - 3) Other pertinent manufacturer identification,
- C. Instruments Used in Equipment and Connections Quality Control Testing:
 1. Minimum calibration frequency:
 - a. Field analog instruments: Not more than 6 months.

- b. Field digital instruments: Not more than 12 months.
 - c. Laboratory instruments: Not more than 12 months.
 - d. If instrument manufacturer's calibration requirements are more stringent, those requirements shall govern.
- 2. Carry current calibration status and labels on all testing instruments.
- 3. See individual testing programs for additional instrumentation compliance requirements.
- D. Testing and Monitoring Program Documentation:
 - 1. Provide reports with tabbed sections for each piece of equipment tested.
 - 2. Include all testing results associated with each piece of equipment under that equipment's tabbed section.
 - a. Include legible copies of all forms used to record field test information.
 - 3. Prior to start of testing, submit one copy of preliminary report format for Engineer review and comment
 - a. Include data gathering and sample test report forms that will be utilized.
 - 4. In the final report, include as a minimum, the following information for all equipment tested:
 - a. Equipment identification, including:
 - 1) Name and tag numbers identified in the Contract Documents.
 - 2) Manufacturer's serial numbers.
 - 3) Other pertinent manufacturer identification,
 - b. Date and time of each test.
 - c. Ambient conditions including temperature, humidity, and precipitation.
 - d. Visual inspection report.
 - e. Description of test and referenced standards, if any, followed while conducting tests.
 - f. Results of initial and all retesting.
 - g. Acceptance criteria.
 - h. "As found" and "as left" conditions.
 - i. Corrective action, if required, taken to meet acceptance.
 - j. Verification of corrective action signed by the Contractor, equipment supplier, and Owner's representative.
 - k. Instrument calibration dates of all instruments used in testing.
 - 5. Provide three (3) bound final reports prior to Project final completion.
- E. Electrical Equipment and Connections Testing Program:
 - 1. See individual Division 26 Specification Sections for equipment specific testing requirements.
 - 2. Test all electrical equipment.
 - a. Perform all required NETA testing.
 - b. Perform all required NETA testing plus the optional testing identified with each specific type of equipment in Article 3.2 of this Specification Section.

3.2 SPECIFIC EQUIPMENT TESTING REQUIREMENTS

- A. Transformers - Small Dry Type:
 - 1. Perform inspections and tests per NETA ATS 7.2.1.1.
 - 2. Perform the following additional tests:
 - a. Record phase-to-phase, phase-to-neutral, and neutral-to-ground voltages at no load after energizing, and at operating load after startup.
 - 3. Adjust tap connections as required to provide secondary voltage within 2-1/2% of nominal under normal load after approval of Engineer.

4. Record as-left tap connections.
- B. Cable - Low Voltage:
 1. Perform inspections and tests per NETA ATS 7.3.2.
 - a. Insulation resistance testing is limited to conductors #4 AWG and larger.
- C. Low Voltage Molded Case Circuit Breakers:
 1. Perform inspections and tests per NETA ATS 7.6.1.1.
 2. Components:
 - a. Test all components per applicable paragraphs of this Specification Section and NETA ATS.
 - b. Thermal magnetic breakers: Visual and mechanical inspection per NETA ATS only.
 - c. Solid state trip type: Visual and mechanical inspection and electrical tests per NETA ATS.
 3. Record as-left settings.
- D. Protective Relays:
 1. Perform inspections and tests per NETA ATS 7.9.
 - a. Tests to be performed using secondary injection of 3 PH current and potential at final settings.
 - b. Test at manufacturer's recommended test points and critical timing points identified on relay setting sheet.
 2. Perform all tests identified as optional per NETA ATS.
 3. Perform the following additional tests:
 - a. Verification of direct trip of associated lockout relay or circuit breaker(s) by using relay test function or shorting trip contact at relay case.
 - b. Microprocessor-based relays:
 - 1) Complete commissioning procedure per manufacturer's instructions, followed by tests of each relay element at final settings.
 - 2) Verification of all internally-programmed logic.
 - c. Verification of all auxiliary input and output signals.
 - d. Verification of power supply/self-diagnostic alarm contact and remote annunciation.
 4. Record as-left settings.
- E. Instrument Transformers:
 1. Perform inspections and tests per NETA ATS 7.10.
 2. Components: Test all components per applicable paragraphs of this Specification Section and NETA ATS.
 3. Perform the following optional tests per NETA ATS:
 - a. Dielectric withstand test on potential transformers.
- F. Metering:
 1. Perform inspections and tests per NETA ATS 7.11.
 2. Components: Test all components per applicable paragraphs of this Specification Section and NETA ATS.
- G. Grounding:
 1. Perform inspections and tests per NETA ATS 7.13.
 2. Components: Test all components per applicable paragraphs of this Specification Section and NETA ATS.
- H. Motors:

1. Perform inspections and tests per NETA ATS 7.15.
 2. Testing of motors:
 - a. After installation and prior to energizing the motor, perform inspections and tests per NETA ATS 7.15 for all motors HP or above.
 - b. Ensure motor has been lubricated.
 - c. Bump motor to check for correct rotation.
- I. Motor Controllers:
1. Perform inspections and tests per NETA ATS 7.16.
 2. Components: Test all components per applicable paragraphs of this Specification Section and NETA ATS.
- J. Generators:
1. Perform inspections and tests per NETA ATS 7.15.2.
 2. Components: Test all components per applicable paragraphs of this Specification Section and NETA ATS.
 3. Perform the following additional tests:
 - a. Load and cycle crank test per Specification Section 26 32 14.
- K. Control System Functional Test:
1. Perform test upon completion of equipment acceptance tests.
 2. The test is to prove the correct interaction of all sensing, processing and action devices.
 3. Develop a test plan and parameters for the purpose of evaluating the performance of the system.
 4. Perform the following tests:
 - a. Verify the correct operation of all interlock safety devices for fail-safe functions in addition to design function.
 - b. Verify the correct operation of all sensing devices, alarms and indicating devices.

END OF SECTION

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SECTION 26 09 13
ELECTRICAL METERING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Digital metering equipment.
- B. Related Sections include but are not necessarily limited to:
 - 1. Section 26 05 00 – Common Work Results for Electrical.
 - 2. Section 26 08 13 - Acceptance Testing.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. National Electrical Manufacturers Association (NEMA):
 - a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
 - 2. National Electrical Manufacturers Association/American National Standards Institute (NEMA/ANSI):
 - a. C12.20, For Electricity Meter - 0.2 and 0.5 Accuracy Classes.
 - 3. Underwriters Laboratories, Inc. (UL):
 - a. 508, Standard for Safety Industrial Control Equipment.

1.3 SUBMITTALS

- A. Shop Drawings:
 - 1. Product technical data including:
 - a. Provide submittal data for all products specified in PART 2 of this Specification:
 - b. See Section 26 05 00 for additional requirements.
 - 2. Fabrication and/or layout drawings.
 - a. Electrical wiring/connection diagrams.
- B. Contract Closeout Information:
 - 1. Operation and Maintenance Data:
 - a. See Specification Section 01 78 23 for requirements for the mechanics, administration, and the content of Operation and Maintenance Manual submittals.
 - b. Content of Operation and Maintenance Manual:
 - 1) Data sheet of the meters electrical parameters, configuration and characteristics including a complete model number and associated equipment connected too.
 - 2) Operating instructions of the meter(s) supplied.
 - 3) Operating instructions of the Power Management software.
 - 4) Maintenance instructions.
 - 5) As-constructed electrical wiring/connection diagrams.
 - 6) Acceptance testing data.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:

1. Allen-Bradley.
2. Eaton.
3. Electro Industries.
4. GE by ABB.
5. Power Measurement.
6. Square D Company.
7. Siemens.

2.2 DIGITAL METERING DEVICES

A. General:

1. Direct reading metered or calculated values.
2. Microprocessor based.
3. Integral LED or LCD display.
4. Current and potential transformers as required.
5. Integral fusing.
6. Operating temperature: 0 degrees F to 150 degrees F.
7. Standards:
 - a. NEMA/ANSI C12.20.
 - b. UL 508.

B. Type 'B' Midrange Meter:

1. Display the following minimum electrical parameters (accuracy):
 - a. RMS current per phase (+0.3% full scale).
 - b. RMS voltage line-to-line and line-to-neutral (+0.3% full scale).
 - c. Real power (W): 3 PH total (+0.6% full scale).
 - d. Apparent power (VA): 3 PH total (+0.6% full scale).
 - e. Reactive power (VAR): 3 PH total (+0.6% full scale).
 - f. Power factor (+1.0%).
 - g. Frequency (+0.17%).
 - h. Percent current total harmonic distortion (31st).
 - i. Percent voltage total harmonic distortion (31st).
2. Data logging:
 - a. Min. 512 KB.
 - b. Selectable for parameters listed above for display.
 - c. Software for configuration, retrieval, and trending.
3. Communication ports and protocols: Ethernet TCP/IP, MODBUS.
4. Supply voltage: 120 VAC.

2.3 ACCESSORIES

A. Power Management and Control Software:

1. Manufacturer's standard, see Part 3 for minimum functionality.

PART 3 - EXECUTION

3.1 INSTALLATION

- #### **A. Install as indicated and in accordance with manufacturer's recommendations and instructions.**
1. Provide all equipment as necessary to provide a complete and functioning system.

2. Coordinate with the Owner on final computer screen layouts, trending requirements and printouts.
- B. Meter Type Application:
1. Type B meters: Integral to equipment as indicated on the Drawings.
- C. Communication Configuration:
1. As indicated on the Drawings.
 2. The main breaker meter shall be connected to the nearest process control system Ethernet switch.
- D. Computer Screen Configuration:
1. Each meter shall have a data screen with the following minimum data as applicable for the capabilities of that type of meter:
 - a. Voltage line-to-line for each phase and an average.
 - b. Voltage line-to-neutral for each phase and an average.
 - c. Current for each phase, neutral and average and peak demands.
 - d. Kilowatts (kW) for each phase, total, demand and peak demand.
 - e. Kilovolt-amperes (kVA) for each phase, total, demand and peak demand.
 - f. Kilovolt-amperes reactive (kVAR) for each phase, total, demand and peak demand.
 - g. Power factor for each phase and total.
 - h. Frequency.
 - i. Voltage total harmonic distortion for each phase.
 - j. Current total harmonic distortion for each phase.
 - k. Energy (kWhr) for each phase and total.
 - l. A seven day kW, kVA and kVAR trend average.
 - m. Peak demands shall be resettable by the operator.
 2. Meter shall also have the following 15 minute trending graphs.
 - a. Duration: Adjustable, with a seven day default.
 - b. Phase A current: Minimum, maximum, and average.
 - c. Phase B current: Minimum, maximum, and average.
 - d. Phase C current: Minimum, maximum, and average.
 - e. Neutral current: Minimum, maximum, and average.
 - f. Phase A Watts: Minimum, maximum, and average.
 - g. Phase B Watts: Minimum, maximum, and average.
 - h. Phase C Watts: Minimum, maximum, and average.
 - i. Watts total.
 - j. Phase A Voltamps: Minimum, maximum, and average.
 - k. Phase B Voltamps: Minimum, maximum, and average.
 - l. Phase C Voltamps: Minimum, maximum, and average.
 - m. Voltamps total.
 - n. Phase A power factor: Minimum, maximum, and average.
 - o. Phase B power factor: Minimum, maximum, and average.
 - p. Phase C power factor: Minimum, maximum, and average.
 - q. Power factor total.

3.2 FIELD QUALITY CONTROL

- A. Acceptance Testing: See Section 26 08 13.

3.3 TRAINING

- A. A qualified factory-trained manufacturer's representative shall provide the Owner with 8 hours of on-site training in the operation and maintenance of the metering system and its components.

END OF SECTION

SECTION 26 24 16

PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Branch circuit panelboards.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Section 10 14 00 – Identification Devices.
 - 2. Section 26 05 00 - Common Work Results for Electrical.
 - 3. Section 26 09 13 – Electrical Metering Devices.
 - 4. Section 26 28 00 - Overcurrent and Short Circuit Protective Devices.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. National Electrical Manufacturers Association (NEMA):
 - a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
 - b. PB 1, Panelboards.
 - 2. National Fire Protection Association (NFPA):
 - a. 70, National Electrical Code (NEC).
 - 3. Underwriters Laboratories, Inc. (UL):
 - a. 50, Enclosures for Electrical Equipment, Non-Environmental Considerations.
 - b. 67, Standard for Panelboards.

1.3 DEFINITIONS

- A. Branch Circuit Panelboard: Bus rating of 400A and less or where labeled as Branch Circuit Panelboard on the Drawings.

1.4 SUBMITTALS

- A. Shop Drawings:
 - 1. Product technical data.
 - a. Provide submittal data for all products specified in PART 2 of this Specification Section.
 - b. See Section 26 05 00 for additional requirements.
 - 2. Fabrication and/or layout drawings:
 - a. Panelboard layout with alphanumeric designation, branch circuit breakers size and type, as indicated in the panelboard schedules.
- B. Contract Closeout Information:
 - 1. Operation and Maintenance Data:
 - a. See Specification Section 01 78 23 for requirements for the mechanics, administration, and the content of Operation and Maintenance Manual submittals.
 - 2. Panelboard schedules with as-built conditions.
- C. Informational Submittals:
 - 1. Service equipment marking and documentation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
 - 1. Eaton.
 - 2. GE by ABB.
 - 3. Square D by Schneider Electric.
 - 4. Siemens Corporation.
- 5. Or Engineer approved equal.

2.2 MANUFACTURED UNITS

- A. Standards: NEMA PB 1, NFPA 70, UL 50, UL 67.
- B. Ratings:
 - 1. Current, voltage, number of phases, number of wires as indicated on the Drawings.
 - 2. Short Circuit Current Rating (SCCR) and/or Ampere Interrupting Current (AIC) ratings equal to or greater than the interrupting rating indicated on the Drawings or in the schedule.
 - a. Series rating is not acceptable.
 - b. When fault current or minimum interrupting rating is not indicated, use rating of upstream equipment or infinite bus calculation of transformer secondary.
- C. Construction:
 - 1. Interiors factory assembled and designed such that switching and protective devices can be replaced without disturbing adjacent units and without removing the main bus connectors.
 - 2. Multi-section panelboards: Feed-through or sub-feed lugs.
 - 3. Main lugs: Solderless type approved for copper and aluminum wire.
- D. Bus Bars:
 - 1. Main bus bars:
 - a. Tin plated aluminum or tin-plated copper sized to limit temperature rise to a maximum of 65 degrees C above an ambient of 40 degrees C.
 - b. Drilled and tapped and arranged for sequence phasing of the branch circuit devices.
 - 2. Ground bus and isolated ground bus, when indicated on the Drawings: Solderless mechanical type connectors.
 - 3. Neutral bus bars: Insulated 100% rated or 200% rated, when indicated on the Drawings and with solderless mechanical type connectors.
- E. Overcurrent and Short Circuit Protective Devices:
 - 1. Main overcurrent protective device:
 - a. Molded case circuit breaker.
 - 2. Branch overcurrent protective devices:
 - a. Molded case circuit breaker.
 - 3. See Specification Section 26 28 00 for overcurrent and short circuit protective device requirements.
 - 4. Factory installed.
- F. Integral surge protective device:
 - 1. Provide for panelboards where indicated on the Drawings
 - 2. See Specification Section 26 43 13.
- G. Enclosure:

1. Boxes: Code gage galvanized steel, furnish without knockouts.
2. Trim assembly: Code gage steel finished with rust inhibited primer and manufacturers standard paint inside and out.
3. Branch circuit panelboard:
 - a. Trims supplied with hinged door-in-door construction.
 - 1) Outer door:
 - a) Allows access to the interior of the enclosure.
 - b) Hinged to the enclosure.
 - c) Opened by removal of screws or by operating a mechanical latch located behind the inner door.
 - 2) Inner door:
 - a) Allows access to breakers (non-live parts).
 - b) Hinged to outer door.
 - c) Opened by operation of a keyed corrosion resistant chrome-plated combination lock and catch. Locks for all branch circuit panelboards keyed alike.
 - b. Trims for surface mounted panelboards, same size as box.
 - c. Trims for flush mounted panelboards, overlap the box by 3/4 inches on all sides.
 - d. Nominal 20 inches wide and 5-3/4 inches deep with gutter space in accordance with NFPA 70.
 - e. Clear plastic cover for directory card mounted on the inside of each door.
 - f. Where NEMA 3R or NEMA 12 rating is indicated: Door gasketed.
 - g. Where NEMA 4X is indicated: Stainless Steel.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install as indicated on the Drawings, in accordance with the NFPA 70, and in accordance with manufacturer's instructions.
- B. Support panelboard enclosures from wall studs or modular channels support structure, per Section 26 05 00.
- C. Provide NEMA rated enclosure as indicated on the Drawings. Where enclosure type is not indicated, provide enclosure rating suitable for the atmosphere where equipment is installed.
- D. Equipment Marking and Documentation:
 1. Provide labeling per NFPA 70 and other applicable codes.
 2. Service equipment:
 - a. Arc-flash hazard warning label. (Ref. NFPA 70 Article 110.16(A) and (B))
 - b. Available fault current label and documentation of the calculations made for compliance with marking requirements. (Ref. NFPA 70 Article 110.24)
 3. Other than service equipment:
 - a. Arc-flash hazard warning label. (Ref. NFPA 70 Article 110.16(A))
 - b. Available fault current label. (Ref. NFPA 70 Article 408.6)
 4. Identify (tag) all equipment and equipment components.
 5. Provide labels and tags in accordance with Section 10 14 00.
 6. Available fault current and other required label data from Coordinated Power System Study as required by the contract documents.
- E. Provide each panelboard with a typed directory:
 1. Identify all circuit locations in each panelboard with the load type and location served.

2. Use Owner-furnished mechanical equipment designation if different than designation indicated on the Drawings.
3. Use final building room names and numbers as identified by the Owner if different than designation indicated on the Drawings.
4. Identify spare overcurrent devices.

END OF SECTION

SECTION 26 27 26

WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Material and installation requirements for:
 - a. Wall switches.
 - b. Receptacles.
 - c. Device wallplates and coverplates.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Section 26 05 00 - Common Work Results for Electrical.
 - 2. Section 26 05 33 - Raceways and Boxes.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. National Electrical Manufacturers Association (NEMA):
 - a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
 - b. WD 1, General Color Requirements for Wiring Devices.
 - c. WD 6, Wiring Devices - Dimensional Requirements.
 - 2. Underwriters Laboratories, Inc. (UL):
 - a. 20, General-Use Snap Switches.
 - b. 498, Standard for Attachment Plugs and Receptacles.
 - c. 514A, Metallic Outlet Boxes.
 - d. 894, Standard for Switches for Use in Hazardous (Classified) Locations.
 - e. 943, Ground-Fault Circuit-Interruptioners.
 - f. 1010, Standard for Receptacle-Plug Combinations for Use in Hazardous (Classified) Locations.
 - g. 1310, Standard for Class 2 Power Units.

1.3 SUBMITTALS

- A. Shop Drawings:
 - 1. Product technical data:
 - a. Provide submittal data for all products specified in PART 2 of this Specification Section.
 - b. See Section 26 05 00 for additional requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
 - 1. Wall switches and receptacles:
 - a. Bryant Electric.
 - b. Cooper Wiring Devices by Eaton.
 - c. Hubbell Incorporated Wiring Device-Kellems.
 - d. Leviton Manufacturing Company.

- e. Legrand/Pass & Seymour.
- f. Eaton Crouse-Hinds.
- g. Appleton Electric Co.
- h. Hubbell Killark.
- i. Or Engineer approved equal.

2.2 WALL SWITCHES

- A. Basic requirements unless modified in specific requirements paragraph of switches per designated areas or types:
 - 1. Industrial Specification Grade.
 - 2. Quiet action, snap switch.
 - 3. Self-grounding with grounding terminal.
 - 4. Back and side wired.
 - 5. Solid silver cadmium oxide contacts.
 - 6. Rugged thermoplastic and/or nylon housing and one-piece switch arm.
 - 7. Ratings: 20 A, 120/277 VAC.
 - 8. Switch handle type: Toggle.
 - 9. Switch handle color: Gray.
 - 10. Types as indicated on the Drawings:
 - a. Single-pole.
 - b. Double-pole.
 - c. 3-way.
 - d. Momentary contact.
 - 11. Standards: UL 20, UL 514A, NEMA WD 1, NEMA WD 6.
- B. Specialty Switch Specific Requirements:
 - 1. Momentary Contact Switch for Lighting Control:
 - a. SPDT, 3-position, center "off".
 - b. Rating: 15A, 120/277VAC.
 - 2. Pilot Light Switch:
 - a. Neon lamp in red toggle handle, handle to light when switch is on.
 - b. Rating: 120 or 277 VAC.
- C. Dry and Dusty Non-Architecturally Finished Area Specific Requirements:
 - 1. Coverplate:
 - a. Cast aluminum, gasketed, stainless steel hardware, natural, lacquer, or factory painted finish.
 - b. Operator type:
 - 1) Side mounted rocker type handle to operate snap switch.
 - 2) Front mounted lever type handle to operate snap switch.
 - 3) Push/pull operator to operate snap switch.
 - 4) Spring type door to cover snap switch.
 - c. Single or multiple gang as required.
- D. Wet or Damp Non-Architecturally Finished or Exterior Area Specific Requirements:
 - 1. Coverplate:
 - a. Cast iron alloy, gasketed, stainless steel hardware, galvanized and factory painted finish.

- b. Cast aluminum, gasketed, stainless steel hardware, natural, lacquer, or factory painted finish.
- c. Operator type:
 - 1) Side mounted rocker type handle to operate snap switch.
 - 2) Front mounted lever type handle to operate snap switch.
 - 3) Push/pull operator to operate snap switch.
 - 4) Spring type door to cover snap switch.
- d. Wet location rated.
- e. Single or multiple gang as required.

2.3 RECEPTACLES

- A. Basic requirements unless modified in specific requirements paragraph of receptacles and per designated areas:
 - 1. Industrial Specification Grade.
 - 2. Straight blade.
 - 3. Brass triple wipe line contacts.
 - 4. One-piece grounding system with double wipe brass grounding contacts and self-grounding strap with grounding terminal.
 - 5. Back and side wired.
 - 6. Rating: 20 A, 125 VAC.
 - 7. High impact nylon body.
 - 8. Receptacle body color:
 - a. Normal power: Gray.
 - b. Generator or UPS power: Red.
 - 9. Duplex or simplex as indicated on the Drawings.
 - 10. Configuration: NEMA 5-20R.
 - 11. Standards: UL 498, UL 514A, NEMA WD 1, NEMA WD 6.
- B. Receptacle Type Specific Requirements:
 - 1. Basic receptacles:
 - a. Weather-resistant when located in exterior locations or interior damp or wet areas as indicated on the Drawings.
 - 1) Identification: Letters "WR" on face of receptacle.
 - 2. Ground Fault Circuit Interrupter (GFCI):
 - a. Specification Grade.
 - b. Class A protection.
 - c. Feed through type.
 - d. Test and reset buttons.
 - e. Self-testing.
 - f. Visual indicator light.
 - g. Weather-resistant when located in exterior locations or interior damp or wet areas as indicated on the Drawings.
 - 1) Identification: Letters "WR" on face of receptacle.
 - h. Tamper resistant (TR) when indicated on the Drawings.
 - i. Additional standards: UL 943.
 - 3. Plug load (PL) control receptacle.
 - a. Commercial Specification Grade.
 - b. Dual controlled (PLD) or half controlled (PLH) as indicated on the Drawings.

- c. Identification: NEMA approved controlled receptacle marking on face of receptacle.
- C. Dry and Dusty Non-Architecturally Finished Areas Specific Requirements:
 - 1. Coverplate:
 - a. Cast aluminum, gasketed, self-closing cover, stainless steel hardware, natural, lacquer or factory painted finish.
 - b. Single or multiple gang, as required.
- D. Damp Non-Architecturally Finished Areas Specific Requirements:
 - 1. Coverplate:
 - a. Cast aluminum, gasketed, self-closing cover, stainless steel hardware, natural, lacquer or factory painted finish.
 - b. Weatherproof when receptacle is covered.
 - c. Single or multiple gang as required.
- E. Wet Non-architecturally Finished Areas Specific Requirements:
 - 1. Coverplate:
 - a. Extra-duty rated, weatherproof (NEMA 3R) while in use, gasketed, stainless steel hardware, copper-free aluminum, 3.2 inches minimum cover depth for #12 AWG cords.
- F. Exterior Locations Specific Requirements:
 - 1. Coverplate:
 - a. Extra-duty rated, weatherproof (NEMA 3R) while in use, gasketed, stainless steel hardware, copper-free aluminum, 3.2 inches minimum cover depth for #12 AWG cord.
- G. Special Purpose Receptacles:
 - 1. NEMA configuration as indicated on the Drawings.
 - 2. Coverplate: See requirements per area designations herein.
 - 3. 20 A, 250 V, 2-pole, 3-wire grounding, simplex; side and back wired; NEMA 6-20R; ivory.
 - 4. 30 A, 125 V, 2-pole, 3-wire, grounding, simplex; NEMA 5-30R; black.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Mount devices where indicated on the Drawings and as scheduled in Section 26 05 00.
- C. See Specification Section 26 05 33 for device outlet box requirements.
- D. Where more than one receptacle is installed in a room, they shall be symmetrically arranged.
- E. Provide blank plates for empty outlets.
- F. Momentary contact switches shall be installed and connected such that the up position is 'on only' and the down position is 'off only.'

END OF SECTION

SECTION 26 28 00
OVERCURRENT AND SHORT CIRCUIT PROTECTIVE DEVICES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Low voltage circuit breakers.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Section 26 05 00 - Common Work Results for Electrical.
 - 2. Section 26 08 13 - Acceptance Testing.
 - 3. Section 26 36 00 – Transfer Switches.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. National Fire Protection Association (NFPA):
 - a. 70, National Electrical Code (NEC).
 - 2. Underwriters Laboratories, Inc. (UL):
 - a. 248-1, Low-Voltage Fuses - Part 1: General Requirements.
 - b. 248-8, Low-Voltage Fuses - Part 8: Class J Fuses.
 - c. 248-12, Low-Voltage Fuses - Part 12: Class R Fuses.
 - d. 489, Standard for Safety Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures.

1.3 SUBMITTALS

- A. Shop Drawings:
 - 1. Product technical data including:
 - a. Provide submittal data for all products specified in PART 2 of this Specification Section.
 - b. See Section 26 05 00 for additional requirements.
- B. Contract Closeout Information:
 - 1. Operation and Maintenance Data:
 - a. See Specification Section 01 78 23 for requirements for the mechanics, administration, and the content of Operation and Maintenance Manual submittals.
- C. Informational Submittals:
 - 1. Ground fault protection system test reports signed by the projects supervising electrical foreman.
 - 2. Reports:
 - a. Short circuit study report.
 - b. Protective coordination study report.
 - c. As-left condition of all circuit breakers that have adjustable settings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
 - 1. Circuit breakers:

- a. Eaton.
 - b. GE by ABB.
 - c. Square D Company.
 - d. Siemens.
 - e. Or Engineer approved equal
2. Fuses:
- a. Eaton Bussmann, Inc.
 - b. Littelfuse, Inc.
 - c. Mersen
 - d. Or Engineer approved equal

2.2 CIRCUIT BREAKERS

A. Molded Case Type:

- 1. General:
 - a. Standards: UL 489.
 - b. Unit construction.
 - c. Over-center, toggle handle operated.
 - d. Quick-make, quick-break, independent of toggle handle operation.
 - e. Manual and automatic operation.
 - f. All poles open and close simultaneously.
 - g. Three position handle: On, off and tripped.
 - h. Molded-in ON and OFF markings on breaker cover.
 - i. One-, two- or three-pole as indicated on the Drawings.
 - j. Current and interrupting ratings as indicated on the Drawings.
- 2. Thermal magnetic type: Unless shown otherwise on Drawings, provide per the below paragraphs.
 - a. Inverse time overload and instantaneous short circuit protection by means of a thermal magnetic element.
 - b. Frame size 150 amp and below:
 - 1) Non-interchangeable, non-adjustable thermal magnetic trip units.
 - c. Solid state trip type: Unless shown otherwise on Drawings, provide per the below paragraphs. Inverse time overload, instantaneous short circuit and ground fault protection by means of a solid state trip element, associated current monitors and flux shunt trip mechanism.
 - d. Frame size 150 amp to 600 amp (trip settings between 150 and 600A):
 - 1) Standard rating.
 - 2) Interchangeable current sensor or rating plug.
 - 3) Adjustable long time pick-up setting.
 - a) Adjustable from 50 to 100% of the current sensor or rating plug.
 - 4) Adjustable short time pick-up setting.
 - 5) Adjustable instantaneous pick-up.
 - 6) Fixed ground fault pick-up, when indicated on the Drawings.
- 3. Motor circuit protector:
 - a. Adjustable instantaneous short circuit protection by means of a magnetic or solid state trip element.
 - b. Sized for the connected motor.

2.3 FUSES

- A. UL Class J fuses:
 - 1. Standard: UL 248-1 and UL 248-8.
 - 2. Dual-element time-delay and current limiting rejection type.
 - 3. Ratings: 600 V, 0-600 amps and 200,000 RMS AIC symmetrical.
- B. UL Class RK-1 fuses:
 - 1. Standard: UL 248-1 and UL 248-12.
 - 2. Single-element fast-acting and current limiting rejection type.
 - 3. Dual-element time-delay and current limiting rejection type.
 - 4. Ratings: 250 and 600 V, 1/10-600 amps and 200,000 RMS AIC symmetrical.
- C. UL Class RK-5 fuses:
 - 1. Standard: UL 248-1 and UL 248-12.
 - 2. Dual-element time-delay and current limiting rejection type.
 - 3. Ratings: 250 and 600 V, 1/10-600 amps and 200,000 RMS AIC symmetrical.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Current and interrupting ratings as indicated on the Drawings.
- B. Series rated systems not acceptable.
- C. Devices shall be ambient temperature compensated.
- D. Circuit Breakers:
 - 1. Molded case circuit breakers shall incorporate the following, unless indicated otherwise on the Drawings:
 - a. Frame sizes 150amp and larger shall be solid state trip type.
 - b. Motor circuit protectors sized for the connected motor.
- E. Fuses:
 - 1. UL Class J: Use for feeder devices 600 amps and smaller.
 - 2. UL Class RK-1 (dual element): Use for motor feeder and branch circuit devices.
 - 3. UL Class RK-5: Use for motor feeder and branch circuit devices.

3.2 FIELD QUALITY CONTROL

- A. Coordinated Power System Protection:
 - 1. Prepare a study to demonstrate that the equipment and system constructed [within the scope of these Contract Documents,] meet the specified requirements for equipment ratings, coordination and protection.
 - 2. Perform the studies in accordance with IEEE 242 and IEEE 399.
 - 3. Include the name of the software developer, software package and software version number in the computer generated studies.
 - 4. System short circuit study report:
 - a. Begin the study at the [main service electrical gear] [connection point of the new equipment to the existing equipment] and extend down the system through all buses.
 - 1) Perform a balanced three-phase fault, bolted line-to-line fault and line-to-ground fault study.
 - b. Prepare a one-line diagram to show the electrical system buses, transformers and all sources of fault current including generators and motors.

- c. Utilize manufacturer's data for the actual proposed equipment (e.g., transformer impedance).
- d. Coordinate the available utility fault current with the power utility company.
- e. Show input data in tabular form in the report and/or on the one-line diagram.
 - 1) Input data shall include but is not limited to:
 - a) Utility fault current or MVA and X/R ratio.
 - b) Bus voltages.
 - c) Conductor sizes and type of conduit.
 - d) Generator and motor sizes and contributions.
 - e) Transformer sizes and impedances.
- f. Show available fault current at each bus in tabular form in the report and/or on the one-line diagram.
- g. Perform studies for both normal power and emergency/standby power scenarios.
- 5. System protective coordination study report:
 - a. Begin the study at the [main service electrical gear] [protective device upstream of the connection point of the new equipment] and extend down the system through all buses as required to ensure a coordinated power system.
 - b. Demonstrate that the maximum possible degree of selectivity has been obtained between devices specified for the protection of equipment and conductors from damage from overloads and fault conditions.
 - 1) Where necessary, an appropriate compromise shall be made between system protection and service continuity.
 - 2) Consider system protection and service continuity to be of equal importance.
 - c. Prepare a one-line diagram to show the electrical system buses, transformers and protective devices.
 - d. Utilize manufacturer's data for the actual proposed protective devices.
 - e. Summarize the coordination study, conclusions and recommendations.
 - 1) As a minimum, include the following:
 - a) The manufacturer's information used to prepare the study.
 - b) Assumptions made during the study.
 - c) Recommended taps and settings of all adjustable devices in tabulated form.
 - d) Composite coordination time-current curves on log-log paper showing:
 - (1) That the settings for each protective device will provide protection and selectivity.
 - (2) Identify each curve.
 - (3) Cable and equipment damage points.
 - (4) Circuit interrupting device operating and interrupting times.
 - (5) One-line sketch of the part of the system being investigated.
 - (6) Include as many curves as possible on a graph while maintaining readability.
 - e) Position time-current curves for each device to provide for maximum selectivity to minimize system disturbances during fault clearing.
 - f) Advise the Engineer of potential coordination problems discovered during the study and include recommendations to resolve the problem.
 - (1) Provide time-current curves for the "as found" and "proposed" conditions for upgrade/retrofit projects.
 - g) Submit the report for approval 90 days prior to equipment energization.

B. Adjustable Circuit Breakers:

1. Set all circuit breaker adjustable taps as defined on the Drawings, except adjust motor circuit protectors per the motor nameplate and NFPA 70 requirements.
- C. Testing:
1. Acceptance testing: See Specification Section 26 08 13.
 2. Adjustable circuit breakers:
 - a. Test and verify all circuit breaker trip functions using a test set provided by the manufacturer for that purpose for circuit breakers 1200 A and above.

END OF SECTION

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SECTION 26 29 23
VARIABLE FREQUENCY DRIVES - LOW VOLTAGE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Variable frequency drives (VFDs) for operation of inverter duty motors.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Section 33 14 43 – Packaged Booster Pump Station
 - 2. Section 26 05 00 - Electrical - Basic Requirements.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. American National Standards Institute (ANSI).
 - 2. ETL Testing Laboratories (ETL).
 - 3. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
 - a. 399, Recommended Practice for Industrial and Commercial Power Systems Analysis.
 - b. 519, Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems.
 - c. C62.41, Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.
 - 4. National Electrical Manufacturer's Association (NEMA):
 - a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
 - b. MG 1, Motors and Generators.
 - 5. National Fire Protection Association (NFPA):
 - a. 70, National Electrical Code (NEC):
 - 1) Article 430, Motors Motor Circuits, and Controllers..
 - 6. Occupational Safety and Health Administration (OSHA).
 - 7. Underwriters Laboratory, Inc. (UL):
 - a. 508, Standard for Industrial Control Equipment.
- B. Qualifications:
 - 1. Provide drives that are listed and labeled by UL, ETL, or other Nationally Recognized Testing Laboratory (NRTL) as defined by OSHA regulations, or that have been inspected and subsequent field-labeled by such NRTL.
 - 2. VFD Supplier shall maintain an authorized service organization within 300 miles of the Project Site.
- C. Coordination:
 - 1. The intent of this Specification Section is to allow the VFD manufacturer to provide the best solution for the harmonic and motor protection outlined herein.
 - a. This solution shall include, but not be limited to, all aspects of the distribution system including standby generation, motor feeder cable type and available floor space.
 - 2. Motor and VFD coordination: See Specification Section 33 14 43.
 - 3. VFD shall be supplied complete with all required control components.
 - a. Provide control as indicated:
 - 1) On the electrical drawings.
 - 2) As specified in this Specification Section.

- b. VFD manufacturer shall review the application and provide, at no additional cost to the Owner, the hardware and software necessary to allow the VFD to control the driven equipment motor over its required operating range.
 - 1) These may include, but are not limited to, analog and digital interface modules, communication interface modules, switches, lights and other devices.
- c. Coordinate control devices with devices furnished with driven equipment such as vibration switches, thermal sensors, leak detectors, etc.
- 4. Verify plan dimensions with equipment space requirements as indicated on the Drawings.
 - a. Equipment which exceeds the allotted maximum dimensions may not be acceptable.
 - b. Equipment which reduces clear work space below the minimums established by the NFPA 70 will not be acceptable.

1.3 DEFINITIONS

A. Variable Torque (VT):

- 1. Defines a load characteristic in which the torque delivered from the motor to the load is reduced as speed is reduced below full rated.
- 2. This type of load permits the VFD and the motor to operate at reduced output current at reduced speed.

B. Constant Torque (CT):

- 1. Defines a load characteristic in which the torque delivered from the motor to the load remains constant as speed is varied.
- 2. This type of load requires the VFD to be able to continuously deliver rated output current over the entire speed range.

C. Constant Horsepower:

- 1. Defines a load characteristic in which the torque delivered from the motor to the load is reduced as the speed is increased.
- 2. This characteristic is required for operation of the VFD and motor above rated frequency to maintain output current within the rated value.

D. Inverter Duty Motor: An AC induction motor complying with all requirements of NEMA MG 1 Part 31 for definite-purpose inverter-fed motors.

E. Standard Motor: An AC induction motor that fails to comply with one or more requirements of NEMA MG 1 Part 31.

F. Low Voltage: 600 VAC or less.

1.4 SUBMITTALS

A. Shop Drawings:

- 1. Provide a schedule for each VFD including the following information:
 - a. Equipment Tag Number.
 - b. VFD Complete Catalog Number.
 - c. VFD Amp Frame Size.
 - d. Variable or Constant Torque Rating Basis.
 - e. Rated Input Current.
 - f. Rated Continuous Output Current.
 - g. Rated Short Circuit Current.
 - h. VFD cable type specified (shielded or non-shielded).
 - i. As installed motor Lead Length.
 - j. VFD options provided to meet harmonic or motor protection specifications.
- 2. Submit VFD Shop Drawings concurrently with driven equipment and motor Shop Drawings.

3. Product technical data:
 - a. Complete electrical ratings and performance specifications confirming compliance with specified ratings and performance.
 - b. Maximum rate of heat rejection from VFD and all related components and associated cooling requirements.
 - c. Manufacturer's installation instructions.
 - d. Manufacturer's programming and operating instructions.
 4. Fabrication and/or layout drawings:
 - a. Top, front and side exterior views, with details showing maximum overall dimensions of enclosure, mounting provisions and conduit/cable entry provisions.
 - b. Identify minimum clearances from other VFDs or electrical equipment required for proper cooling at top, bottom, side and back of enclosure.
 - c. Three-line diagrams showing AC schematic of VFD, input, output and bypass devices including device ratings.
 - d. Interior layout drawings showing location of all components within enclosure, field wiring terminal boards, and power and grounding connections.
 - e. Field wiring diagrams showing locations and sizes of all electrical connections, ground terminations, and requirements for shielded wire usage or any other special installation considerations.
 - f. Short Circuit Current Rating (SCCR) nameplate marking per NFPA 70, include any required calculations.
 5. Certifications:
 - a. Submit with Shop Drawings:
 - 1) Identification and location of closest authorized service organization.
 - 2) Harmonic analysis at each PCC per Harmonic Protection Requirements Article.
 - b. Submit prior to shipment:
 - 1) Certified factory test reports confirming compliance with specified requirements.
 - c. Submit after installation:
 - 1) Certified field service reports showing:
 - a) Each VFD is operational.
 - b) Each VFD and its driven equipment motor are compatible.
 - c) Each VFD responds correctly to the input control signals.
 - d) Critical frequencies of the drive system and that the VFD has been set to lockout these frequencies.
 - e) Measured harmonic levels per Harmonic Protection Requirements Article.
 - f) Measured motor terminal peak voltages per Motor Protection Requirements Article.
- B. Contract Closeout Information:
1. Operation and Maintenance Data:
 - a. See Specification Section 01 78 23 for requirements for the mechanics, administration, and the content of Operation and Maintenance Manual submittals.
 2. Approved copy of VFD schedule per Submittals Article.
 3. Manufacturer's instruction manuals.
 4. Troubleshooting procedures with a cross-reference between symptoms and corrective recommendations.
 5. Connection data to permit removal and installation of recommended smallest field-replaceable parts.
 6. Recommended spare parts list.

7. Commissioning sheets showing “as-left” values of all user-programmable or adjustable drive parameters.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
 1. Square D Company,
 2. Or Engineer approved equal.

2.2 GENERAL

- A. VFDs shall consist of a rectifier-DC bus-inverter combination producing a sine-coded pulse-width-modulated (PWM) output voltage waveform.
- B. It is the intent of this Specification that VFDs shall be an “engineered” or “configured” drive package in which the VFD chassis, all input, output and bypass power devices, VFD accessories, ancillary switches, contactors, relays, and related control devices are selected, furnished, factory-assembled and -tested by the VFD manufacturer in a single enclosure requiring only connection of the power supply circuit, motor branch circuit, and external control wiring in the field.

2.3 PERFORMANCE AND DESIGN REQUIREMENTS

- A. Application:
 1. VFD(s) shall be of sufficient capacity and shall provide a quality of output waveform for stepless motor control from 10 to 100% of base speed of the driven equipment.
 2. VFDs shall be compatible with:
 - a. Inverter duty induction motors.
 3. VFDs shall be suitable for Constant Torque (CT) or Variable Torque (VT) applications.
 - a. VFD manufacturer shall coordinate with the manufacturer of the driven equipment to identify CT and VT applications.
 4. VFDs shall be designed to operate successfully under the following site conditions:
 - a. Ambient:
 - 1) Temperature: 0-40 degrees C.
 - 2) 95% non-condensing relative humidity.
 - b. Elevation: Less than 1000 feet above MSL.
 - c. Power supply characteristics:
 - 1) 480Vac, 3 PH, 60 Hz, 3 wire, (±5%).
 - 2) Effectively grounded.
- B. Ratings and Performance Specifications:
 1. Voltage rating:
 - a. Nominal: 460 or 480 VAC, 3 PH, 60 Hz.
 - b. Range for continuous full load operation: ±10% of nominal.
 - c. Voltage imbalance tolerance for full load operation: 3% minimum.
 2. Current ratings:
 - a. Continuous:
 - 1) Equal to or greater than the motor nameplate full load.
 - b. Short-term overload:
 - 1) VT: 110% for 1 minute.
 - 2) CT: 150% for 1 minute.

- 3) Permissible for 1 minute every 10 minutes continuously.
- c. Short circuit:
 - 1) As indicated on the Drawings.
 - 2) Where a short circuit rating is not indicated or specified for individual VFDs, each VFD shall have a rating not less than indicated on the Drawings for the MCC, switchboard or panelboard the VFD is supplied from.
 - 3) Where specified short circuit rating indicates additional input impedance is required to protect semiconductors, provide input AC line reactors, whether required to meet harmonic performance specifications or not.
3. Efficiency:
 - a. 97%, minimum, at full speed and full load.
 - b. 93%, minimum at 1/2 speed and full load.
4. Displacement power factor:
 - a. 95%, minimum from 50% to 100% speed and load.
5. Efficiency and power factor criteria apply from the input terminals to the output terminals of the VFD alone, excluding losses of input and output power circuit accessories.
6. Frequency drift:
 - a. +0.5% of set frequency.
7. Speed regulation (motor dependent): 3%.
8. Speed range: 10:1.
9. Control type:
 - a. Volts/Hertz ratio; constant over the entire operating range of the VFD except:
 - 1) When operating under voltage boost.
 - 2) At frequencies over 60 Hz.
- C. Operational Features:
 1. Insensitive to input phase sequence.
 2. Continued operation with momentary voltage dips of 25% of rated voltage, or single phase condition: 4 seconds, minimum.
 3. Controls power loss ride-through: 500 ms, minimum.
 4. Electronic reversing.
 5. DC injection braking.
 6. Anti-windmilling: Synchronization of VFD starting frequency with spinning or coasting load, forward or reverse.
 7. Critical frequency band lockout:
 - a. Minimum of three settings.
 - b. Adjustable bandwidth, 1 - 5 Hz.
 8. Capable of operating without the motor connected for start-up and troubleshooting.
- D. The VFD shall be provided with the following minimum user-programmable parameters:
 1. Carrier frequency.
 2. Independent maximum and minimum speeds for forward and reverse operation.
 3. Start frequency and hold time.
 4. Independent linear acceleration and deceleration time.
 5. Preset "jog" speed.
 6. Three critical frequency bands.
 7. One preset speed selectable by logic input.
 8. Volts/Hertz ratio.
 9. Voltage boost, magnitude and frequency range.

10. Process controller gain, offset and bias.
 11. Current limit.
 12. Overcurrent pickup.
 13. Overcurrent delay.
 14. Ground fault pickup.
 15. DC injection level and time.
- E. The VFD shall be designed such that the power circuit components are fully protected from line side disturbances and load side faults:
1. General:
 - a. Shutdown conditions associated with supply circuit conditions which can be corrected external to the VFD-motor system shall be provided with automatic reset, with shutdown cause logged in memory:
 - 1) Input under voltage.
 - 2) Input over voltage.
 - 3) Input under frequency.
 - 4) Input over frequency.
 - 5) Input Phase loss.
 - 6) DC Bus under voltage.
 - b. Shutdown conditions which indicate overload or fault within the VFD, the output circuit, or the motor shall require local manual reset at the VFD, requiring operator intervention.
 - 1) Over temperature.
 - 2) Blown fuse.
 - 3) Component failure.
 - 4) Overload.
 - 5) Short circuit.
 - 6) Ground fault.
 - 7) DC Bus over voltage.
 - 8) External safety input (e.g., motor thermal protection).
 - 9) Logic fault.
 - c. When automatic shutdown occurs, VFD shall restart only when remote run signal is removed and reapplied.
 - d. VFD shall hold cause of trip data for a minimum of four shutdowns in memory.
 - 1) Data to be accessible through the keypad, local communication link and remotely.
 2. Input protection:
 - a. Input circuit breaker as shown on Drawings.
 - b. Sustained over voltage trip.
 3. Internal protection:
 - a. Surge suppression and power device snubbers.
 - b. Power devices rated at 2.5 times line voltage.
 - c. Instantaneous over current trip.
 - d. DC bus over voltage trip.
 - e. Power device over temperature trip.
 - f. Control logic circuit malfunction trip.
 4. Output protection:
 - a. Inverse-time overload trip:
 - 1) UL Class 10 characteristic.
 - b. Over voltage trip.

- c. Over frequency trip.
- d. Short circuit trip.
 - 1) Line to line and line to ground.
- e. Ground fault trip.

2.4 OPERATOR INTERFACE

- A. Drive controls shall be microprocessor-based with on-board human machine interface and both local and remote digital communications capability.
 - 1. All monitoring and control functions, other than those shutdowns specified to be manual reset only, shall be available both locally and remotely.
- B. Operator Interface:
 - 1. Unit mounted sealed keypad, membrane type with LED or LCD display.
 - a. Messages shall be in English and engineering units.
 - b. Drive operating parameters shall be programmable.
 - c. Menu driven.
 - d. Password security.
 - e. Display fault and diagnostic data.
 - f. Operating parameters, fault and diagnostic data maintained in non-volatile memory with historic log of fault and diagnostic data.
 - g. Gold plated plug-in contacts.
 - 2. Provide indication and control interface, integral in the keypad, as required in the sequence of operation provided by Owner's system integrator.
 - a. Minimum indications:
 - 1) Run.
 - 2) Stop.
 - 3) Ready.
 - 4) Alarm.
 - 5) Fault.
 - 6) Local control.
 - 7) Remote control.
 - 8) Control source local.
 - 9) Control source remote.
 - 10) Speed indication.
 - b. Minimum control functions:
 - 1) Local/Remote switch.
 - 2) Stop button.
 - 3) Start button.
 - 4) Reset button.
 - 5) Speed control buttons.
 - 3. Diagnostic indicators located externally on the face of the drive shall show the type of fault responsible for drive warning, shutdown or failure.
 - a. On occurrence of more than one condition, each shall be recorded or indicated by the diagnostics.

2.5 HARMONIC PROTECTION REQUIREMENTS

- A. All VFDs shall be capable of satisfactory operation from a source having voltage distortion and notch characteristics identified as acceptable for a "dedicated system" in IEEE 519 Table 10.2.

- B. With all VFDs operating under worst-case harmonic current conditions, and the facility supplied from either or both the utility and generator sources, the VFDs shall not produce harmonic effects in excess of the following limits at any point of common coupling (PCC).
 - 1. Voltage distortion and notch characteristics: IEEE 519 Table 10.2 for General System.
 - 2. Current distortion: IEEE 519 Table 10.3 based on calculated I_{sc}/I_L at each PCC .
- C. PCC shall be considered:
 - 1. Building service entrance switchgear, switchboard or MCC.
- D. The Engineer has performed preliminary calculations based on typical VFD data which indicate that the minimum mitigation measures required to meet the specified harmonic criteria are one of the following topologies:
 - 1. 6-pulse rectifier topology with input line reactors or DC link reactors, minimum impedance 3% on drive kVA base.
- E. VFD manufacturer shall determine, for their proposed equipment, uncorrected harmonic distortion levels and mitigation techniques required to meet the specified limits and shall furnish the VFD types and all accessory items and equipment necessary to do so, whether specified herein or not.
- F. VFD manufacturer shall provide a harmonic analysis of the distribution system based on their proposed specific equipment characteristics and mitigation techniques confirming that the specified levels are not exceeded.
 - 1. Analysis shall be based on the methodology of IEEE 519 and IEEE 399.
 - 2. Power system data for analysis shall be taken from the electrical drawings and approved equipment submittals.
- G. Following start-up, with facility at full load operation, provide measurement of harmonic voltage, current and notch characteristics at each PCC according to the requirements of IEEE 519 Section 9.
 - 1. Values in excess of specified limits require correction by contractor and re-measurement.
 - 2. Provide certification of compliant measurements as part of Field Service Engineer's final report.

2.6 MOTOR PROTECTION REQUIREMENTS

- A. The VFD shall produce a quality of output waveform adequate to allow the motor to produce rated torque at rated RPM continuously without exceeding the temperature rise given in NEMA MG 1 Table 31-2.
- B. Provide motor overload, short circuit and ground fault protection integral to drive electronics.
- C. The VFD shall not produce voltage spikes in excess of the following values at the motor terminals when operated with the feeder types shown on the Drawings and the actual installed feeder lengths.
 - 1. If unmitigated voltage peaks exceed the specified limits, provide output line reactors, filters, or other devices as required to meet the specified limits:
 - a. Inverter duty motors: 1280 V.
 - b. Rise time shall be greater than or equal to 0.1 microsecond.
 - c. Motor lead length and data shall be determined by the Contractor based on the actual routing of the conductors.

2.7 EQUIPMENT CONSTRUCTION

A. Fabrication and Assembly:

1. Each VFD system shall be factory-assembled for wall/rack mounting, and shall utilize interchangeable plug-in printed circuit boards and power conversion components wherever possible.
 - a. Factory assembly shall be performed by the VFD manufacturer or authorized agent.
 - b. Systems fabricated or assembled in whole or in part by parties other than the VFD manufacturer or authorized agent will not be acceptable.
2. Reactors and/or filters, where required, shall be mounted within or in an ancillary enclosure adjacent to the drive, or with the Engineer's permission may be mounted in a separate enclosure.
3. Cooling fans, as required, shall be provided to run when drive is running.
4. Enclosures for separately mounted VFD's:
 - a. NEMA Type 12.

B. Wiring:

1. The wiring in the VFD shall be neatly installed in wire ways or with wire ties where wire ways are not practical.
 - a. Where wire ties are used, the wire bundles are to be held at the back panel with a screw-mounted wire tie mounting base.
 - b. Bases with a self-sticking back will not be allowed.
2. All plug-in contacts shall be gold-plated.
3. Provide terminal boards for all field wiring and inter-unit connections, including analog signals.
 - a. Provide terminals for shield continuity where required.
4. Terminal blocks shall be complete with marking strip, covers and pressure connectors.
 - a. Non-brittle, interlocking, track-mounted type.
 - b. Screw terminals will not be allowed.
 - c. A terminal for each conductor of external circuits plus one ground for each shielded cable.
 - d. For free-standing panels, 8 inches of clearance shall be provided between terminals and the panel base for conduit and wiring space.
 - e. Not less than 25% spare terminals shall be provided.
 - f. Terminals shall be labeled to agree with identification indicated on the suppliers submittal drawings.
 - g. Individually fuse each control loop or system and all fuses or circuit breakers shall be clearly labeled and located for easy maintenance.
5. All grounding wires shall be attached to the enclosure sheet metal with a ring tongue terminal.
 - a. The surface of the sheet metal shall be prepared to assure good conductivity and corrosion protection.
6. Wiring shall not be kinked or spliced and shall have markings on both ends or be color coded.
 - a. Markings or color code shall match the manufacturer's drawings.
7. With the exception of electronic circuits, all interconnecting wiring and wiring to terminals for external connection shall be stranded copper, type MTW or SIS, insulated for not less than 600 V, with a moisture-resistant and flame-retardant covering rated for not less than 90 DegC.

C. Nameplates:

1. Push buttons, selector switches, and pilot lights shall have the device manufacturer's standard legend plate.
2. Relays, terminals and special devices inside the control enclosure shall have permanent markings to match identification used on manufacturer's wiring diagrams.

2.8 COMPONENTS AND ACCESSORIES

A. Reactors:

1. Impedance: 3%.
2. Continuous current: Not less than drive rating.
3. Current overload: 150% for 1 minute.
4. Insulation temperature rating: 180 degrees C.
5. Copper windings.
6. Saturation current rating: 3.5 to 5 times rated current.
7. Hi-potential rating: 2500 VAC line to ground and line to line, for 1 minute.
8. Noise reduction features:
 - a. Epoxy over cast coil.
 - b. Extra dips and bakes of varnish over continuous wound coil.

2.9 SOURCE QUALITY CONTROL

A. Factory Tests:

1. Conduct all standard tests in accordance with NEMA and ANSI standards to ensure conformance to Specification requirements.

2.10 MAINTENANCE MATERIALS

- A. Provide manufacturer's recommended renewable spare parts (e.g., power and control fuses).
- B. Spare parts utilized during pre-start-up or start-up and demonstration testing shall be immediately restocked, at no cost to the Owner.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install products in accordance with manufacturer's instructions and as indicated on the Drawings.
- B. Provide separately mounted VFD with Short Circuit Current Rating (SCCR) labeling as required by NFPA 70 and other applicable codes.
 1. Determine the SCCR rating by one of the following methods:
 - a. Method 1: SCCR rating meets or exceeds the available fault current of the source equipment when indicated on the Drawings.
 - b. Method 2: SCCR rating meets or exceeds the source equipment's Amp Interrupting Current (AIC) rating as indicated on the Drawings.
 2. The source equipment is the switchboard, panelboard, motor control center or similar equipment where the equipment or control panel circuit originates.
- C. Verify the installed motor nameplate electrical requirements do not exceed the VFD capacity.
- D. Provide services of manufacturer's representative to perform start-up services.
- E. The selection of input and output harmonic and voltage spike protection shall also be made on the available physical space.
 1. The space available on the Drawings shall not be exceeded.

3.2 START UP

A. Pre-start-up Services:

1. Shall be completed a minimum of 30 days prior to the start-up and demonstration period described in Specification Section 01 75 00.
2. Shall consist of:
 - a. Physical and electrical installation check.
 - b. Final adjustments and calibration of drive parameters.
 - c. VFD operation from simulated input signals.
3. Shall be complete when VFD(s) are fully operational.

B. Field Quality Control:

1. Perform field measurement of harmonics at each PCC per Harmonic Protection Requirements Article.
 - a. For each individual VFD.
 - b. For the maximum number of VFDs that will be operational at the same time.
 - c. When all loads are at 75% load minimum.
 - d. Duration: 1 hour minimum.
2. Perform field measurement of the maximum voltage peak at the terminals of each motor fed from a VFD per Motor Protection Requirements Article.
 - a. Use a high speed oscilloscope to produce a plot of Voltage (Y axis) versus Time (X axis).
 - 1) Time shall be measured in microseconds.
 - b. Tests shall be performed at full:
 - 1) Full voltage and speed.
 - 2) Loaded to 75% minimum.
 - 3) Duration: 1 hour minimum.
3. Record all data necessary for the preparation of required test reports.

C. Start-up and Demonstration Services:

1. Supervise start-up of all units including recheck of settings made during the pre-start-up tests.
 - a. Perform all work in the presence of the Owner's designated representatives.
2. Setup all VFDs with carrier frequency at minimum value consistent with proper operation; inform Engineer of carrier frequencies set in excess of 5 kHz and reason for setting.
3. Simulate operation of the VFD and its associated control and instrumentation system in both the manual and automatic modes.
 - a. Ensure compatibility of VFD with associated control and instrumentation signals.
4. Simulate VFD failures and demonstrate troubleshooting aids.

D. Instruct Owner's designated personnel:

1. Minimum of 4 hours at the jobsite.
2. Include both field and classroom instruction.
3. Instructions shall include proper operation and maintenance procedures including, but not limited to:
 - a. Lubrication.
 - b. Troubleshooting.
 - c. Repair and replacement.
 - d. Parts inventory.
 - e. Maintenance records.

END OF SECTION

SECTION 26 32 14
ENGINE GENERATOR - DIESEL

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Engine generator equipment.
 - 2. Fuel storage tanks.
 - 3. Engine generator enclosures and accessories.
- B. Related Requirements: Include, but are not necessarily limited to:
 - 1. Section 26 05 00 - Common Work Results for Electrical.

1.2 REFERENCES

- A. Reference Standards:
 - 1. Environmental Protection Agency (EPA):
 - a. 40 CFR Part 60, Subpart IIII, Protection of Environment, Standards of Performance for New Stationary Sources, Standards for Performance for Stationary Compression Ignition Internal Combustion Engines.
 - 2. National Electrical Manufacturers Association (NEMA):
 - a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
 - b. MG 1, Motors and Generators.
 - 3. National Fire Protection association (NFPA):
 - a. 70, National Electrical Code (NEC):
 - 1) Article 700, Emergency Systems.
 - 2) Article 702, Optional Standby Systems.
 - 4. Underwriters Laboratories, Inc. (UL):
 - a. 2200, Standard for Stationary Engine Generator Assemblies.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Regarding delegated design Work required by this Section, comply with "Coordination" requirements of Section 01 35 73 - Delegated Design Procedures.

1.4 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Supplier:
 - a. The engine generator equipment manufacturer or other authorized Supplier has unit responsibility for furnishing all components of required engine generator systems and proper, initial operation of systems required by this Section.

1.5 SUBMITTALS

- A. Action Submittals: Submit the following:
 - 1. Shop Drawings:
 - a. Schedule: Where the Work includes furnishing more than one engine generator system, submit schedule of engine generator systems, indicating for each engine generator system: identification or tag number, engine generator size, location, enclosure type, fuel storage tank capacity, and other pertinent data.

- b. Dimensioned plan, elevation, sections, and detail drawings for engine generator equipment, enclosures, and other components furnished by engine generator manufacturer.
 - c. Fuel storage tank.
 - d. Wire interconnection drawings.
 - e. Control panel layout drawings and internal wiring diagrams.
- 2. Product Data:
 - a. Manufacturer's literature and published data for all components and accessories of engine generator systems.
 - b. Comply with Section 26 05 00 - Common Work Results for Electrical, regarding required Submittals.
 - c. Engine/generator performance curves.
- 3. Delegated Design Instruments of Service Submittals:
 - a. For access stairs and platforms, submit the following documents prepared, sealed, and signed by licensed, registered delegated design professional retained by Contractor, Subcontractor, or Supplier:
 - 1) Design drawings.
 - 2) Design specifications.
 - 3) Certificate of Compliance.
- 4. Testing Plans, Procedures, and Testing Limitations:
 - a. Testing procedure, apparatus, and limitations of apparatus and procedure, for:
 - 1) Source quality control activities indicated in this Section.
 - 2) Field quality control activities indicated in this Section.
- B. Informational Submittals: Submit the following:
 - 1. Certificates:
 - a. Generator equipment manufacturer's documentation of engine USEPA certification including USEPA family name and generator equipment model designation.
 - 2. Other Required Delegated Design Submittals for access stairs and platforms:
 - a. Delegated Design Calculations:
 - 1) Complete design calculations, sealed and signed by delegated design professional, indicating: Basis of design, including list of Laws and Regulations (including code) and standards used for design.
 - 2) Delegated Design Calculations will not be checked and are submitted for record purposes only.
 - b. Shop Drawings bearing delegated design professional's approval stamp. Alternatively, such drawings may be submitted as delegated design professional's "instruments of service" design drawings, required above, when such drawings are sealed and signed by the delegated design professional.
 - c. Product data bearing delegated design professional's approval stamp.
 - 3. Supplier Instructions:
 - a. Serial numbers of items furnished, equipment nameplate information, and similar information for all items furnished.
 - b. Instructions for handling, installing, and startup.
 - 4. Source Quality Control Submittals:
 - a. Results of tests, inspections, and other quality control activities required by the Contract Documents and performed at the place of production or fabrication.
 - 5. Field Quality Control Submittals:
 - a. Results of tests, inspections, and other quality control activities required by the Contract Documents and performed at the Site.

6. Supplier Site Visit Reports:
 - a. Report of each visit to the Site by Supplier, summarizing purpose of visit, activities while onsite, problems encountered, advice given to Contractor or Subcontractor, and actions taken.
7. Qualifications:
 - a. Contractor's, Subcontractor's, or Supplier's delegated design professional.
- C. Closeout Submittals: Submit the following:
 1. Operation and Maintenance Data:
 - a. Submit in accordance with Section 01 78 23 - Operation and Maintenance Data.
 2. Post-Startup Statement:
 - a. Equipment installation, startup, and operational statement for each engine generator system provided.
 3. Keying:
 - a. Upon Substantial Completion, furnish to Owner or facility manager (if any) not less than two sets of keys for locks on generator system enclosures.
- D. Maintenance Material Submittals:
 1. Furnish the following items and submit documentation of delivery to and acceptance of such items by Owner or facility manager (if any), in accordance with Section 01 78 43 - Spare Parts and Extra Materials:
 - a. Spare Parts and Extra Materials:
 - 1) Furnish spare parts and extra materials sufficient for one year of operation as recommended by generator system manufacturer, for each generator system furnished.
- E. Refer to Section 01 81 33 - Cyber Security Requirements for required cyber security related submittals.

1.6 FIELD CONDITIONS

- A. Ambient Conditions:
 1. Ambient Air Temperature:
 2. Minimum: 10 degrees F.
 3. Maximum: 104degrees F.
- B. Existing Conditions:
 1. Site Elevation: 1000 feet above sea level.
 2. Seismic Forces:
 - a. Seismic use group: 2.
 - b. S_s : Per KY Building Code table 1613.3.1.
 - c. S_1 : Per KY Building Code table 1613.3.1.
 - d. Site Class: D.
 - e. Seismic Design Category: B.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
 1. Engine generator unit:
 - a. Cummins.
 - b. Or Engineer approved equal.

2. Silencers:
 - a. Generator equipment manufacturer's standard.
3. Battery charger:
 - a. Generator equipment manufacturer's standard.
4. Governor:
 - a. Generator equipment manufacturer's standard.
5. Radiator:
 - a. Generator equipment manufacturer's standard.
6. Vibration isolators:
 - a. Generator equipment manufacturer's standard.
7. Day/sub-base tank:
 - a. Generator equipment manufacturer's standard.

2.2 DESCRIPTION

- A. Engine generators will be used and rated for:
 1. Emergency power during a power outage, NFPA 70, Article 700.
 2. Optional standby power during a utility power outage, NFPA 70, Article 702.

2.3 EQUIPMENT

- A. Emissions Requirements:
 1. Each generator system's exhaust emissions shall comply with Laws and Regulations. Federal, State and Local government requirements, including but not limited to:
 - a. Environmental Protection Agencies (USEPA) New Source Performance Standards (NSPS), 40 CFR Part 60, Subpart IIII.

2.4 COMPONENTS

- A. Engine Generator Unit General:
 1. Diesel engine direct-connected to alternating current generator mounted on suitable rigid steel skid supports.
 2. Mount unit on skid suitable for installation on concrete foundation.
 3. Base rating on operation at rated RPM when equipped with all operating accessories.
 4. Standards: UL 2200.
- B. Engine:
 1. Four-cycle, full compression ignition, single acting, solid-injection unit, either vertical or V-type pistons [naturally aspirated or] turbo charged with [inner and] after cooling.
 2. Fuel supply: No. 2 Diesel.
 3. Removable full wet-type cylinder liners of close grained alloy iron, heat treated for proper hardness to obtain maximum life.
 4. Capable of operating at idle or light loads for extended periods of time.
- C. Injection Pumps and Valves:
 1. Type not requiring adjustment in service, which may be individually removed and replaced.
 2. Individual injection pump and valve for each cylinder.
 3. Fuel injection pumps: Positive action, constant-stroke, actuated by cam driven by gears from engine crankshaft.
 4. Fuel lines between injection pumps and valves: Heavy seamless steel tubing.
 5. Flexible fuel line connectors for supply and return connections at pump.
- D. Oil Pump:

1. Gear-type lubricating oil pump to supply oil under pressure to main bearings, crank pin bearings, pistons, timing gears, camshaft bearings and valve rocker mechanism.
 2. Spray cool and lubricate pistons.
 3. Oil filters so located that lubricating oil is continuously filtered, except during periods when oil is automatically by-passed to protect vital parts when filters are clogged.
 4. Filter elements accessible and easily removable.
 5. Filter elements: Effective full flow, replaceable resin-impregnated cellulose type.
 6. Equip filter system with spring-loaded by-pass valve.
 7. Oil cooler: Water-cooled, engine-mounted.
- E. Fuel System:
1. Fuel pump: Built-in gear-type, engine-driven fuel transfer pump
 2. Equip fuel system with replaceable fuel filter elements arranged for easy removal without breaking any fuel line connections or disturbing fuel pumps or any other part of engine.
 3. Locate all fuel filters in an accessible housing, ahead of injection pumps to thoroughly filter fuel before it reaches the pump.
 4. Use no screens or filters requiring cleaning or replacement of injection pumps or valve assemblies.
- F. Governor: Fully enclosed electronic type governor with actuator capable of providing accurate speed control within 1% of rated speed, complete with panel-mounted electronic assembly with ramp generator and speed-sensing modules.
- G. Air Cleaners: Engine-mounted, dry type air cleaners of sufficient capacity.
- H. Electric Starting System:
1. Sufficient capacity to crank at speed which will start engine under normal operating conditions.
 2. Controls to provide automatic cranking of engine when generator is called to start.
 3. Prevent excessive cranking which could damage cranking motor.
 4. Automatic stop controls.
 5. Starter motors with positive-engagement feature.
- I. Cooling System:
1. Capacity for cooling engine at the specified operating conditions.
 2. Engine driven, centrifugal type water circulating pump and thermostatic valve to maintain the engine at recommended temperature level.
 3. Provide fan guards.
- J. Heater:
1. Thermostatically controlled jacket water heater(s) to maintain cooling jacket at the manufacturer's recommended temperature at the specified low ambient temperature.
 2. 120 V, single phase.
- K. Silencer:
1. Suitable type for residential silencing.
 2. Seamless, stainless steel, flexible, exhaust adapter for exhaust outlet to silencer.
- L. Engine Instruments and Controls:
1. Engine-mounted instruments:
 - a. Oil pressure gage.
 - b. Water temperature gage.
 - c. Run time meter.

- d. Battery voltage meter.
 2. Automatic cycle cranking and over-crank protection.
 3. Safety controls: Equip engine with automatic safety controls to shut down engine in event of low lubricating oil pressure, high jacket water temperature, overspeed or overcrank.
 4. Auxiliary control devices: Either integral with specified engine instruments, control, and safety devices or as separate devices as required to operate various signal circuits specified for remote annunciator panel.
 5. Three NO auxiliary contacts for interface with louvers, fans or other miscellaneous equipment.
 - a. Contacts shall close when generator is started.
- M. Fuel Day Tank:
1. Double wall sub-base day tank mounted underneath engine generator unit.
 2. Steel construction, top and bottom baffles, steel channel side supports, weatherproof secondary containment, rust preventive interior coating, rust proofed and finish painted exterior.
 3. Tank connections: Fuel level gauge, fuel lines to generator, fill, vent, drain and pressure relief.
 4. Manual overfill protection.
 5. Low level warning with contacts for remote alarm.
 - a. Set to alarm at 50% of capacity.
 6. Critical low level shutoff with contacts for remote alarm.
 7. Leak detection alarm with contacts for remote alarm.
 8. Capacity: 24 hours at full load.
- N. Batteries:
1. Lead acid type.
 2. Furnish electrolyte separately for use when installation is complete and unit is ready for testing.
- O. Battery Charger:
1. Output current rating of at least 1/20th of ampere hour capacity of battery and capable of automatically switching between low rate (float) mode and high rate (equalize) mode.
 2. Solid state rectifiers, DC voltmeter and ammeter, fuse input and output, and 115 VAC input.
 3. Malfunction alarm contacts (minimum): low and high battery voltage, weak battery and charger failure.
- P. Generator:
1. Brushless, 4-pole drip-proof revolving field type with permanent magnet, 2/3 pitch stator, direct-coupled rotor, Class H insulation.
 2. Minimum continuous standby ratings:
 - a. As indicated on the Drawings, substantiated by manufacturer's standard published curves and conform to NEMA MG 1 specification.
 - b. Special ratings or maximum ratings are not acceptable.
 3. Rated to serve up to 50% non-linear load without exceeding rated temperature rise.
 4. Minimum efficiency: 92% at 50 to 110% of nominal standby rating, less than 30% instantaneous voltage dip at full load and rated power factor and suitable for simultaneous operation with other future units connected in parallel.
 5. Stator and rotor: 130 degrees C temperature rise with minimum Class H insulated with 100 percent epoxy impregnation and overcoat of resilient insulating material to reduce possible fungus and/or abrasive deterioration.
 6. Directly connect stator to engine flywheel housing.

7. Drive rotor through semiflexible driving flange to ensure permanent alignment.
8. Self-ventilating with suitable blower, air inlet and outlet openings.
9. Provide terminal box of adequate size for entrance of conduit and termination of conductors.
10. Generator drive free from critical torsional vibration within operating range.
11. Provide generator mounted main circuit breaker:
 - a. Solid state molded case type.
 - b. Ratings as indicated.

Q. Voltage Regulator:

1. SCR type, to maintain 2% voltage regulation from 0 to full load with steady state modulation not exceeding plus 1/2% including cross-current compensation to provide maximum of 5% unbalance in kVA load sharing between this unit and possible future generators.
2. Automatic protection against short circuits on system.
3. Permit unit to operate at no load below rated frequency for engine start up and shut down procedures.
4. Provide voltage level and gain controls for normal operating adjustments.
5. Provide voltage level control with minimum range of plus or minus 5% from rated voltage.
6. Mount regulator, volts per hertz type, in generator housing on suitable vibration isolators.

R. Generator Instruments and Controls:

1. Generator mounted NEMA 1 type, illuminated vibration isolated instrument and control panel(s).
2. AC voltmeter and phase selector switch.
3. AC ammeter and phase selector switch.
4. Frequency meter.
5. Run-off-auto engine, start-stop control switch.
6. Emergency stop.
7. Run time meter.
8. Governor control rheostat.
9. Voltage level adjustment rheostat.
10. Cool down time delay 0-15 minute adjustable.
11. Cycle cranking control.
12. Minimum red shut down indicating lights as follows:
 - a. Overcrank.
 - b. Overspeed.
 - c. Low lubricating oil pressure.
 - d. High engine water temperature.
13. Minimum amber alarm indicator lights as follows:
 - a. Control switch not in auto position.
 - b. Low engine water temperature (less than 70 degrees F).
 - c. Low fuel in day tank.
 - d. Day tank leak.
 - e. Battery charger malfunctioning.
 - f. Low battery voltage.
14. Minimum amber prealarm indicator lights as follows:
 - a. High engine water temperature.
 - b. Low lubricating oil pressure.

15. Common dry contact and audible alarm to indicate when one or more alarm or prealarm conditions exist.
- S. Vibration Isolators: Vibration system shall consist of engine and generator mount isolators with or without additional mechanical spring isolators rubber pads to control both high and low frequency vibrations between major components, sub-base and structural foundation and to provide required vibration isolation for the seismic zone of the Project.

2.5 ACCESSORIES

- A. Provide interposing relays (24 VDC to 120 VAC) as required for interfacing with customer's 120 Vac monitoring system.
- B. Generator set non-walk-in weather protective enclosure rated for level 2 sound attenuation:
 1. Sheet steel with side servicing panels, air intake louvers and rear control panel access door.
 2. Side servicing panels shall have two locking points; all panels and doors shall be key lockable.
 3. Pitched roof with silencing exhaust muffler mounted outside the enclosure.
 4. Completely install enclosure on generator set mounting base.
- C. Generator Access Stairs and Platforms: Provide per the following paragraphs if required for meeting NEC access requirements.
 1. Description:
 - a. Access stairs and platforms shall be designed and provided by generator manufacturer.
 - b. Provide access stairs and platforms around all sides of generator requiring access to service panels or access doors.
 - c. Coordinate and provide foundations required by design of generator access stairs and platforms.
 2. Performance and Design Criteria for access stairs and platforms:
 - a. Platforms shall be level with top of fuel tank and not less than four feet wide.
 - b. Live loading:
 - 1) 100 pounds per square foot, uniform load.
 - 2) 300 pounds concentrated load on four-inch by four-inch area.
 - 3) Components shall be adequate for uniform load, concentrated load, and loads required by Laws and Regulations, whichever requires the stronger component.
 - c. Maximum deflection: 1/300 of span under superimposed live load of 100 pounds per square foot.
 3. Materials and Fabrication:
 - a. Provide landings, railings, and all supports of galvanized steel in accordance with Section 05 50 00 - Metal Fabrications.
 - b. Provide grating in accordance with Section 05 50 00 - Metal Fabrications
 - c. Guardrails:
 - 1) Match typical guardrail specification material and detailing.
 - 2) Provide four inch high by 3/8 inch thick toeboard for each side of landings and platforms.
 - 3) Guardrails shall be removable.
 - d. Access stairs and platforms shall be in accordance with Section 05 50 00 – Metal Fabrications.

2.6 SOURCE QUALITY CONTROL

- A. Individually test each prime mover.
 1. Apply derating factors for the proposed site to test data.

2. Continuously test for a period not less than two hours.
3. Test procedure shall be as follows:
 - a. Start prime mover and upon reaching rated RPM, pick up 100 percent of nameplate KW rating at rated power factor in one step.
 - b. Observe and record the cranking time(s) required to start and run for each prime mover.
 - c. Observe and record the time required to come up to operating speed for each prime mover.
 - d. Record voltage and frequency overshoot for each prime mover.
 - e. Record voltage, frequency and amperes.
 - f. Record oil pressure, water temperature where applicable and battery charge rate at first load acceptance and at 15 minute intervals thereafter for each prime mover.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install all components as indicated and in accordance with manufacturer's recommendations and instructions.
- B. Fill cooling system with solution of 50-50 water and ethylene glycol anti-freeze to prevent freezing at temperatures as low as minus 30 degrees F.
- C. Provide fuel for a full day tank.
- D. Install all wiring to engine in conduit.
 1. Control wiring on engine may be factory installed in high temperature loom.
- E. Provide control wiring in conduit between generator control panel and remote devices as described under generator instrument and controls paragraph and remote annunciator paragraph of this Specification.
- F. Mount on concrete pad utilizing vibration/seismic isolators, see structural drawings for pad detail.
- G. Sound attenuating engine generator enclosure:
 1. Field test installation under load.
 2. Use a precision sound measuring instrument meeting ANSI S1.4 Type 1.
 3. Provide measurements to Architect.

3.2 FIELD QUALITY CONTROL

- A. Field Tests and Inspections:
 1. Provide two load tests and one cycle crank test.
 2. Tests one and two shall be for continuous period of no less than two hours each.
 3. Engineer and Owner shall be notified seven days prior to testing.
 4. Test number one:
 - a. With prime mover(s) in a "cold start" condition and emergency load at normal operating level, initiate a normal power failure by opening all switches or breakers supplying normal power to facility.
 - b. Observe and record the time delay on engine start.
 - c. Observe and record the cranking time(s) required to start and run for each prime mover.
 - d. Observe and record the time required to come up to operating speed for each prime mover.
 - e. Record voltage and frequency overshoot for each prime mover.
 - f. Observe and record time required to achieve steady-state condition with all switches transferred to emergency position.

- g. Record voltage, frequency and amperes.
 - h. Record oil pressure, water temperature where applicable and battery charge rate at 5-minute intervals for the first 15 minutes and at 15 minute intervals thereafter for each prime mover.
 - i. Return normal power to facility, record time delay on retransfer to normal for each switch and cooldown time delay for each prime mover.
- 5. Test number two:
 - a. Immediately after completion of test number one, start prime mover and upon reaching rated RPM, pick up 100% of nameplate KW rating in one step.
 - 1) Unity power factor is acceptable for on-site testing
 - b. Observe and record the cranking time(s) required to start and run for each prime mover.
 - c. Observe and record the time required to come up to operating speed for each prime mover.
 - d. Record voltage and frequency overshoot for each prime mover.
 - e. Observe and record time required to achieve steady-state condition.
 - f. Record voltage, frequency and amperes.
 - g. Record oil pressure, water temperature where applicable and battery charge rate at first load acceptance and at 15 minute intervals thereafter for each prime mover.
- 6. Cycle crank test:
 - a. Perform test for each prime mover.
 - 1) Utilize any method recommended by manufacturer to prevent prime mover(s) from running.
 - 2) Put control switch into "run" position to cause prime mover to crank.
 - b. A complete cranking cycle shall consist of an automatic crank period of approximately 15 seconds duration followed by a rest period of approximately 15 seconds duration.
 - 1) Upon starting and running of the prime mover, further cranking shall cease.
 - 2) Two means of cranking termination shall be utilized so that one will act as a backup to the other to prevent inadvertent starter engagement.
 - 3) Cranking limiter time shall be 75 seconds for cycle crank.
- 7. Furnish load banks of required ratings necessary for tests.
- 8. Record engine fuel consumption by means of test equipment.
- 9. Test all safeties specified for generator instruments and controls [and generator remote annunciator panel] as recommended by manufacturer and as required to verify proper operation.
- 10. The Contractor shall be responsible for fuel and all consumables use during the test.
- B. Supplier's onsite services: Employ and pay for services of equipment manufacturer's field service representative(s) to:
 - 1. Inspect equipment covered by this Specification Section.
 - 2. Supervise pre-startup adjustments and installation checks.
 - 3. Conduct initial startup of equipment and perform operational checks.
 - 4. Provide Owner written statement that manufacturer's equipment has been installed properly, started up, tested, and is ready for operation by facilities operations and maintenance personnel.
 - 5. Provide training of facility operation and maintenance personnel in accordance with Section 01 79 23 - Instruction of Operation and Maintenance Personnel.

END OF SECTION

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SECTION 26 36 00

TRANSFER SWITCHES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Automatic transfer switches.
- B. Related Sections include but are not necessarily limited to:
 - 1. Section 26 05 00 - Electrical - Basic Requirements.
 - 2. Section 26 28 00 – Overcurrent and Short Circuit Protective Devices

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. National Electrical Manufacturers Association (NEMA):
 - a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
 - b. KS 1, Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).
 - 2. Underwriters Laboratories, Inc. (UL):
 - a. 98, Standard for Safety Enclosed and Dead-Front Switches.
 - b. 1008, Standard for Safety Switch Equipment.

1.3 SUBMITTALS

- A. Shop Drawings:
 - 1. Product technical data:
 - a. Provide submittal data for all products specified in PART 2 of this Specification:
 - b. See Section 26 05 00 for additional requirements.
 - 2. Fabrication and/or layout drawings.
- B. Contract Closeout Information:
 - 1. Operation and Maintenance Data:
 - a. See Specification Section 01 78 23 for requirements for the mechanics, administration, and the content of Operation and Maintenance Manual submittals.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. See Section 26 05 00.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the listed manufacturers are acceptable:
 - 1. Automatic transfer switches:
 - a. Automatic Switch Company.
 - b. Kohler.
 - c. Onan.
 - d. Russelectric.
 - e. ABB Zenith.
 - f. Engineer approved equal.

2.2 AUTOMATIC TRANSFER SWITCH

A. Construction:

1. Electrically operated mechanically held, double throw, air-break type.
2. Silver-surface main contacts and protect by arcing contacts.
3. Switch shall have provisions for visual inspection of switch blades and contacts.
4. Mechanical design will positively open all ungrounded conductors from normal source before connection is made to alternate source and will positively open alternate source before connection is made to normal source.
5. Mechanical interlock to ensure the switch cannot be readily disabled, disconnected, improperly adjusted, removed or otherwise made inoperative.
6. Make all contacts and coils readily accessible for replacement from front of panel without major disassembly.
7. Ratings:
 - a. Service Rated, with a circuit breaker per section 26 28 00 and Drawings.
 - b. Continuous duty in both normal and emergency.
 - c. Three-phase, four-pole, four-wire.
 - d. Voltage and current ratings as indicated on the Drawings.
 - e. Short circuit withstand rating equal to or greater than the value required by Drawings .
 - f. Furnished with a neutral, grounding kit and **lock-on** provisions
8. Standards: UL 1008.

B. Operation:

1. Refer to Section 01 81 33 - Cyber Security Requirements for cyber security related product requirements.
2. Microprocessor based control module.
3. Open transition.
4. Red and green indicating lights with fuses, identification nameplates, and test switch on front to simulate normal power failure at switch.
5. Engine starting contacts and all other auxiliary contacts and accessory devices for functions to be performed.
6. Supervisory voltage relays on each phase of normal source and single phase supervisory voltage and frequency relay for emergency source.
 - a. Normal source voltage sensing.
 - 1) Adjustable pickup from 85-100% of rated voltage, factory set 90%.
 - 2) Adjustable dropout from 75-98% of pickup setting, factory set 85%.
 - b. Emergency source voltage and frequency sensing:
 - 1) Adjustable pickup from 85-100% of rated voltage, factory set 90%.
 - 2) Fixed voltage dropout at 85% of pickup setting.
 - 3) Adjustable pickup from 90-100% of rated frequency, factory set 95%.
 - 4) Fixed frequency dropout at 88% of pickup setting.
7. Time delays:
 - a. Engine start, adjustable from 0 to 10 seconds, factory set at 4 seconds, to avoid unnecessary starting caused by short time outages.
 - b. Transfer to generator, adjustable from 0 to 120 seconds, factory set at 10 seconds.
 - c. Retransfer to normal, adjustable from 2 to 30 minutes, factory set at 15 minutes to avoid erratic operation caused by short time reestablishment of normal source.
 - 1) Automatically bypassed when emergency source fails and normal source is available.
 - d. Generator cool down, adjustable from 0 to 60 minutes, factory set at 10 minutes.

8. Exerciser timer:
 - a. Enable and disable function.
 - b. Selectable to exercise with or without transferring load.
 - c. Adjustable exercise duration from 1 minute to 24 hours, factory set at 15 minutes.
 - d. Adjustable day of the week exercise setting, factory set for Monday.
9. Inphase monitor:
 - a. Compare the phase relationship and frequency difference between the normal and emergency sources and permit transfer the first time the sources are within 15 electrical degrees and only if transfer can be accomplished within 60 electrical degrees as determined by monitoring the frequency differences.
 - b. Inphase transfer accomplished if both sources are within 2 Hz of rated frequency and 70% or more of rated voltage.
- C. Enclosure:
 1. NEMA 3R rated.
 2. Body and cover: 304SS.
 3. No knockouts, hinged and lockable door.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install as indicated and in accordance with manufacturer's recommendations and instructions.
- B. Connect as indicated in one-line diagram.
- C. Mounting of automatic transfer switches:
 1. Wall-mounted or floor mounted on 4 inches high concrete pad.

3.2 FIELD QUALITY CONTROL

- A. Automatic Transfer Switch Testing:
 1. Simulate power outage by opening normal source overcurrent device.
 - a. Verify engine generator starts and switch transfers in the specified time.
 2. Close normal source overcurrent device to simulate the return of normal power.
 - a. Verify the switch retransfers and engine generator shuts down in the specified time.
 3. Perform an automatic transfer and retransfer.
 4. Verify the indicator lights function properly.
 5. Field test per relevant section of NETA 2021.

3.3 CLOSEOUT ACTIVITIES

- A. Refer to Section 01 81 33 – Cyber-Security Requirements for cyber security related closeout requirements.

END OF SECTION

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SECTION 26 41 13
LIGHTNING PROTECTION SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Lightning protection systems using lightning rods, including lightning protection systems for:
 - a. Buildings and Structures.
- B. Scope:
 - 1. Contractor shall provide all labor, materials, equipment, tools, services, and incidentals necessary and required to provide lightning protection systems of the type indicated.
 - 2. Contractor shall furnish the services of individual possessing required qualifications, as indicated in this Section, to prepare the final design of the lightning protection systems required, in accordance with this Section and other Contract Documents. Such services are not delegated design.
 - 3. Provide lightning protection systems for the following buildings and structures:
 - a. Payneville Packaged Booster Pump Station.
- C. Related Requirements include but are not necessarily limited to:
 - 1. Section 26 05 26 - Grounding and Bonding.

1.2 REFERENCES

- A. Terminology: In this Section and relative to lightning protection system Work, the terminology indicated below has the following meaning, regardless of whether indicated with initial capital letters:
 - 1. Classification of Buildings in accordance with NFPA 780:
 - a. Class I: Any commercial, industrial, or residential building less than 75 feet in height.
- B. Reference Standards:
 - 1. ASTM International (ASTM):
 - a. B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft.
 - 2. Lightning Protection Institute (LPI):
 - a. 175 - Standard for the Design - Installation - Inspection of Lightning Protection Systems.
 - 3. National Fire Protection Association (NFPA):
 - a. 780 - Standard for the Installation of Lightning Protection Systems.
 - 4. National Electrical Manufacturers Association (NEMA):
 - a. TC 2 - Electrical Polyvinyl Chloride (PVC) Tubing and Conduit.
 - 5. Underwriters Laboratories, Inc. (UL):
 - a. 96 - Standard for Safety Lightning Protection Components.
 - b. 96A - Standard for Installation Requirements for Lightning Protection Systems.
 - c. 651 - Standard for Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordination - General:
 - a. Contractor shall coordinate the services of lightning protection system designer with all other elements of the Work.

- b. Contractor has full responsibility for scheduling lightning protection system designs and all related Work.
 - c. Allow sufficient time in Progress Schedule for performance of lightning protection system services, including requests for interpretation or clarification between lightning protection system designer and Contractor and between Contractor and Engineer.
2. Coordination of Lightning Protection System Work's Connections to Other Work:
- a. Where lightning protection system Work connects to other Work designed by Engineer, existing construction, or both, the lightning protection system Work shall be consistent with the other Work and existing construction to which lightning protection system Work connects, and adjacent construction.
 - b. Submit details, loading, anchorage, and other coordinating information necessary for the lightning protection system Work to properly interface with Work designed by Engineer.
 - c. Changes in the Work, whether designed by Engineer, designed by lightning protection system designer, or existing construction, necessary as a result of the lightning protection system are ineligible for increase in Contract Price or Contract Times, unless: (1) otherwise agreed by both Engineer and Owner, or (2) expressly indicated otherwise elsewhere in the Contract Documents for the lightning protection system Work.
 - d. Changes requiring extra compensation, time, or both arising from lightning protection system design aspects needed for convenience of Contractor, Subcontractor, or Supplier, are not grounds for increase in Contract Price or Contract Times.
3. Coordination of Submittals, Fabrication, Production, and Shipment:
- a. Do not release for raw materials procurement, fabrication, production, and shipment to the Site materials, equipment, or systems designed by lightning protection system designer until the associated lightning protection system designer has completed the design and Engineer has reviewed and approved all associated Shop Drawings, product data Submittals, Samples, and such Submittals have been delivered to and accepted by Engineer.
 - b. Allow sufficient time in the Progress Schedule for required Submittals and required actions by lightning protection system designer and Engineer.

1.4 QUALITY ASSURANCE

A. Qualifications:

1. Lightning Protection System Designer:
- a. One individual, acceptable to Engineer, shall design or directly supervise preparation of the final design of all lightning protection systems required for the Work.
 - b. Individual preparing, or directly supervising preparation of, final design of lightning protection systems shall possess current, valid "Designer Inspector" (DI) certification from Lightning Protection Institute (LPI) or "Lightning Protection Master Certification" (LPMC) from Underwriters Laboratories (UL).
 - c. In addition, individual performing, or directly supervising preparation of, final design of lightning protection system shall be able to furnish documentation indicating possession of not less than ten years' experience personally designing or supervising the preparation of lightning protection systems similar to that required for the Work.
 - d. Designer may be employee of lightning protection system Supplier or individual or entity retained by lightning protection system Supplier.
 - e. Submit to Engineer copy of current certification as LPI DI or UL LPMC and record documenting experience of lightning protection system designer. Indicate designer's current employer and employment history.
 - f. Upon Engineer's request, submit information for not less than five prior lightning protection systems, similar in type, scope, and extent to that required for the Work. Construction of each lightning protection system on each such project shall have been substantially complete for not less than one year at the time such documentation is

submitted to Engineer. Such information shall include, for each project, the following: project name and location (city, state or province, country); project owner; designer's employer and their role in the project (prime contractor, subcontractor, or supplier); name of project's design professional (company name) and location; year lightning protection system was completed; and general description of scope and extent of lightning protection system work. .

2. Installer:
 - a. Installer of lightning protection system may be Contractor or Subcontractor.
 - b. Throughout the Work, installer shall be a current, "UL Listed Lightning Protection Contractor".
 - c. Installer's project manager or site superintendent shall possess a current, valid certification as "Master Installer" from LPI. Such individual shall be actively involved in managing and supervising installation of the lightning protection system Work.
 - d. Installer shall furnish valid "UL Master Label" for the substantially completed lightning protection system Work.
 - e. In addition, installer shall possess not less than five years' relevant experience performing lightning protection system construction and shall be able to document not less than five completed, prior projects or similar scope and complexity to the lightning protection system Work within the most-recent five-year period.
 - f. Submit to Engineer documentation of installer's current status as "UL Listed Lightning Protection Contractor" and copy of required LPI "Master Installer" certification.
 - g. Upon Engineer's request, submit documentation of required experience.

1.5 SUBMITTALS

A. Action Submittals: Submit the following:

1. Shop Drawings:
 - a. Drawings of entire lightning protection system for each building and structure for which lightning protection system is required. Include plans, sections, schematics, and details as appropriate.
 - b. Plan drawings showing type, size, and locations of all lightning protection materials and equipment. Roof penetration detail drawings.
 - c. Submit schedules (tables) of materials and equipment as appropriate, indicating type, size, materials, and location of each, together with other pertinent information.
 - d. "Certificate of Compliance" by lightning protection system designer, in accordance with this Section's Article, "Responsibilities of Lightning Protection System Designer".
2. Product Data:
 - a. Data for all materials and equipment required by "Part 2 – Products" of this Section. Submit material and equipment manufacturers' published product data such as catalog pages, standard drawings, expected performance data, specifications, and the like.
 - b. Submit data sheets that include manufacturer's name and product model number. Clearly identify all optional accessories.
 - c. Certification that materials and equipment proposed submitted are in accordance with applicable standards of LPI or UL.

B. Informational Submittals: Submit the following:

1. Certifications and Notices:
 - a. Roofing system manufacturer written consent to installer's proposed penetrations (if any) through roofing system.
2. Roofing System Manufacturer's Instructions:
 - a. When Contractor proposes mechanically fastening lightning protection system components to, or providing penetrations through, roofing, obtain and submit to Engineer the roofing system manufacturer's:

- b. Written concurrence with proposed installation methods.
 - c. Written instructions for sealing penetrations into or through roofing system.
- 3. Supplier's Instructions:
 - a. Manufacturer's written instructions for handling, storage, and installation for all materials and equipment furnished.
- 4. Field Quality Control Results:
 - a. Submit results of field quality control activities required in this Section.
- 5. Supplier's Reports:
 - a. Submit written report of each visit to the Site by manufacturer's factory-trained representative.
 - b. Submit written report of each visit to the Site by lightning protection system designer.
- 6. Qualifications Statements:
 - a. Lightning protection system designer.
 - b. Installer.
- C. Closeout Submittals: Submit the following:
 - 1. Post-Installation Certifications:
 - a. Installer's written certification that the substantially completed lightning protection system Work complies with the Contract Documents.
 - b. "UL Master Label" certificate.
 - 2. Operation and Maintenance Data:
 - a. Manufacturer's operation and maintenance manual for each building's or structure's lightning protection system provided or modified. Comply with Section 01 78 23 - Operation and Maintenance Data.
 - b. Indicate requirements for, and frequency of, periodic inspections.
 - 3. Record Documents:
 - a. Prepare and submit drawings, including plans of roof or top of each building and structure for which lightning protection system was provided or modified, indicating as-constructed conditions. Include appropriate sections, details, and schematics.
 - b. Record drawings shall expressly indicate their status as "as-constructed" drawings with an appropriate revision date.

1.6 RESPONSIBILITIES OF LIGHTNING PROTECTION SYSTEM DESIGNER

- A. Responsibilities of lightning protection system designer employed on the Work include, but are not necessarily limited to, the following, unless specifically indicated otherwise in the associated elements of the Contract Documents where the lightning protection system is required:
 - 1. Ethical Conduct and Professionalism: Comply with Laws and Regulations, and standards and guidelines regarding codes of ethics and codes of conduct published by relevant industry organizations, including LPI and UL.
 - 2. Comply with Laws and Regulations and relevant design standards applicable to the subject lightning protection system Work.
 - 3. Performance and Design Criteria Indicated in the Contract Documents and Other Information:
 - a. Review performance and design criteria, indicated in the Contract Documents, that the lightning protection system Work must satisfy.
 - b. Prepare written requests for interpretations or clarifications of performance or design criteria.
 - c. Review existing information about the Site that constitutes Technical Data (if any, applicable to the subject lightning protection system Work), as indicated in the Supplementary Conditions.

4. Site Information and Investigations: With Contractor, obtaining all other necessary dimensions, field information, and other information necessary for preparing lightning protection system Shop Drawings.
5. Design Services: Personally, perform and prepare, or actively exercise direct, personal, supervisory control over others performing or preparing:
 - a. Necessary design evaluations of conditions, materials, and equipment.
 - b. Prepare the Shop Drawings and product data Submittals, and related design documents such as calculations, for the subject lightning protection system Work.
 - c. Assist Contractor with applying for and obtaining permits and approvals (not previously obtained by Owner or those for whom Owner is responsible) necessary for the lightning protection system Work.
 - d. Preparing modifications of the lightning protection system design documents as necessary.
6. Certification of Compliance by Lightning protection system designer:
 - a. Through Contractor, submit to Engineer, lightning protection system designer's written certification indicating:
 - b. General Information: (1) Project name and designation, (2) Contractor name and Contract designation, (3) Subcontractor or Supplier name (when applicable), (4) full name of lightning protection system designer's business entity under which the lightning protection system services were performed, (5) full name and certification number of the individual responsible for the final design of the subject lightning protection system Work, (6) specific elements of lightning protection system Work to which the certification applies, and (7) lightning protection system designer's signature, and date of signature; apply lightning protection designer's seal when applicable.
 - c. Explicit certification that the subject lightning protection system complies with:
 - 1) All applicable performance and design criteria indicated in the Contract Documents. Expressly indicate on certification of compliance the specific performance and design criteria used in the lightning protection system design.
 - 2) All Laws and Regulations.
 - 3) Applicable design standards commonly applicable to such types of construction. Expressly indicate such design standards on the certification of compliance.
7. Progress and Quality of Construction of Lightning protection system Work:
 - a. Where appropriate for the subject lightning protection system Work, periodically visit the Site at appropriate intervals to observe the progress and quality of the subject lightning protection system Work.
 - b. Where lightning protection system designer does not visit the Site during construction, keep informed of the progress and quality of the subject lightning protection system Work via discussions with Contractor, Subcontractor, and Suppliers, via photographic documentation, and other means acceptable to lightning protection system designer.
 - c. Advise Contractor in writing when the subject lightning protection system Work is not in accordance with the lightning protection system designer's design documents (approved by Engineer) and related Submittals approved by lightning protection system designer.
 - d. Furnish to entity that retained lightning protection system designer copy of lightning protection system designer's written report of each visit to the Site.
8. Modifications to Design:
 - a. Design appropriate modifications to the lightning protection system Work, including preparing new or revised certifications, reports, design drawings, sketches, design specifications, and calculations, as appropriate.
 - b. Such design documents and calculations shall be submitted to Engineer through Contractor to same extent original design documents Submittals and calculations, if any, where required by the Contract Documents for the subject lightning protection system Work.

9. Other services, as mutually agreed upon by lightning protection system designer and its client, or as required elsewhere in the Contract Documents.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
 1. A/C Lightning Protection, Inc.
 2. Harger Lightning & Grounding.
 3. Heary Bros. Lightning Protection Co. Inc.
 4. National Lightning Protection Corporation.
 5. Preferred Lightning Protection, Inc.
 6. Thompson Lightning Protection, Inc.
 7. VFC Lightning Protection.
 8. East Coast Lightning Equipment, Inc.
 9. Robbins Lightning, Inc.
 10. Or equal.

2.2 PERFORMANCE AND DESIGN CRITERIA.

- A. Provide lightning protection systems Work in accordance with NFPA 780, UL 96A, and LPI 175.
- B. Material for air terminals, main conductors and bonding conductors: Copper or aluminum.
- C. Size of air terminals, main conductors, and bonding conductors shall be in accordance with NFPA 780.

2.3 MATERIALS

- A. Unless otherwise expressly indicated in the Contract Documents, lightning protection system materials shall be compatible with materials of construction for the building or structure being protected and meet the requirements of UL 96.
- B. Provide lightning protection system with Class I or Class II materials, in accordance with NFPA 780.
- C. Ground Rods:
 1. 5/8-inch diameter by 10 feet long.
 2. Copper-clad:
 - a. Uniform coating, not less than 10 mils thick, of electrolytic copper molecularly bonded to rigid steel core.
 - b. Corrosion resistant bond between copper and steel.
 - c. Hard drawn, scar-resistant surface.
- D. Material for conductor fasteners, connector fittings, bonding fittings, conductor splicers and through-wall or through-roof assemblies shall be cast bronze, brass, or copper, with bolt pressure connectors.
- E. Material for bolts, nuts, and screws shall be stainless steel.
- F. Underground conductors shall be bare, soft-drawn, stranded copper in accordance with ASTM B8.
- G. Raceways:
 1. Indicated as Schedules 40 ("PVC-40") or Schedule 80 ("PVC-80"):
 - a. PVC thermoplastic, with inert modifiers to improve weatherability and heat distribution.
 - b. Rated for direct sunlight exposure.

- c. Fire retardant and low smoke emission.
- d. In accordance with NFPA 70 Type PVC, NEMA TC 2, UL 651.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions:
 - 1. When lightning protection systems will be installed on existing buildings or structures, carefully evaluate and become familiar with existing conditions, and tailor lightning protection system to be appropriate for the Work and the existing facility, in accordance with the Contract Documents.
 - 2. When lightning protection systems will be installed on new buildings or structures, coordinate such Work with other elements of the associated building or structure and provide complete system in accordance with the Contract Documents.
- B. Installing the Work constitutes Contractor's approval of underlying work, substrates, and field conditions prevailing at the time of the Work.

3.2 INSTALLATION

- A. Installation – General:
 - 1. Design and provide lightning protection system Work in accordance with LPI 175, NFPA 780, and UL 96A.
 - 2. Install lightning protection system in accordance with the Contract Documents and Shop Drawings approved by Engineer.
 - 3. Roofing System and Installation of Lightning Protection System:
 - a. Adhesively fasten lightning protection system components to roof system unless expressly shown or indicated otherwise in the Contract Documents.
 - b. Do not mechanically fasten lightning protection system components to metal roof panels or penetrate roof membrane without written consent of both roofing system manufacturer and Engineer. Submit to Engineer written consent of roofing system manufacturer.
 - c. Seal all penetrations in accordance with roofing system manufacturer's written instructions and details. Obtain such instructions and details from roofing system manufacturer.
 - 4. Surge protective devices to be provided, by others, as shown on the Drawings.
- B. Structures and Buildings:
 - 1. Lightning protection system shall include:
 - a. Roof-mounted air terminals.
 - b. Interconnecting conductors.
 - 1) Steel roof beams and trusses may be utilized as the main and secondary conductors.
 - c. Downleads: Provide the following type(s) of conductor downleads:
 - 1) Conductors surface-mounted on the building's or structure's exterior wall . Route conductor in Schedule 80 PVC conduit for not less than one foot below finished grade and four feet above finished grade.
 - d. Ground terminations.
 - e. Bonding of other grounded systems of building or structure.
 - f. Bonding to grounding electrode system.
 - 2. Connect downleads to the grounding electrode system ground ring.
 - 3. Underground connections shall be via exothermic weld.

3.3 FIELD QUALITY CONTROL

A. Field Tests and Inspections:

1. Perform fall-of-potential ground resistance test on each ground rod or ground ring.
 - a. When resistance exceeds 25 ohms for individual ground rod:
 - 1) Provide additional ground rod so they are 20 feet apart, interconnect with no. 4/0 AWG and retest.
 - 2) If retest exceeds 25 ohms, contact Engineer.
 - b. When resistance exceeds 25 ohms for a ground ring, contact Engineer.
2. Perform continuity test for system elements concealed within structure.
3. Perform continuity test for system elements utilized structural steel as downconductors.
4. Submit to Engineer written results of required field quality control activities expressly indicating building or structure name, and Project, type of test or inspection performed, results obtained, problems observed or noted during the test or inspection, and whether results obtained indicate successful completion (i.e., acceptance). The Work will not be eligible for inspection for Substantial Completion until such results are submitted to and accepted by Engineer.

3.4 CLOSEOUT

A. Documentation and Nameplates:

1. Prior to requesting inspection for Substantial Completion of lightning protection system Work, provide the following for each lightning protection system provided or modified:
 - a. Nameplate, securely fastened to building or structure, indicating: "Lightning protection system provided by", followed by company name and address of lightning protection system installer. Name plate shall be resistant to corrosion and deterioration (to which it may be subject at its installed location), including deterioration and fading due to exposure to sunlight.
 - b. Submit "UL Master Label" certification.
 - c. Deliver final operation and maintenance manuals for the lightning protection system.
2. Prior to requesting final payment, deliver to Engineer the following for each lightning protection system provided or modified:

As-constructed record drawings, in accordance with this Section's "Submittals" Article. Such as-constructed drawings shall be developed from Shop Drawings approved by Engineer and those of the Drawings showing the lightning protection system.

END OF SECTION

SECTION 26 43 13

SURGE PROTECTION DEVICES FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Type PC3 SPD - Medium exposure locations (switchboard, panelboard and motor control center), integrally mounted.

B. Related Sections include but are not necessarily limited to:

- a. 26 24 16 Panelboards
- b. 26 36 00 Transfer Switches

1.2 QUALITY ASSURANCE

A. Referenced Standards:

1. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
 - a. C62.41, Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.
 - b. C62.41.1, Guide on the Surge Environment in Low-Voltage (1000V and Less) AC Power Circuits.
 - c. C62.41.2, Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits.
 - d. C62.45, Recommended Practice on Surge Testing For Equipment Connected to Low-Voltage (1000V and Less) AC Power Circuits.
2. National Electrical Manufacturers Association (NEMA):
 - a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
3. National Fire Protection Association (NFPA):
 - a. 70, National Electrical Code (NEC).
4. Underwriters Laboratories, Inc. (UL):
 - a. 1283, Standard for Electromagnetic Interference Filters.
 - b. 1449, Standard for Surge Protective Devices.

B. Qualifications:

1. Provide devices from a manufacturer who has been regularly engaged in the development, design, testing, listing and manufacturing of SPDs of the types and ratings required for a period of 10 years or more and whose products have been in satisfactory use in similar service.
 - a. Upon request, suppliers or manufacturers shall provide a list of not less than three customer references showing satisfactory operation.

1.3 DEFINITIONS

A. Clamping Voltage:

1. The applied surge shall be induced at the 90 degrees phase angle of the applied system frequency voltage.
2. The voltage measured at the end of the 6 inches output leads of the SPD and from the zero voltage reference to the peak of the surge.

B. Let-Through Voltage:

1. The applied surge shall be induced at the 90 degrees phase angle of the applied system frequency voltage.

2. The voltage measured at the end of the 6 inches output leads of the SPD and from the system peak voltage to the peak of the surge.
- C. Maximum Continuous Operating Voltage (MCOV): The maximum steady state voltage at which the SPD device can operate and meet its specification within its rated temperature.
- D. Maximum Surge Current:
 1. The maximum 8 x 20 microsecond surge current pulse the SPD device is capable of surviving on a single-impulse basis without suffering either performance degradation or more than 10% deviation of clamping voltage at a specified surge current.
 2. Listed by mode, since number and type of components in any SPD may vary by mode.
- E. Protection Modes: This parameter identifies the modes for which the SPD has directly connected protection elements, i.e., line-to-neutral (L-N), line-to-line (L-L), line-to-ground (L-G), neutral-to-ground (N-G).
- F. Surge Current per Phase:
 1. The per phase rating is the total surge current capacity connected to a given phase conductor.
 - a. For example, a wye system surge current per phase would equal L-N plus L-G; a delta system surge current per phase would equal L-L plus L-G.
 - b. The N-G mode is not included in the per phase calculation.
- G. System Peak Voltage: The electrical equipment supply voltage sine wave peak (i.e., for a 480/277 V system the L-L peak voltage is 679V and the L-N peak voltage is 392 V).

1.4 SUBMITTALS

- A. Shop Drawings:
 1. Product technical data including:
 - a. Manufacturer's qualifications.
 - b. Standard catalog cut sheet.
 - c. Electrical and mechanical drawing showing unit dimensions, weights, mounting provisions, connection details and layout diagram of the unit.
 - d. Testing procedures and testing equipment data.
 - e. Create a Product Data Sheet for each different model number of SPD provided (i.e., Model XYZ with disconnect and Model XYZ without disconnect, each require a Product Data Sheet).
 - 1) Data in the Product Data Sheet heading:
 - a) SPD Type Number per PART 2 of the Specification.
 - b) Manufacturer's Name.
 - c) Product model number.
 - 2) Data in the Product Data Sheet body:
 - a) Column one: Specified value/feature of every paragraph of PART 2 of the Specification.
 - b) Column two: Manufacturer's certified value confirming the product meets the specified value/feature.
 - c) Name of the nationally recognized testing laboratory that preformed the tests.
 - d) Warranty information.
 - 3) Data in the Product Data Sheet closing:
 - a) Signature of the manufacturer's official (printed and signed).
 - b) Title of the official.
 - 4) Date of signature.
- B. Operation and Maintenance Manuals:

1. See Specification Section 01 78 23 for requirements for:
 - a. The mechanics and administration of submittal process.
 - b. The content of the Operation and Maintenance Manuals.
2. Warranty.

1.5 WARRANTY

- A. Minimum of a five year Warranty from date of shipment against failure when installed in compliance with applicable national/local electrical codes and the manufacturer's installation, operation and maintenance instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable: Panelboard or transfer switch manufacturer's standard supply.

2.2 GENERAL

- A. Standards: IEEE C62.41.1, IEEE C62.41.2, IEEE C62.45, UL 1283, UL 1449.

2.3 TYPE PC3 SPD

- A. Product:
 1. SPD tag number or electrical equipment tag number to which SPD is connected
 2. Integrally mounted in a switchboard or panelboard.
 3. Hybrid solid state high performance suppression system.
 - a. Do not use gas tubes, spark gaps or other components in suppression system which might short or crowbar the line resulting in interruption of normal power flow to connected loads.
 4. Do not connect multiple SPD modules in series to achieve the specified performance.
 5. Designed for parallel connection.
 6. Field connection: Use mechanical or compression lugs for each phase, neutral and ground that will accept bus bar or #10 through #1/0 conductors.
 7. Device monitor:
 - a. Long-life, solid state, externally visible indicators and Form C contact(s) that monitor the on-line status of each mode of the units suppression filter system or power loss in any of the phases.
 - b. A fuse status only monitor system is not acceptable.
- B. Operating Voltage: The nominal unit operating voltage and configuration as indicated on the Drawings.
- C. Modes of Protection: All modes.
 1. Three phase (delta): L-L, L-G.
 2. Three phase (wye): L-N, L-L, L-G and N-G.
 3. Single phase (2 pole): L-L, L-N, L-G and N-G.
 4. Single phase: L-N, L-G and N-G.
- D. Maximum Continuous Operating Voltage: Less than 130% of system peak voltage.
- E. Operating Frequency: 45 to 65 Hz.
- F. Short Circuit Rating: Equal to or greater than rating of equipment SPD is connected to.
- G. Maximum Surge Current: 120,000 A per phase, 60,000 A per mode minimum.
- H. Minimum Repetitive Surge Current Capacity: 4000 IEEE C High or B combination waveform impulses with no degradation of more than 10% deviation of the clamping voltage.

- I. SPD Protection:
 - 1. Integral unit level and/or component level overcurrent fuses and sustained overvoltage thermal cutout device.
 - 2. An IEEE B combination wave shall not cause the fuse to open and render the SPD inoperable.
- J. Maximum Clamping Voltages: Dynamic test at the 90 degrees phase angle including 6 inches lead length and measured from the zero voltage reference:

System Voltage	Test Mode	IEEE C62.41		UL 1449
		B Comb. Wave	B3 Ring Wave	
L-L < 250 V L-N < 150 V	L-L	1000 V	700 V	800 V
	L-N	600 V	400 V	500 V
	L-G	800 V	550 V	600 V
	N-G	800 V	550 V	600 V
L-L > 250 V L-N > 150 V	L-L	2000 V	1400 V	1800 V
	L-N	1150 V	800 V	1000 V
	L-G	1550 V	1000 V	1200 V
	N-G	1550 V	1000 V	1200 V

- K. EMI-RFI Noise Rejection: Attenuation greater than 30 dB for frequencies between 100 kHz and 100 MHz.

2.4 SOURCE QUALITY CONTROL

- A. SPD approvals and ratings shall be obtained by manufacturers from nationally recognized testing laboratories.
- B. The SPD are to be tested as a complete SPD system including:
 - 1. Integral unit level and/or component level fusing.
 - 2. Neutral and ground shall not be bonded during testing.
 - 3. 6 inches lead lengths.
 - 4. Integral disconnect switch when provided.
- C. The “as installed” SPD system including the manufacturers recommended circuit breaker, the SPD is connected to, will not open when tested with a IEEE C3 combination waveform.
- D. Tests to be performed in accordance with IEEE C62.45:
 - 1. Clamping voltage performance testing using IEEE C62.41 Category waveforms.
 - 2. Single pulse surge current capacity test.
 - 3. Repetitive surge current capacity testing.
 - 4. Spectrum analysis for EMI-RFI noise rejection.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Type PC3 SPD:
 - 1. Connected in parallel to the equipment.

2. Install in dedicated electrical equipment compartment, bucket or panelboard box at the factory before shipment.
3. Provide leads that are as short and straight as possible.
4. Maximum lead length: 12 inches.
5. Minimum lead size: #2 stranded AWG or bus bar.
6. Connect leads to the equipment to be protected by one of the following means:
 - a. Through a circuit breaker or molded case switch mounted in the equipment.
 - b. Use manufacturer recommended circuit breaker size.
 - c. Circuit breaker or switch to be operable from the equipment exterior or from behind a hinged door.

END OF SECTION

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SECTION 26 50 00
INTERIOR AND EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Material and installation requirements for:
 - a. Interior building and exterior building mounted luminaires.
 - b. Exterior and site luminaires.
 - c. LEDs.
 - d. Drivers.
 - e. Light poles.
 - f. Lighting control.
- B. Related Specification Sections include but are not necessarily limited to:
1. Division 03 - Concrete.
 2. Section 26 05 00 - Common Work Results for Electrical.
 3. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables.
 4. Section 26 09 16 - Control Equipment Accessories.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
1. American National Standards Institute (ANSI):
 - a. C78.377, Specification for the Chromaticity of Solid State Lighting Products.
 2. Federal Communications Commission (FCC):
 - a. Code of Federal Regulations (CFR), 47 CFR 18, Industrial, Scientific and Medical Equipment.
 3. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
 - a. C62.41, Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.
 4. Illuminating Engineering Society of North America (IESNA):
 - a. LM-79, Electrical and Photometric Measurements of Solid-State Lighting Products.
 - b. LM-80, Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays and Modules.
 5. National Electrical Manufacturers Association (NEMA):
 - a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
 - b. 410, Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts.
 - c. LE 4, Recessed Luminaires, Ceiling Compatibility.
 6. National Electrical Manufacturers Association/American National Standards Institute (NEMA/ANSI):
 - a. SSL 1, Electronic Drivers for LED Devices, Arrays or Systems.
 7. National Fire Protection Association (NFPA):
 - a. 70, National Electrical Code (NEC).
 - b. 101, Life Safety Code.
 8. Underwriters Laboratories, Inc. (UL):
 - a. 248-4, Low-Voltage Fuses - Part 4: Class CC Fuses.
 - b. 924, Standard for Emergency Lighting and Power Equipment.

- c. 1012, Power Units Other Than Class 2.
- d. 1310, Standard for Class 2 Power Units.
- e. 1598, Luminaires.
- f. 8750, Standard for Light Emitting Diode (LED) Equipment for Use in Lighting Products.
- 9. United States Department of Energy (USDOE):
 - a. EPCa, the National Energy Policy Act.

1.3 DEFINITIONS

- A. Useful Life for LED luminaire light sources:
 - 1. The operating hours before reaching 70% of the initial rated lumen output (L70) with no catastrophic failures under normal operating conditions.
 - 2. This is also known as 70% "Rated Lumen Maintenance Life" as defined in IESNA LM-80.

1.4 SUBMITTALS

- A. Shop Drawings:
 - 1. Product technical data:
 - a. Provide submittal data for all products specified in PART 2 of this Specification Section.
 - b. Identify luminaire by Luminaire Schedule designation.
 - c. Luminaire data sheet:
 - 1) Name of manufacturer.
 - 2) Complete order information (catalog number).
 - 3) Description of construction and optics.
 - 4) Total input wattage.
 - 5) Luminous efficacy (lumens/Watt).
 - 6) Photometric performance data including candlepower distribution and coefficient of utilization (CU) table.
 - 7) Dimensional size.
 - 8) Weight.
 - 9) UL nameplate data for luminaires used in Class 1, Division 1 and 2 areas.
 - 10) Effective Projected Areas (EPA) for pole mounted luminaires.
 - d. Solid state Luminaire additional data:
 - 1) Voltage.
 - 2) Initial and IES L70 lumens.
 - 3) Luminous efficacy (lumens/Watt).
 - 4) Correlated Color Temperature (CCT).
 - 5) Color Rendering Index (CRI).
 - 6) Total Harmonic Distortion (THD).
 - 7) Lamp life.
 - 8) Driver manufacturer and model number.
 - 9) Driver life.
 - 10) Driver type (0-10V, constant voltage, constant current).
 - 11) Dimming range and control device compatibility.
 - 12) Remote driver: Maximum wire length to luminaire.
 - 13) Emergency battery driver:
 - a) Compatibility with lighting module.
 - b) Lumen output of lighting module in emergency operation.
 - c) Battery life.

- d) Description of testing.
 - e) Ambient operating temperature.
 - 14) Toxicity Characteristic Leaching Procedure (TCLP) compliance.
 - 15) DesignLights Consortium (DLC) Listing.
 - 16) Warranty information.
 - e. Pole data sheet:
 - 1) Name of manufacturer.
 - 2) Complete order information (catalog number).
 - 3) Description of construction.
 - 4) Length, shaft size and thickness.
 - 5) Wind loading (available luminaire EPA per wind speed).
 - 6) Anchor bolt template.
 - 7) Bolt size and material.
 - f. Photometric calculation for manufacturers not listed in the Luminaire Schedule:
 - 1) Location: Pump Station interior and exterior Per Table on the Drawings.
 - a) Calculation method: Point-to-Point.
 - b) Required footcandle level: average IESNA LM-79.
 - c) Light loss factor: 0.9.
 - g. See Section 26 05 00 for additional requirements.
 - 2. Test Reports:
 - a. IESNA LM-79 Test Report for Solid-State Luminaire.
 - b. IESNA LM-80 Test Report Solid-State Light Source.
 - 3. Certifications: Solid-state Luminaire Useful Life Certificate.
- B. Contract Closeout Information:
- 1. Operation and Maintenance Data:
 - a. See Section 01 78 23 for requirements for the mechanics, administration, and the content of Operation and Maintenance Manual submittals.
 - b. Submittal data for each component covered by warranty.
 - c. Warranty.

1.5 WARRANTY

- A. Minimum of a five year Warranty from date of manufacture against failure for solid-state luminaire including LED arrays, LED drivers and integral control devices. The solid-state product is considered defective if more than 15% of the individual light emitting diodes fail to illuminate.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
 - 1. Luminaires: Per Luminaire Schedule [or equal].
 - 2. Solid State Light Sources:
 - a. Cree.
 - b. Xicato.
 - c. Luminaire manufacturer's proprietary system.
 - d. Or Engineer approved equal.
 - 3. LED Driver: Luminaire manufacturer's standard.

4. Emergency ballasts:
 - a. Iota Engineering.
 - b. Philips Bodine.
 - c. Or Engineer approved equal.
5. Emergency transfer devices: Philips Bodine, or Engineer approved equal
6. Poles: Luminaire manufacturer's standard.

2.2 GENERAL REQUIREMENTS

- A. Luminaires complete with LED modules and drivers.
- B. Rated for area classification as indicated on the Drawings.
- C. Provide all recessed luminaires with gaskets of rubber, fiberglass, or equivalent material to prevent light leaks around flush trim.
 1. Provide recessed luminaires with trim gaskets cemented in proper position.
- D. Provide standard plaster frame for all recessed luminaires installed in plaster walls or ceilings.
 1. Design, finish and fabricate material to preclude possibility of rust stain in plaster.
- E. Coordinate luminaire mounting where recessed into building canopies prior to Submitting Shop Drawings. Confirm clearances and luminaire flange compatibility with construction.
- F. Electrical components of recessed luminaires shall be accessible and removable through luminaire without having to remove luminaire from ceiling.
- G. No live parts normally exposed to contact.
- H. When intended for use in wet areas: Mark luminaire "Suitable for wet locations."
- I. When intended for use in damp areas: Mark luminaire "Suitable for damp locations" or "Suitable for wet locations."

2.3 LUMINAIRES

- A. Standards and Listings:
 1. DesignLights Consortium (DLC).
 2. UL 1598.
 3. NEMA LE 4 for recessed locations.
- B. Housings:
 1. As indicated in the Luminaire Schedule and the following:
 - a. Troffer luminaires:
 - 1) Minimum 22 gage sheet steel.
 - 2) Integral end plates and trim flanges to suit ceiling construction.
 - 3) Wire way covers with captive retainers to allow access to electrical components without use of tools.
 - b. Down Light luminaires:
 - 1) Minimum 22 gage sheet steel, or minimum 16 gage sheet aluminum, unless noted otherwise.
 - 2) Auxiliary junction box secured to mounting frame.
 - c. Extruded aluminum housings, where scheduled, shall be at least 1/8 inches thick.
 - d. Punch and form housings prior to finishing (post-paint).
- C. Castings:
 1. As indicated in the Luminaire Schedule and the following:
 - a. Uniform quality, free from imperfections affecting strength and appearance.

- b. Exterior surfaces, if not receiving a finish coat, shall be smooth and match adjacent surfaces. At least one coat of clear methacrylate lacquer shall be applied unless a painted finish is specified.

D. Fasteners:

- 1. As indicated in the Luminaire Schedule and the following:
 - a. Aluminum or steel luminaires: Zinc-Nickel plated, stainless steel, or equivalent.
 - b. Stainless steel luminaires: Stainless steel.
 - c. Bronze luminaires: Bronze or stainless steel.
 - d. Non-metallic luminaires: Stainless steel.

E. Finishes:

- 1. As indicated in the Luminaire Schedule and the following:
 - a. Painted surfaces:
 - 1) Manufacturer's standard metal pretreatment and baked or air-dried, light-stabilized enamel finish, acrylic, alkyd, epoxy, polyester, or polyurethane.
 - 2) White finishes shall have minimum 85% reflectance.
 - b. Unpainted surfaces:
 - 1) Interior: Clear anodic coating, satin finish.
 - 2) Exterior: Clear anodic coating.

F. Lens/Louver Frames:

- 1. As indicated in the Luminaire Schedule and the following:
 - a. Extruded aluminum with mitered corners.
 - b. Hinging or other normal motion shall not cause lens or louver to drop out.
 - c. No light leak between frame and housing.

G. Lenses:

- 1. As Indicated in the Luminaire Schedule and the Following:
 - a. 100% virgin, UV stabilized acrylic.
 - b. Held securely in place but must also be removable for cleaning and servicing.
 - c. Luminaires with directional lenses shall include a lens orientation device to ensure that lens installation provides light distribution as designed.
 - d. No light leaks between the lens and the luminaire.

H. Reflectors:

- 1. As Indicated in the Luminaire Schedule and the Following:
 - a. Down Light Reflector and Baffle Finishes: First-quality "Alzak" anodized specular finish.
 - b. Troffer reflector finish: Integral reflectors shall be painted white after fabrication with a minimum reflectance value of 90%.

I. Gaskets:

- 1. As Indicated in the Luminaire Schedule and the Following:
 - a. Gaskets at face plates or frames of recessed luminaires which serve as ceiling trim and allow interior access.
 - b. Moisture seal gaskets at exterior locations and in other designated wet areas.
 - c. Secure frames to luminaire bodies with screws or other means, to result in tight installation, without light leaks.

J. Ventilation:

- 1. Ventilation openings of adequate size and quantity to permit operation of driver without affecting rated output or life expectancy. Include wire mesh screens.

K. Wiring:

1. Factory-wired to be compatible with the project electrical and controls systems.

L. Mounting Accessories:

1. Provide appropriate mounting accessories for each luminaire, compatible with various structural conditions encountered.
2. All luminaires with adjustable beam angles shall have a locking device to ensure that the beam distribution is not effected during servicing or cleaning.
3. Recessed Luminaires:
 - a. Plaster Frames: Provide frames for luminaires installed in gypsum board and concealed suspension system ceiling tile. Make frames of non-ferrous metal or suitably rustproof after fabrication.
 - b. Baffles and Gaskets: As required to prevent light leakage.
 - c. Flanged luminaires are required in all ceiling systems except exposed grid lay-in panel type.
4. Luminaire Suspension Material:
 - a. Unfinished Spaces:
 - 1) 1/2 inches minimum diameter swivel stem, unless otherwise noted.
 - 2) Safety chain on high bay type.
 - b. Finished Spaces: Unless otherwise noted.
 - 1) Manufactured cable or stem and outlet box canopy.
 - a) Contemporary design with swivel self-aligning features.
 - b) Size canopy to cover outlet box, minimize size of canopy not associated with outlet box.
 - c) Finish to match luminaire.
 - 2) Coordinate pendant location with ceiling tiles/ceiling grid.
 - a) Submit coordinated mounting accessories as part of Shop Drawing submission.
 - 3) Luminaires mounted on suspended ceiling grids should be provided with outlet box designed for grid mounting with direct cord entry and supported by outlet box.

2.4 SOLID-STATE LUMINAIRES - ADDITIONAL REQUIREMENTS

A. Standards:

1. IESNA LM-79, IESNA LM-80.
2. NEMA SSL 1.
3. UL 1012, 1310, and 8750.

B. Solid state modules and driver to be provided and warrantied by luminaire manufacturer.

C. Solid-State Modules:

1. Uniform color temperature of 4000K unless otherwise noted on the Luminaire schedule.
 - a. Color temperature measurement shall have a maximum 3 SDCM on the MacAdam Ellipse for frosted lensed luminaires, and 2 SDCM for other luminaire types (ANSI C78.377).
2. Minimum color rendering index (CRI) of 80 for indoor and 70 for outdoor applications.
3. LED module light output and efficacy: Measured in accordance with IESNA LM-79 standards.
4. LED useful life and lumen maintenance: Measured in accordance with IESNA LM-80 standards.
5. Driver and LED module: Minimum useful life of 50,000 hours (L70).
6. Individual LEDs connected such that a failure of one LED will not result in a light output loss of the entire luminaire.

D. Driver:

1. Compatible with solid-state modules and control devices specified.
2. Operate from 60 Hz input source of 120V through 277V with sustained variations of $\pm 10\%$ (voltage and frequency).
3. Input current Total Harmonic Distortion (THD): Less than 20% when operated at nominal line voltage.
4. Power Factor: Greater than 0.90.
5. Avoid interference with infrared devices and eliminate visible flicker.
6. Comply with ANSI C62.41 Category A for Transient protection.
7. Comply with the requirements of the Federal Communications Commission (FCC) rules and regulations, Title 47 CFR part 18, Non-Consumer (Class A) for EMI/RFI (conducted and radiated).
8. Dimmable drivers capable of continuous dimming over a range of 100% to 10% of rated lumen output, unless otherwise specified in Luminaire Schedule. Dimming controlled by a 0 - 10 VDC signal, unless otherwise specified in Luminaire Schedule.
9. Control device must be compatible with type of driver and coordinated prior to submission of Shop Drawings. List of compatible dimming controllers must include the range of perceived brightness. No visible flicker throughout the dimming range.
10. Remote-mounting:
 - a. Provide maximum allowable distances for secondary wire runs to luminaires.
 - b. Provide remote mounting hardware and enclosures as required.
11. Operating temperature range must be suitable for site temperature conditions within exterior and gasketed luminaires.

E. Emergency Battery Driver:

1. UL 924.
2. Confirm compatibility with LED modules utilized.
3. Consist of a high temperature, maintenance-free nickel cadmium battery, charger, and electronic circuitry.
4. A solid state charging indicator light to monitor the charger and battery.
5. Single-pole test switch.
6. The following product family shall be selected based on coordination with LED lamp type:
 - a. Philips Bodine "BSL23C": can operate up to 4.5W at 410mA.
 - b. Philips Bodine "BSL26C": can operate up to 5.1W at 265mA.
 - c. Philips Bodine "BSL722 inches: can operate up to 23W at 770mA.
 - d. Philips Bodine "BSL23C": can operate up to 23W at 770mA in operating conditions ranging from -20 degrees C (-4 degrees F) to 60 degrees C (140 degrees F).
 - e. Alternate manufacturer: Iota.

F. Luminaire properly heat sunk to assure LED junction temperature ratings are not exceeded.

1. Provide ambient operating temperature range for which product is warranted.

2.5 EXIT SIGNS AND EMERGENCY LIGHTING UNITS

A. Standards:

1. UL 924.
2. NFPA 101.
3. Local State or City requirements.

B. Exit Signs:

1. Housing and finish: As indicated in the Luminaire Schedule.

2. LED illuminated with integral driver.
3. AC powered or AC and battery powered: As indicated in the Luminaire Schedule.
4. Battery powered units:
 - a. Battery type: As indicated in the Luminaire Schedule.
 - b. Self-testing/self-diagnostic.
 - 1) Electronic circuitry automatically test emergency lighting for a minimum of 30 seconds every 30 days and 90 minutes once a year.
 - c. Consist of battery, charger, and electronic circuitry.
 - d. Solid state charging indicator light to monitor the charger and battery.
 - e. Single-pole test switch.
 - f. A user selectable audible alarm. The alarm shall be engaged unless noted otherwise on the Drawings.

C. Emergency Lighting Units:

1. Housing: As indicated in the Luminaire Schedule.
2. Lamps: As indicated in the Luminaire Schedule.
3. Battery type: As indicated in the Luminaire Schedule.
4. Self-testing/self-diagnostic.
 - a. Electronic circuitry automatically test emergency lighting for a minimum of 30 seconds every 30 days and 90 minutes once a year.
5. Consist of battery, charger, and electronic circuitry.
6. Solid state charging indicator light to monitor the charger and battery.
7. Single-pole test switch.
8. A user selectable audible alarm. The alarm shall be engaged unless noted otherwise on the Drawings.

D. Emergency Circuit Transfer Device:

1. Transfer device permits emergency lights to be switched under normal conditions and automatically transfers to unswitched emergency circuit upon power interruption.
2. Multiple luminaire switching:
 - a. Up to 20A.
 - b. Mounting as indicated on the Drawings.
 - c. Acceptable product family:
 - 1) Philips Bodine GTD20A or equal.
3. Individual luminaire switching:
 - a. Mount on top of luminaire or in ballast channel.
 - b. Acceptable product family:
 - 1) Philips Bodine GTD or equal.

2.6 POLES

A. As Indicated in the Luminaire Schedule and the Following:

1. Designed for attached luminaire EPA with a 130MPH maximum wind velocity at the base with a 1.3 wind gust factor.
2. Additional features:
 - a. Handhole near base of pole.
 - b. Grounding lug accessible at handhole.
 - c. Galvanized anchor bolts.
 - d. Anchor bolt covers.
 - e. Vibration dampener(s).

B. Metal Poles:

1. Material: Aluminum.
2. Shaft shape: Tapered.
3. Pole cross section: Round.
4. Pole height: ≤ 15 feet.
5. Designed for attached luminaire EPA with a 130MPH maximum wind velocity at the base with a 1.3 wind gust factor.
6. Additional features:
 - a. Luminaire mounting provisions.
 - b. Handhole near base of pole.
 - c. Grounding lug accessible at handhole.
 - d. Galvanized anchor bolts.
 - e. Anchor bolt covers.
 - f. Vibration dampener(s).
7. Aluminum pole finish: Brushed aluminum.

2.7 MAINTENANCE MATERIALS

- A. Furnish a minimum of 10% of total of each type and amperage of fuses for fixtures indicated to be fused.
- B. Spare parts are to be stored in a box clearly labeled as to its contents.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Coordinate Luminaire Types with Ceiling Construction:
 1. Provide mounting hardware for the ceiling system in which the luminaire is to be installed.
- B. Fasten luminaires supported by suspended ceiling systems to ceiling framing system with hold down clips.
- C. Provide mounting brackets and/or structural mounting support for wall-mounted luminaires.
 1. Do not support luminaire from conduit system.
 2. When luminaire is supported from outlet boxes, install per NFPA 70.
 3. Supports for luminaire mounted on exterior walls shall not be attached to exterior face of the wall.
- D. Support surface mounted luminaires from the building structure and not from the ceiling suspension system.
 1. Luminaires up to 4 feet wide and 4 feet long: A minimum of four supporting points, one at each corner.
 2. Luminaires 8 feet long: A minimum of five support points, one at center of luminaire and one at each corner.
 3. Luminaires smaller than 2 feet in length: A minimum of two supporting points.
- E. Provide pendant luminaires with swivel hangers which will allow luminaire to swing in any direction but will not permit stem to rotate.
 1. Provide hangers with enclosure rating (NEMA 1, 4, or 7) equal to enclosure requirements of area in which they are installed.
 2. Swivel hangers for luminaires in mechanical equipment areas: Shock absorbing type.
 3. Secure low and high bay luminaires with safety chain or safety aircraft cable to the building structure.

- a. Chain or cable to prevent luminaire from falling more than 3 inches before the luminaire is caught by the chain or cable.
- F. Pendant Mounted, Open, Industrial Luminaire:
 - 1. Not in continuous rows:
 - a. Supported by conduit or by approved chains or cable:
 - b. Hardwired to ceiling mounted junction box.
 - 2. In continuous rows:
 - a. Supported rigidly with conduit and fasten luminaire to each other or mount on continuous metal channel per Section 26 05 00.
 - b. Hardwired to ceiling mounted junction box.
 - c. Provide reflector alignment clips.
- G. Provide access panels for recessed luminaires that require access for maintenance when such access is not provided for in design of luminaire.
 - 1. Locate luminaires in accordance with reflected ceiling plans.
- H. Locate luminaire in exact center of ceiling tile unless otherwise indicated.
 - 1. Relocate incorrectly installed luminaire and replace damaged ceiling materials.
- I. Mount luminaire at heights indicated in Section 26 05 00 or per Luminaire Schedule or as indicated on the Drawings.
- J. Install exterior luminaires so that water cannot enter or accumulate in the wiring compartment.
- K. Luminaires with Emergency Battery:
 - 1. Where luminaires with emergency battery are shown controlled via switching device, connect the emergency battery to corresponding unswitched circuit so emergency battery will not operate when normal power is available and switching device turns lights off. Upon failure of normal power, luminaire will operate in emergency mode regardless of switch position.
 - 2. Luminaire manufacturer to supply the emergency battery with luminaire.
- L. Ground luminaire.

3.2 POLE INSTALLATION

- A. Drawings Indicate the Intended Location of Light Pole:
 - 1. Field conditions may affect actual location.
 - 2. Coordinate location with all existing or new utilities and pavement.
- B. Anchor Base Plated Poles:
 - 1. Mounted on cast-in-place foundations, as detailed on the Drawings.
 - a. Concrete and reinforcing steel, in accordance with Division 03 Specification Sections.
 - b. Concrete:
 - 1) Minimum compressive strength: 4000 psi at 28 days.
 - 2) Concrete work in accordance with ACI 301.
 - c. Reinforcing steel:
 - 1) ASTM A615/A615M, Grade 60.
 - 2. Protect pole finish during installation.
 - a. Repair damage to pole finish with manufacturer approved repair kit.
- C. Ground poles as indicated on the Drawings.
- D. Conductors:
 - 1. See Section 26 05 19 for required underground conductors.

2. Use interior building wire, as specified in Section 26 05 19, from pole base to luminaire, #12 AWG minimum.
- E. Overcurrent and Short Circuit Protection:
1. Protect each phase with a UL Class CC fuse:
 - a. Size: Three times load current.
 - b. Standard: UL 248-4.
 2. Fuseholder:
 - a. Watertight, in-line and break-a-way style.
 - b. Accept up to a 30 A, 600 V fuse.
 - c. Neutral conductor shall utilize a fuseholder with a solid copper rod.
 - d. Conductor terminal: Adequate size for the installed conductors.

3.3 LIGHTING CONTROL

- A. See Specification Section 26 09 16 for lighting control equipment.
- B. Exterior wall mounted and pole mounted fixtures controlled as detailed on the Drawings.
- C. Exterior wall mounted and pole mounted fixtures.
1. Major equipment:
 - a. Lighting control panel.
 - b. Electrically held lighting contactor.
 - 1) Mounted in control panel.
 - 2) Quantity of contactors and number of poles as required.
 - 3) Auxiliary contact.
 - c. Photocell mounted on roof.
 - d. Three-position (HOA) switch panel mounted.
 - e. Red panel mounted indicator light.
 2. Sequence of operation:
 - a. When the HOA switch is in the HAND position
 - 1) Contactor is energized and the exterior lights are ON.
 - 2) Contactor auxiliary contact is energized and the indicator light is ON.
 - b. When the HOA switch is in the OFF position:
 - 1) Contactor is de-energized and the exterior lights are OFF.
 - 2) Contactor auxiliary contact is de-energized and the indicator light is OFF.
 - c. When the HOA switch is in the AUTO position:
 - 1) Contactor is energized and de-energized according to the light level as seen by the photocell.
 - 2) Contactor auxiliary contact is energized and de-energized according to the light level as seen by the photocell.

3.4 ADJUST AND CLEAN

- A. See Section 01 74 00.
- B. Aim all emergency lighting units, so that, the path of egress is illuminated.

END OF SECTION

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DIVISION 31

EARTHWORK



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SECTION 31 10 00

SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Site clearing Work, including:
 - a. General provisions for site clearing Work.
 - b. Preparation for site clearing Work.
 - c. Clearing and grubbing.
 - d. Tree protection, selective removals, and selective trimming.
 - e. Disposal and cleaning.

B. Related Requirements: Include but are not necessarily limited to:

1. Section 02 41 00 - Demolition.
2. Section 31 23 33 – Trenching, Backfilling, and Compacting Utilities.

1.2 REFERENCES

A. Terminology:

1. Terms indicated below are not defined terms indicated with initial capital letters but, when used in this Section, have the meanings indicated below:
 - a. “Arborist” means Subcontractor retained to perform Work requiring a specialist in trees, shrubs, brush, other vegetation of the types existing at the Site, and possessing not less than the required qualifications indicated in this Section.
 - b. “Clearing and grubbing” means removing and disposing of all: (1) trees, brush, and other vegetation, logs, and similar items (“clearing”); and (2) stumps, roots, logs, rubbish, and debris on or in the soil (“grubbing”) after Clearing. Clearing and grubbing includes grinding and removing of stumps. When clearing and grubbing, topsoil stripping and stockpiling, [and required demolition Work] is complete, the Site will be ready for grading and other new construction.
 - c. “Demolition” means removal, whether in whole or in part, of existing human-made construction, such as removal of buildings, structures, and building systems; site work (such as pavement, curbs, sidewalks, gutters) and the like; Underground Facilities; and other existing construction.
 - d. “Selective removal” means removal of specific trees, shrubs, brush, and other vegetation, whether as shown or indicated in the Contract Documents or as directed at the Site by Engineer.
 - e. “Selective trimming” means removal of selected parts of trees, shrubs, brush, and other vegetation, performed by arborist, for the purpose of either: (1) allowing installation of new construction adjacent to or through the tree, shrub, brush, or vegetation, or)2) removing damaged or unhealthy growth, to allow balance of the subject tree, shrub, brush, or vegetation to continue normal, healthy growth.
 - f. “Site clearing” means all the Work required by this Section and related Drawings.
 - g. “Topsoil” means existing material at the Site, visible after clearing and grubbing, to be stripped, when such material is friable, clay loam, surface soil present in depth of not less than four inches. Topsoil shall be free of subsoil, clay lumps, stones, and other objects over two-inch diameter and other objectionable material. Topsoil required for planting and landscaping Work in the Specifications of Division 32 may differ from the meaning indicated in this Section.

B. Reference Standards:

1. ASTM International (ASTM):
 - a. C700, Standard Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated.
 - b. D448, Standard Classification for Sizes of Aggregate for Road and Bridge Construction.
2. American National Standards Institute (ANSI):
 - a. A300, Standard for Tree Care Operations – Tree, Shrub, and Other Woody Plant Maintenance – Standard Practices.
3. International Society of Arboriculture (ISA):
 - a. Container Rootball Shaving.
 - b. Crown Correction.
 - c. Balled and Burlapped Root Correction.
 - d. Container Root Correction.
 - e. High Branched Crown Observation.
 - f. Low Branched Crown Observation.
 - g. Multiple Low Branches Crown Observation.
 - h. Balled and Burlapped Root Observation.
 - i. Container Root Observation - Tree.
 - j. Protection Maintenance.

1.3 SUBMITTALS

A. Action Submittals: Submit the following:

1. Shop Drawings:
 - a. Limits of Site Clearing Work: When limits of site clearing Work are not expressly shown on the Drawings, or where Contractor proposes alternative limits of site clearing Work, submit drawings, developed from the Drawings, clearly indicating proposed limits of site clearing Work, with dimensions indicated where appropriate.
 - b. Where proposed limits of clearing and grubbing, selective removals, and topsoil stripping are not identical with each other, clearly and expressly indicate limits of each on the Shop Drawings.

B. Informational Submittals: Submit the following:

1. Permits and Approvals:
 - a. Submit copy of each permit required and obtained for site clearing Work, issued by authority having jurisdiction.
 - b. Where Owner's permission or approval is required for selected site clearing activities, submit copy of Owner's written permission or approval for such activity.
 - c. When approval of owner of property (other than Owner) is required for selected site clearing activity, submit to Engineer written copy of such approval.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Tree Wound Dressing:

1. Provide tree wound dressing, waterproof, adhesive and elastic with an antiseptic, free from kerosene, coal tar, creosote, and other material injurious to life of tree or other plant.

B. Drain Tile:

1. Provide four-inch diameter, standard strength, perforated wall, bell-and- spigot clay pipe, in accordance with ASTM C700.

C. Filter Fabric:

1. In accordance with requirements for temporary erosion and sediment controls indicated in Section 01 57 05 - Temporary Controls.
- D. Drainage Fill:
 1. Selected crushed stone, or crushed or uncrushed gravel, washed.
 2. Size 24 (in accordance with ASTM D448), with 90 to 100 percent passing 2.5-inch sieve and not more than 10 percent passing 3/4-inch sieve.
- E. Burlap:
 1. Jute, not less than 7.2 ounces per square yard.
- F. For other materials needed for site clearing Work, such as stone, topsoil, or other, comply with requirements of the Contract Documents.

PART 3 - EXECUTION

3.1 SITE CLEARING – GENERAL

- A. Limits of Site Clearing Work:
 1. Limits of site clearing Work are shown and indicated on the Drawings.
- B. General Provisions for Site Clearing:
 1. Contractor shall provide all labor, materials, equipment, tools, services, and incidentals necessary and required to perform site clearing Work in accordance with the Contract Documents.
 2. Perform site clearing Work to avoid creating nuisances, pollution, and preventable adverse effects on the environment.
 3. Excavation required for site clearing shall comply with Section 31 23 33 - Trenching and Backfilling.
 4. Requirements of Authorities Having Jurisdiction:
 - a. Perform site clearing Work in accordance with Laws and Regulations.
 - b. Obtain, pay for, and comply with permits required for site clearing Work. Obtain from authorities having jurisdiction and furnish copy of each permit as a Submittal.
 5. Traffic Control:
 - a. Where site clearing Work is along or adjacent to travelled ways subject to public traffic, comply with Section 01 55 26 - Traffic Control.
 - b. Establish such controls prior to and maintain in place throughout site clearing Work that has potential to affect traffic.
 6. Site clearing Work shall comply with ANSI A300 and applicable ISA standards indicated in this Section's "References" Article, unless the Contract Documents indicate more-stringent requirements.
 7. Demolition Work is indicated in Section 02 41 00 - Demolition, including removal of site improvements and Underground Facilities.

3.2 PREPARATION

- A. Permits and Approvals:
 1. Do not commence site clearing Work until necessary permits and approvals are obtained and copies furnished to Engineer as Submittals.
- B. Delineation of Limits of Site Clearing Work Areas:
 1. Locate and clearly flag at the Site:
 - a. Limits of site clearing Work.
 - b. Trees, shrubs, vegetation, and other materials to remain within limits of site clearing Work.

- c. Trees, shrubs, and other vegetation to be selectively trimmed.
 - d. Trees, shrubs, and vegetation to be selectively removed.
 - e. Salvageable trees, shrubs, and vegetation (to be relocated) within limits of site clearing Work.
- 2. Flagging:
 - a. Flagging shall be high-visibility type. Where necessary, provide lath or stakes driven into the ground, with flagging, to clearly delineate limits.
 - b. Provide different-colored flagging for each type of delineation required by this Article.
 - c. Promptly replace lost, moved, or destroyed flagging until Engineer concurs that flagging is no longer needed.
- C. Protection: Establish protection of trees, shrubs, and vegetation to remain, in accordance with this Section's Article, "Tree Protection, Selective Removals, and Selective Trimming", and other applicable provisions of the Contract Documents.
- D. Temporary Erosion and Sediment Controls:
 - 1. Provide applicable temporary erosion and sediment controls before commencing clearing and grubbing and topsoil stripping Work.
 - 2. Comply with temporary erosion and sediment control requirements of Section 01 57 05 - Temporary Controls.
 - 3. Continue providing temporary erosion and sediment controls as clearing and grubbing and topsoil stripping and stockpiling Work progresses into previously uncleared, ungrubbed areas of the Site.

3.3 CLEARING AND GRUBBING

- A. Clearing and Grubbing – General:
 - 1. Remove and dispose of all materials constituting clearing and grubbing Work within limits shown and indicated in the Contract Documents.
 - 2. After grubbing Work is complete, properly fill holes resulting from grubbing before commencing site grading Work.
- B. Trees and Shrubs Improperly Destroyed or Damaged:
 - 1. Refer to this Section's Article, "Tree Protection, Selective Removals, and Selective Trimming".
- C. Trees and Shrubs to Remain:
 - 1. Trees and shrubs to remain shall be protected, and trimmed where necessary or required, in accordance with this Section's Article, "Tree Protection, Selective Removals, and Selective Trimming".

3.4 TREE PROTECTION, SELECTIVE REMOVALS, AND SELECTIVE TRIMMING

- A. General Provisions for Tree Protection, Selective Removals, and Selective Trimming:
 - 1. Provide temporary fencing, barricades, or guarding measures, as recommended by arborist, outside drip line of trees and shrubs to remain.
 - 2. Protect root systems from damage caused by noxious materials, storm water runoff, site clearing, planting and landscaping, other Work, and storage of materials and equipment. Protect root systems from flooding, erosion, and excessive wetting resulting from dewatering of excavations, drainage of tanks, and other construction activities.
 - 3. Fires are not allowed under or adjacent to trees, shrubs, and other vegetation to remain.
 - 4. Do not store matter resulting from site clearing or demolition, topsoil, or other excavated material within drip line of trees and shrubs to remain. Vehicles are not allowed within drip line. Restrict foot, vehicle and equipment traffic to prevent compaction of soil over root systems. Where such activities are unavoidable, and only as acceptable to Engineer, provide temporary, continuous, heavy-duty wood planking effectively fastened together and

capable of distributing loads from such activities. Temporary planking shall be underlaid by layer of filter fabric covered with two-inch layer of gravel.

5. Cut branches and roots, when necessary, with sharp pruning instruments; do not break or chop. Fully paint cuts 1/2-inch and larger in size with tree wound dressing.

B. Excavation and Protection of Trees and Shrubs:

1. Excavate within drip line of trees only where shown.
2. Where trenching for utilities is required within drip line, tunnel under or around main lateral feeder roots by drilling, auger boring, pipe jacking, or digging by hand under supervision of arborist. Do not cut main lateral roots or tap roots; cut smaller roots, which interfere with installation of the Work.
3. Where excavation for the Work is required within drip line of trees or shrubs, hand excavate to minimize damage to root systems. Perform excavation under supervision of arborist. Provide temporary shoring or other protective support systems at excavations, to minimize sloping and benching of excavations. Use narrow tine spading forks and comb excavated material to expose roots.
4. Relocate roots in backfill areas wherever possible. If large, main lateral roots are encountered, expose beyond excavation limits as required to bend and relocate without breaking. If encountered immediately adjacent to location of construction and relocation is not practical, cut roots approximately three inches back from construction.
5. Do not allow exposed roots to dry out before permanent backfill is provided; provide temporary earth cover. Water and maintain in moist condition and temporarily support and protect from damage until permanently relocated and covered with earth.

C. Grade Adjustments and Tree Protection:

1. Maintain existing grade within drip line of trees, unless otherwise shown or indicated.
2. Lowering of Preconstruction Grade:
 - a. Where required finish grade is below preconstruction grade around trees and shrubs, grade beyond drip line. Maintain preconstruction grade within drip line of trees and shrubs.
 - b. Prune tree and shrub roots exposed during grade lowering, or provide permanent protections as recommended by arborist. Do not cut main or lateral roots or tap-roots; cut only smaller roots.
 - c. Compensate for loss of roots and prune branches to stimulate root growth.
 - d. Provide extended service through completion of the Contract correction period as recommended by arborist.
3. Minor Fills:
 - a. Where preconstruction grade is six inches or less below elevation of finish grade shown, fill with topsoil complying with quality requirements of Specifications for finish grading and landscaping.
 - b. Place in single layer and do not compact.
 - c. Hand-grade to required finish elevations.
4. Moderate Fills:
 - a. Where preconstruction grade is more than six inches, but less than 16 inches, below finish grade elevation, provide layer of drainage fill and filter fabric on preconstruction grade prior to placing topsoil that complies with quality requirements of Specifications on finish grading and landscaping.
 - b. Carefully place drainage fill against trunk of tree or shrub approximately two inches above elevation of finish grade and extend not less than 1.5 feet from tree or shrub trunk on all sides.
 - c. Provide filter fabric with edges overlapping by 6 inches, minimum.
 - d. Place fill layer of topsoil to finish grade elevation.

- e. Do not compact stone, gravel or topsoil layers. Hand-grade to required finish elevations.
5. Deep Fills:
- a. Provide an open dry circular well of durable, unmortared stone, located not less than two feet from trunk of associated tree or shrub.
 - b. To facilitate proper drainage, provide eight to 10 continuous runs of four-inch drain tiles horizontally on the preconstruction ground surface under the complete spread of branches in radial pattern around the tree or shrub.
 - c. Slope drain tiles away from tree or shrub.
 - d. Provide drainage fill on preconstruction ground surface in depth of two inches under and six inches over drain tiles.
 - e. Provide filter fabric over entire top surface of drainage fill.
 - f. Provide eight to 10 drainage tiles, each four-inch diameter, vertically in radial pattern around tree or shrub, located five feet from trunk of tree or shrub. Extend vertical drainage tiles from the filter fabric layer above the horizontal drainage tiles to postconstruction finished grade
 - g. Hold drainage tiles in place with drainage fill.
 - h. Hand-grade to required finish grade elevation.
- D. Repair and Replacement of Trees and Shrubs:
- 1. Perform tree and shrub repair under direction of arborist.
 - 2. Cavity Repair:
 - a. Remove decayed areas to depth that exposes healthy tissue.
 - b. Shape cavities to provide drainage.
 - c. Paint inside of cavity with antiseptic tree wound dressing material.
 - d. Do not fill cavities.
 - e. When cavity's cross-section exceeds 60 percent of cross-section of tree or shrub branch, selectively trim subject branch. When cavity's cross-section exceeds 60 percent of cross-section of trunk of tree or shrub, remove tree or shrub upon Engineer's authorization. Engineer will consider arborist's recommendation. Comply with this Section's requirements for selective trimming and selective removals.
 - 3. Repair trees and shrubs damaged by construction operations, or selectively trimmed, within 24 hours of occurrence of such damage or selective trimming. Treat damaged trunks, branches, and roots according to written instructions of arborist, in accordance with ANSI A300 and applicable ISA standards indicated in this Section's "References" Article.
 - 4. Remove and replace trees and shrubs that are (1) dead or destroyed due to construction operations, or (2) damaged beyond reasonable hope of recovery (as determined by arborist) following repairs, or (3) damaged and determined by arborist to be incapable of resuming normal growth pattern after repairs.,
 - 5. Obtain opinion from arborist regarding whether damaged trees, shrubs, and other vegetation is repairable with reasonable chance of success. Submit arborist's certification required in this Section's "Submittals" Article.
 - 6. For each tree or shrub to remain but is destroyed or damaged (beyond repair) by Contractor:
 - a. For trees 12 inches or more in diameter (measured one foot above preconstruction ground surface), provide two replacements of the same species. Each replacement shall be four inches diameter (measured one foot above top of root ball).
 - b. For trees smaller than 12 inches diameter, and for shrubs, provide one replacement for each, of same species. Replacements shall be equal in size to original, up to maximum of four inches (measured one foot above root ball).
 - c. Provide replacement at locations at the Site as directed by Engineer.

- d. Provide replacements in accordance with the Contract Documents, including Specifications on planting and landscaping.

3.5 DISPOSAL AND CLEANING

A. Disposal – General:

1. Dispose of matter resulting from clearing and grubbing, selective removals, and selective trimming, at appropriate offsite location, unless otherwise expressly allowed by the Contract Documents or mutual agreement of Owner and Contractor.
2. Do not use cleared, grubbed, or trimmed material as fill, backfill, or in embankments.
3. Dispose of cleared, grubbed, and trimmed material, and other materials, rubbish, and debris, in accordance with Laws and Regulations.
4. Pay all costs associated with transporting and disposing of materials and debris resulting from site clearing Work.
5. Cleared lumber and trimmings from trees are Contractor's property and, at Contractor's option, may be sold or salvaged offsite.

B. Burning:

1. Burning of trees, shrubs, brush, other vegetation, and other materials at, or adjacent to, the Site, whether in-place or cut, is prohibited unless: (a) burning is not prohibited by Laws or Regulations, and (b) required permits, if any, are obtained by Contractor from authorities having jurisdiction and are furnished to Engineer as Submittals; and (c) written approval of Owner is obtained and furnished to Engineer as a Submittal; and (d) when burning will be performed on lands at the Site not owned by Owner, obtain and submit to Engineer as Submittals written approval of owners of such properties.
2. Before burning, alert local fire department (both orally and in writing) not less than 72 hours before burning, and provide at location of burning appropriate emergency materials, tools, and equipment to contain and extinguish fires. Use such items and furnish necessary labor to prevent fire from burning other than intended trees, shrubs, brush, and vegetation.
3. If burning is allowed, exercise appropriate care and judgement. Do not perform burning in high wind conditions. Do not perform burning when areas adjacent to burning are of dryness that will foster wildfires.
4. Promptly and fully extinguish fires before they burn unintended areas or materials, and when burning is completed.
5. Dispose of ashes and burned materials off-site at appropriate location.

END OF SECTION

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SECTION 31 20 01

EARTH MOVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Requirements for excavating, filling, and other earth moving Work, including:
 - a. Field conditions.
 - b. Soil and aggregate materials.
 - c. Site preparation, including site clearing.
 - d. Excavation.
 - e. Temporary support of excavations.
 - f. Dewatering of excavations.
 - g. Preparation of subgrades.
 - h. Filling and compacting.
 - i. Rough grading.
 - j. Disposal of excavated spoil materials.

B. Related Requirements: Include, but are not necessarily limited to:

1. Section 31 10 00 – Site Clearing.
2. Section 31 23 33 – Trenching, Backfilling, and Compacting for Utilities.

1.2 REFERENCES

A. Terminology:

1. The following terms are not defined and are not indicated with initial capital letters but, when used in this Section, have the following meaning:
 - a. “Borrow” means material required for earth work construction in excess of quantity of suitable material available from required grading, cuts, and excavations at the Site. Borrow may be necessary even though not otherwise expressly required by the Contract Documents.
 - b. “Cohesive soil” means clay (fine grained soil), or soil with a high clay content, which has cohesive strength. Cohesive soil does not crumble, can be excavated with vertical or near-vertical sideslopes, and is plastic when moist. Cohesive soil is difficult to break up when dry, and exhibits significant cohesion when submerged. Cohesive soils include clayey silt, sandy clay, silty clay, clay and organic clay.
 - c. “Cohesionless soil” means fill material that does not clump together; its grains remain separate and apart from each other. Cohesionless soils typically have a low proportion of fine (no. 200 mesh size and less) particles and may be soil material or granular material. The terms “cohesionless soils”, “cohesionless materials”, “non-cohesive soils”, and the like have the same meaning.
 - d. “Fill” means soil material, granular material, or other material indicated in this Section required for backfilling excavations or as material for achieving required rough grading. Unless indicated otherwise in the context of a specific provision, the terms “fill” and “backfill” have the same meaning, as do derivative terms such as, “filling” and “backfilling”. When used by itself, the term “backfill” means material required for refilling an excavation.
 - e. “Granular material” means gravel, sand, or silt, (coarse grained soil) with little or no clay content. Granular soil has no cohesive strength. Some moist granular soils exhibit apparent cohesion. Granular soil cannot be molded when moist and crumbles easily when dry. The terms “granular material”, “aggregate material”, and “granular soil” have

the same meaning. Detailed requirements for specific types of granular material are indicated in Article 2.1 of this Section.

- f. "Rock" means: igneous, metamorphic, or sedimentary rock or stone; boulders over [two] cubic yards in volume in open areas and boulders over [one] cubic yard in volume in trenches; and mass concrete; that cannot be removed using rippers and therefore requires drilling and blasting or use of large excavator-mounted pneumatic breakers. If rock is encountered during the Work, promptly furnish notice of differing subsurface condition in accordance with the General Conditions (as may be modified by the Supplementary Conditions); when necessary, Engineer will furnish requirements for rock removal via appropriate Contract modification. The following do not qualify as rock:
 - 1) Soft, weathered or disintegrated rock that can be removed by normal excavating equipment, including bulldozers with rippers and large trackhoes with rock teeth or rock buckets.
 - 2) Loose or previously blasted rock.
 - 3) Broken stone in rock fills.
 - 4) Rock or stone that falls into the excavation from outside limits of excavation shown or indicated in the Contract Documents.
 - 5) Boulders that can be removed without drilling, blasting, or pneumatic breakers.
 - 6) Pavements, sidewalks, and gutters of concrete, asphalt, or masonry.
 - g. "Subgrade" means the uppermost surface of native soil material unmoved from cuts; the bottom of excavation.
 - h. "Unclassified", when used in referring to excavating or excavations, means excavation and disposal of all materials, of any description whatsoever, encountered in performing the Work, unless otherwise shown or indicated in the Contract Documents.
- B. Reference Standards: Standards referenced in this section include, but are not necessarily limited to, the following:
- 1. American Association of State Highway and Transportation Officials (AASHTO):
 - a. AMRL R18 - AASHTO Accreditation Procedure Manual.
 - 2. American Institute of Steel Construction (AISC):
 - a. ANSI/AISC 360 - Specification for Structural Steel Buildings.
 - 3. American Welding Society (AWS):
 - a. D1.1/D1.1M - Structural Welding Code - Steel
 - 4. ASTM International (ASTM):
 - a. C33/C33M - Standard Specification for Concrete Aggregates.
 - b. D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
 - c. D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method.
 - d. D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)).
 - e. D2166 - Standard Test Method for Unconfined Compressive Strength of Cohesive Soil.
 - f. D2216 - Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.
 - g. D2434 - Standard Test Methods for Measurement of Hydraulic Conductivity of Coarse-Grained Soils.
 - h. D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
 - i. D2850 - Standard Test Method for Unconsolidated-Undrained Triaxial Compression Test on Cohesive Soils.

- j. D3740 - Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
- k. D4253 - Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.
- l. D4254 - Standard Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.
- m. D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- n. D6913 - Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis.
- o. D6938 - Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
- p. D7928 - Standard Test Method for Particle-Size Distribution (Gradation) of Fine-Grained Soils Using the Sedimentation (Hydrometer) Analysis.
- q. E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.

1.3 SUBMITTALS

A. Informational Submittals: Submit the following:

1. Procedure Submittals:

- a. Copies of permits and approvals required for earth moving Work, obtained from authorities having jurisdiction, including owners of affected utilities and transportation facilities, for excavation methods proposed.

1.4 QUALITY ASSURANCE

A. Qualifications:

1. Contractor's Testing Laboratory:

- a. Retain the services of independent testing laboratory to perform testing and determine compliance with the Contract Documents of materials specified in this Section.
- b. When Contractor is expressly required, by this Section's "Field Quality Control" Article or elsewhere in the Contract Documents, to retain testing laboratory for tests required under this Section's "Field Quality Control" Article, retain one testing laboratory for quality assurance testing and field quality control testing.
- c. Retain testing laboratory different from testing laboratory and special inspectors retained by Owner or Owner's consultant for code-required tests and special inspections for the Project, if any.
- d. Testing laboratory shall possess current, valid accreditation from the AASHTO Materials Reference Laboratory (AMRL), in accordance with AASHTO AMRL R18, for ASTM D3740, for tests required for quality assurance testing indicated in this Article and field quality control testing indicated to be Contractor's responsibility.
- e. Testing laboratory shall comply with ASTM E329 [and Section 01 45 29.13 - Testing Laboratory Services Furnished by Contractor].
- f. Testing laboratory shall be experienced in the types of testing required.
- g. Selection of testing laboratory is subject to Engineer's acceptance. Upon Engineer's request, submit qualifications statement for testing laboratory, including name of entity, location, copies of applicable certifications, summary of entity's experience, and names and qualifications of personnel who will perform the subject sampling and testing.

B. Quality Assurance Testing:

- 1. Quality assurance testing, which may also be regarded as source quality control testing, is in addition to field quality control testing required by this Section's "Field Quality Control" Article.

2. Materials used in the Work may require testing and retesting, as directed by Engineer, during the Project. Allow free access to onsite material stockpiles, borrow sources, and other sources of aggregate and soil materials at all times. Tests not specifically indicated to be performed at Owner's expense, including retesting of defective materials and defective Work, shall be at Contractor's cost.
3. Contractor's Testing Laboratory Scope:
 - a. Obtain samples and perform testing of proposed fill materials in the laboratory, at the Site, and at borrow locations (if any) to provide assurance that the Work will comply with the Contract Documents.
 - b. Testing laboratory shall perform testing required to obtain data for selecting moisture content for placing and compacting fill materials.
 - c. Submit to Engineer, via Contractor, written results of each test.
4. Required Quality Assurance Material Testing by Contractor's Testing Laboratory:
 - a. Perform the following quality assurance tests on materials to be incorporated into the Work. Submit results of such tests to Engineer and obtain Engineer's acceptance thereof prior to incorporating the subject materials into the Work.
 - b. Gradation in accordance with ASTM D6913 and ASTM D7928. Perform one test for every 1,000 cubic yards of each material to be incorporated into the Work.
 - c. Atterberg limits in accordance with ASTM D4318. Perform one test for every [1,000] cubic yards of the following types of materials to be incorporated into the Work: suitable soil material, and soil structural fill.
 - d. Moisture/density relations for fill in accordance with ASTM D698, ASTM D1557, ASTM D4253, or ASTM D4254, as applicable. Perform one test for every 1,000 cubic yards of each material to be incorporated into the Work.
 - e. Moisture content of stockpiled or borrow material in accordance with ASTM D2216. Perform one test for every 1,000 cubic yards of each material to be incorporated into the Work.

1.5 SUBMITTALS

1. Product Data:
 - a. Borrow Soil Materials: Name and address of Supplier of borrow soil materials, gradation, and Supplier's certification that materials are sufficiently free of Constituents of Concern so that a Hazardous Environmental Condition will not be created or exacerbated.. If no soil materials will be obtained from any borrow location, expressly so indicate to Engineer in writing.
 - b. Aggregate: Supplier's published description of aggregate materials, including name and address of Supplier, certification of material's compliance with AASHTO and state department of transportation standards, and gradation.
- B. Informational Submittals: Submit the following:
 1. Procedure Submittals:
 - a. Excavation plan indicating:
 - 1) Excavation Method(s): Indicate high-level methods to be used for excavating, such as use of backhoe or other earth moving construction equipment, use of explosives in excavating (when allowed), trenchless excavating methods, micro-trenching, hydro-excavating (when allowed), air vacuum excavating (when allowed), or other. Where different methods will be used, indicate locations of each in the Work. Purpose of indicating high-level excavating methods is for Owner's information regarding effect of excavating method on Owner's or facility manager's (if other than Owner) property and operations.
 - 2) Copies of permits and approvals required for earth moving Work, obtained from authorities having jurisdiction, including owners of affected utilities and transportation facilities, for excavation methods proposed.
 - 3) Contractor-Proposed Modifications:

- a) Contractor-proposed modifications to the Work requested to accommodate temporary supports for excavations, temporary dewatering of excavations, or both.
 - b) Should any Contractor-proposed modifications from Contract requirements be approved, a suitable Contract modification will be duly issued.
 - c) If no such request is part of Contractor's excavation plan Submittal prior to start of the Work of this Section, Engineer will proceed on the premise that Contractor-proposed modifications are not intended.
 - b. Compaction procedure and compaction equipment proposed for use. Where different procedures or equipment will be used for compacting different types of material or at different locations at the Site, indicate where each procedure and equipment item will be used.
 - c. Engineer's acceptance of excavation plan does not, in any way, modify Contractor's sole responsibility for complying with the Contract Documents, construction means, methods, procedures, techniques, or sequences, and safety and protection measures incident thereto.
2. Quality Assurance Test Results Submittals:
- a. Submit results of quality assurance testing performed in accordance with this Section's "Quality Assurance" Article, unless included as part of another submittal under this Section. Submit results for the following quality assurance testing:
 - 1) Tests on materials from onsite and borrow sources.
 - 2) Optimum moisture – maximum dry density curve for each type of fill material.
3. Field Quality Control Submittals:
- a. Submit results of testing and inspection performed in accordance with the field quality control Article in "Part 3 – Execution" of this Section, including:
 - 1) Indication of soil classification in accordance with ASTM D2487.
 - 2) Field density testing.
 - 3) Proctor Compaction Test to determine optimum moisture for soil and maximum dry density.
4. Qualifications Statements:
- a. Quality assurance testing laboratory, when requested by Engineer.

1.6 FIELD CONDITIONS

A. Existing Conditions:

- 1. Subsurface Conditions:
 - a. Subsurface Information: The Supplementary Conditions indicate information (if any) that is Technical Data on subsurface conditions at the Site. Such information and data are not intended as a representation or warranty of continuity of conditions between soil borings or test pits, nor of groundwater levels at dates and times other than date and time when measured, nor that purpose of obtaining the information and data were appropriate for use by Contractor. Owner and Engineer are not responsible for interpretations or conclusions drawn therefrom by Contractor.
 - b. Contractor's Explorations: Soil borings and other exploratory operations may be made by Contractor, at no additional cost to Owner. Coordinate Contractor-performed test borings and other exploratory operations with Owner, utility owners, and owners of transportation facilities as appropriate. Perform such explorations without disrupting or otherwise adversely affecting operations of Owner and others.
- 2. Where subsurface conditions or locations of Underground Facilities and structures are unforeseen or differ substantively from that shown or indicated in the Contract Documents, comply with Contract requirements for giving notice and other actions.
- 3. Existing Structures and Underground Facilities:

- a. The Contract Documents show or indicate certain structures and Underground Facilities adjacent to the Work. Such information was obtained from existing records and is not guaranteed to be correct or complete. Contractor shall explore ahead of the excavation to determine the exact location of all existing structures and Underground Facilities. Existing structures and Underground Facilities shall be supported and protected from damage by Contractor. Immediately repair and restore existing structures and Underground Facilities damaged by Contractor without additional cost to Owner.
- b. Movement or operation of construction equipment and machinery over Underground Facilities shall be at Contractor's sole risk. When required by owner of the Underground Facility, prepare and submit to owner of such Underground Facility, and obtain their acceptance, of Contractor's plan presenting Contractor's analysis of the loads to be imparted during construction (including transient loading by construction equipment, machinery, and vehicles) and Contractor's proposed measures to protect structures and Underground Facilities during the Work.
- c. Acceptance of or approval by utility owner or Engineer of Contractor's proposed evaluation and method(s) for protecting Underground Facilities in no way modifies or reduces Contractor's sole responsibility for complying with the Contract Documents, means, methods, procedures, techniques, and sequences of construction, and the safety and protection measures incident thereto.
- d. Coordinate with utility owners for shut off of services in active piping and conduits. When required by utility owner, Owner will assist Contractor with utility owner notifications. Completely remove buried piping and conduits indicated for removal and not otherwise indicated as being abandoned or to remain in place.
- e. In general, service lines and laterals to individual residences, businesses, buildings, and structures, are not shown; however, Contractor shall assume that a service exists for each utility owner to each residence, business, building, structure, and property.
- f. Do not interrupt existing utilities serving facilities occupied and used by Owner or others, except when such interruption is indicated in the Contract Documents or when allowed in writing by Engineer after acceptable temporary utility services are provided by Contractor for the affected structure or property.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Granular Under-Slab Fill:

1. Provide granular under-slab fill under foundations (including footings, slabs-on-grade, mats, and similar construction), manholes, handholes, and similar Work.
2. ASTM C33/C33M gradation size no. 67, or other material acceptable to Engineer.

B. Granular Structural Fill:

1. Granular structural fill, sometimes called "select granular fill", is required for improving subgrade (after removal of unsuitable material), as backfill for excavations in areas that, after restoration, will be subject to vehicular traffic, and at other locations shown or indicated for such material in the Contract Documents.
2. Material shall be well-graded, crushed aggregate, and free of organic and deleterious material.

C. Subbase Material:

1. Subbase material is granular material underlying pavement, sidewalks, and other surfaces expressly indicated in the Contract Documents.
2. Material shall be naturally- or artificially-graded mixture of natural or crushed gravel, crushed stone, or natural or crushed sand. Slag is unacceptable.

D. Pipe Bedding Material:

1. Materials: Unless otherwise expressly required in the Contract Documents, pipe bedding material shall be crushed stone and gravel, free of: rock or gravel larger than one-inch in any dimension, debris, waste, frozen materials, organic material and other deleterious matter.

2.2 SOURCE QUALITY CONTROL

A. Tests and Inspections at Source of Supply:

1. Perform quality assurance testing, and submit results to Engineer, in accordance with the "Quality Assurance" Article in Part 1 of this Section.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:

1. Provide Engineer with sufficient notice and with means to examine areas and conditions under which excavating, filling, and grading will be performed. Engineer will advise Contractor in writing when Engineer is aware of conditions that may be detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.
 2. This Article, however, in no way modifies or reduces Contractor's sole responsibility for complying with the Contract Documents, for construction means, methods, procedures, techniques, and sequences, and for the safety and protection measures incident thereto.
 3. Nothing in this Article, including action by Engineer or Resident Project Representative (if any), is for benefit of Contractor.
- B. Installing the Work constitutes Contractor's approval of underlying work, subgrades, and field conditions prevailing at the time of the Work.**

3.2 PREPARATION

A. Site Preparation:

1. Clear areas to be occupied by permanent construction of all trees, brush, roots, stumps, logs, rubbish, debris (including concrete and masonry, whether or not reinforced), and other materials. Strip vegetation fully unless shown or indicated in the Contract Documents, and remove sod, topsoil and other surficial soil materials, organic matter, and other deleterious materials from subgrades where fills will be placed and from areas where buildings or structures will be constructed. Remove from the Site and properly dispose of all waste materials.
2. Burning is not allowed at the Site.

B. Dust Control:

1. Relative to controlling dust during construction, comply with Section 01 57 05 - Temporary Controls.

C. Maintenance and Protection of Traffic:

1. Keep all streets and traffic ways open for passage of traffic and pedestrians during the Project, unless otherwise approved by owner of the street, traffic way, or right-of-way, as applicable. Construction traffic shall access the Site only via entrance(s) indicated in the Contract Documents.
2. When required to cross, obstruct, or temporarily close a street or traffic way, provide and maintain suitable bridges, detours, and other acceptable temporary expedients to accommodate traffic. Closings of streets or traffic ways shall be for shortest time practical, and passage shall be restored immediately after completion of filling and temporary paving or bridging.
3. Give required advance notice to fire department, police department, and other emergency services as applicable of proposed construction operations.

4. Give reasonable notice to owners or tenants of private property who may be affected by construction operations. Give such notice not less than 48 hours prior to construction that will affect the property.
5. All hydrants, valves, fire alarm boxes, mailboxes, express courier drop boxes, and other facilities that may require access during construction shall be kept accessible for use.
6. Provide temporary signage, signals, barricades, warning lights, lighting and other equipment, service, and personnel necessary and required to regulate and protect traffic and warn of hazards. Such Work shall comply with requirements of owner of right-of-way and authorities having jurisdiction at the Site. Remove temporary equipment and facilities when no longer required, and restore grounds to original or to specified conditions, as applicable.

3.3 EROSION AND SEDIMENT CONTROLS DURING CONSTRUCTION

A. Temporary Erosion and Sediment Controls – General:

1. Provide temporary erosion and sediment controls in accordance with Section 01 57 05 - Temporary Controls, and other requirements of the Contract Documents.
2. When applicable, also comply with requirements of the erosion and sediment control plan approved by authorities having jurisdiction and the Project's storm water pollution prevention plan and permit, if any.

3.4 DEWATERING

A. Dewatering – General:

1. Provide and maintain adequate temporary drainage and dewatering equipment to remove and dispose of all surface water and ground water entering excavations, or other parts of the Work and work areas. Keep each excavation dry during excavation and subgrade preparation, and continually thereafter until the Work to be provided therein is acceptable to Engineer and filling operations are completed and acceptable to Engineer.
2. Keep all work areas at the Site free of surface water at all times. Provide temporary drainage ditches and temporary dikes, and provide required temporary pumping and other work necessary for diverting or removing water resulting from precipitation and all other accumulations of surface water from excavations and fill areas. Perform diversion and removal of groundwater and surface water in manner that prevents accumulation of water behind permanent or temporary structures and at other locations at or adjacent to the Site, unless such accumulation is expressly intended, such as in a temporary storm water sedimentation basin. Comply with storm water control requirements and disposal of groundwater and storm water in Section 01 57 05 - Temporary Controls.
3. Control pollution in water discharged from the Site and adjacent areas in accordance with Section 01 57 05 - Temporary Controls.
4. Contractor is responsible for condition of piping, conduits, and channels used for drainage and such piping, conduits, and channels shall be clean and free of sediment.
5. Remove water from excavations as fast as water collects.

3.5 EXCAVATION

A. Excavation - General:

1. Perform all excavation required to complete the Work as shown, specified, and required. Excavating Work includes removing, handling, and proper disposal of earth, sand, clay, gravel, hardpan, soft, weathered or decomposed rock, concrete and masonry (reinforced or unreinforced), pavements, rubbish, debris, stumps, and other materials, regardless of moisture content, within the excavation limits.

B. Excavation Methods:

1. Traditional Excavation Methods: Excavation via traditional methods, such as backhoe, bulldozer, other earth moving construction equipment or machinery, or excavation using hand tools, is acceptable for all excavating Work

2. Use of Explosives:
 - a. Use of explosives is not allowed.
 3. Micro-trenching: Installation of buried utilities using micro-trenching equipment and techniques is acceptable when the associated Underground Facility is of a size and depth appropriate for such construction method. Submit to Engineer request for interpretation or clarification for requirements for resin backfilling of micro-trenches. Engineer will issue such requirements via Field Order.
 4. Trenchless: Where Contractor proposes trenchless construction techniques, such as directional drilling, micro-tunneling, or others, comply with the Contract Documents regarding such construction methods. When the Contract Documents do not include requirements for the proposed trenchless construction method, submit to Engineer request for interpretation or clarification to obtain appropriate requirements, which will be issued via appropriate Contract modification.
 5. Hydro-excavating (also known as Hydro-Vacuum Excavating):
 - a. Hydro-excavating is acceptable for all excavating Work.
 - b. Avoid creating nuisances, unsafe conditions, and inconvenience to Owner, owners and occupants of adjacent property, and the public when hydro-excavating is allowed and used.
 6. Air Vacuum Excavating:
 - a. Air vacuum excavating is acceptable for all excavating Work.
 - b. Avoid creating sandblasting outside of excavations, dust emissions, other nuisances, unsafe conditions, and inconvenience to Owner, owners and occupants of adjacent property, and the public when air vacuum excavating is allowed and used.
- C. Excavation Protection:
1. Provide excavation protection system(s) in accordance with Laws and Regulations to prevent injury to persons and property, including Underground Facilities.
 2. Provide safe access to excavations, including emergency exit, and safe access for construction equipment and machinery, where applicable, in accordance with laws and Regulations.
 3. Excavations in stable rock may be made with vertical sides. Under all other conditions, excavations shall be sloped and benched, or Contractor shall provide proper temporary support of excavations.
 4. Maintain excavations in dry condition in accordance with "Dewatering" Article in this Section's "Part 3 – Execution".
 5. Comply with "Temporary Support of Excavations" Article of this Section.
- D. Excavations for Buildings, Structures, and Footings:
1. Elevation of bottom of footings shown is approximate. Engineer may direct, via appropriate Contract modifications, such minor changes in dimensions and elevations as may be required to ensure a stable bearing surface.
 2. Extend excavations sufficiently on each side of structures, footings, and similar construction for installing forms, temporary supports of excavations, observation and inspection of the Work, and safe sloping of sides of excavations, as necessary.

3.6 UNAUTHORIZED EXCAVATION

A. Unauthorized Excavation - General:

1. Excavations outside lines and grades shown or indicated and that are not approved by Engineer (including excavations below required subgrade elevation, unless Engineer directs removal of unsuitable subgrade material), together with removing and disposing of the associated material, shall be at Contractor's cost and risk.
2. Fill unauthorized excavations with properly-compacted granular structural fill material at Contractor's cost.

3.7 TEMPORARY SUPPORT OF EXCAVATIONS

A. Temporary Support of Excavations - General:

1. Provide temporary sheeting, shoring, bracing, shields, cofferdams, and other excavation supports as necessary and required for the Work.
2. Contractor is solely responsible for adequacy of temporary supports for excavations.
3. Materials:
 - a. In this Section, the terms “sheet piling”, “sheeting”, and “piling” (and derivative terms, such as “piles”) have the same meaning.
 - b. Previously-used materials, where used for temporary support of excavations, shall be in good condition and be neither damaged nor excessively pitted.
 - c. Steel or wood sheeting designated in the Contract Documents as to remain in place shall be new or in good condition.
 - d. Steel work for temporary support of excavations shall be in accordance with ANSI/AISC 360 and welding shall be in accordance with AWS D1.1/D1.1M.
4. As excavation progresses, carry down temporary supports of excavation to required elevation at bottom of excavation.
5. Comply with Laws and Regulations regarding temporary supports of excavations.
6. Maintain temporary supports of excavations regardless of time period excavations will be open.
7. Unless otherwise shown, specified, or directed, remove materials used for temporary construction when the Work is completed. Perform such removal in manner not injurious to the structures and Underground Facilities, their appearance, and adjacent construction.

B. Removal of Sheeting and Bracing:

1. Remove sheeting and bracing from excavations, unless otherwise directed by Engineer in writing. Perform removal to avoid damaging the Work and adjacent construction. Removal shall be equal on both sides of excavation to ensure no unequal loads on structures and Underground Facilities.
2. Defer removal of sheeting and bracing, where removal may cause soil to come into contact with concrete, until the following conditions are satisfied:
 - a. Concrete has cured for not less than seven days, and reached full design strength as indicated in the Contract Documents.
 - b. Wall and floor framing, up to and including grade level floors, is in place.

C. Temporary Trench Shields:

1. Trench shields are fabricated, moveable items expressly intended to protect personnel working in excavations, and are relocated as the excavation Work progresses. In this Section, the terms, “trench shield” and “shield” have the same meaning and need not only refer to such items in trenches.
2. Using Trench Shields:
 - a. Excavation of earth material below bottom of trench shield shall not exceed limits established in Laws and Regulations.
 - b. When using a shield for installing piping:
 - c. Portions of trench shield extending below the mid-diameter of an installed, rigid pipe, such as prestressed concrete pipe and other types of rigid pipe, shall be raised above the pipe's mid-diameter elevation prior to moving the shield along the trench for further construction.
 - d. Bottom of shield shall not at any time extend below mid-diameter of installed pipe that is flexible or has flexing capability, such as steel, ductile iron, PVC, CPVC, polyethylene, and other pipe that has flexing capability.
 - e. When using trench shield for installing structures, bottom of shield shall not extend below the top of material underlying the structure.

3. Removal and Relocation of Trench Shields:
 - a. When removing trench shield or moving the shield ahead, exercise extreme care to prevent moving piping, the associated structures, and other Underground Facilities, and prevent disturbance of bedding material for piping, structures, and other Underground Facilities.
 - b. When piping, structures, or Underground Facilities are disturbed, remove and reinstall the disturbed items in accordance with the Contract Documents.

3.8 FILLING AND COMPACTING

A. Filling and Compacting - General:

1. Provide and compact all fill required for the finished grades as shown and as specified in this Section.

B. Place fill as promptly as progress of the Work allows, but not until completing the following:

1. Obtaining Engineer's concurrence, after observation by Engineer or Resident Project Representative (if any) of construction below finish grade, including removal of formwork, dampproofing, waterproofing, perimeter insulation, and similar Work.
2. Successful completion of required field quality control activities for Work that will be covered or concealed by filling, including field quality control testing of buried piping, conduits that will convey fluid or gas, and structures that will contain fluid or gas, and exfiltration testing (where performed or required) of manholes, chambers, vaults, and similar items. For manholes, chambers, and vaults, where infiltration testing or vacuum testing is performed or required, such testing may be performed following backfilling.
3. Removal of temporary supports of excavations and, where applicable, filling voids in concrete where such voids resulted from temporary support of excavations.
4. Permanent or temporary horizontal bracing is in place on horizontally-supported walls.
5. Remove fill that includes organic materials or other unacceptable material and replace with fill material complying with the Contract Documents.

C. Placement - General:

1. Place fill to the grades shown or indicated. Bring up evenly on all sides fill around structures and Underground Facilities.
2. Management of Moisture Content:
 - a. Place fill materials at moisture content and density as specified in this Article's requirements on compaction density. Furnish and use construction equipment and machinery capable of adding measured amounts of water to the fill materials to bring fill materials to a condition within required moisture content range.
 - b. Furnish and use construction equipment and machinery capable of discing, aerating, and mixing the fill materials to ensure reasonable uniformity of moisture content throughout the fill materials, and to reduce moisture content of borrow materials by gravity drainage, aeration, scarifying, and air drying, when necessary.
 - c. When subgrade or lift of fill materials requires moisture-conditioning before compaction, fill material shall be sufficiently mixed or worked on the subgrade to ensure uniform moisture content throughout the lift of material to be compacted.
 - d. Materials at moisture content in excess of specified limit shall be dried by appropriate means, such as aeration or stockpiling for gravity drainage and air drying.
3. Compaction:
 - a. Compaction Equipment:
 - 1) Perform compaction with construction equipment and machinery suitable for the type of fill material placed.
 - 2) Select and use equipment capable of providing the minimum density required in the Contract Documents.

- 3) Furnish and use construction equipment and machinery capable of compacting in restricted areas next to structures and around piping and Underground Facilities.
 - b. Compaction Test Area:
 - 1) Effectiveness of construction equipment and machinery selected by Contractor shall be tested at start of compacted fill Work by constructing a small section of fill within the area where fill will be placed.
 - 2) If tests on the test section of fill indicate that required compaction is not obtained, do one or more of the following: increase the quantity of coverages, decrease the lift thicknesses, or use different compactor equipment or machinery.
 4. Placement of Lifts and Compaction:
 - a. Place fill materials in horizontal, loose lifts, not exceeding specified thickness prior to compacting.
 - b. Place fill in manner ensuring uniform lift thickness after placing.
 - c. Mechanically compact each lift, by not less than two complete coverages of compactor. One coverage is defined as the conditions reached when all portions of the fill lift have been subjected to the direct contact of compactor's compacting surface.
 - d. Compaction of fill materials by inundation with water is unacceptable.
 5. Restrictions:
 - a. Do not place fill materials when standing water is present on surface of area where fill will be placed.
 - b. Do not compact fill when standing water is present on the fill to be compacted.
 - c. Do not place or compact fill in frozen condition or on top of frozen material.
 - d. Fill containing organic or deleterious materials or other unacceptable material previously described shall be removed and replaced prior to compaction.
 6. If required densities are not obtained because of improper control of placement or compaction procedures, or because of inadequate or improperly-functioning compaction equipment or machinery, perform all work necessary to provide required densities. Such work shall include, at no additional cost to Owner, complete removal of unacceptable fill areas and replacement and re-compaction until acceptable fill is provided.
 7. Repair, at Contractor's cost, observed or measured settlement. Make repairs and replacements as necessary and required within 30 days after being so advised by Engineer, unless more-timely action is necessary to avoid or reduce the potential for safety hazards or damage to property.
- D. Fill Required Under Subbase for Pavement and Other Traveled Ways:
1. Where bottom of pavement or surfacing of other traveled way will be at elevation equal to or less than preconstruction ground surface, after required excavation and preparation of subgrade, provide required subbase material to required depth. At underside of pavement or other surfacing of traveled way, subbase material shall extend horizontally six inches beyond edges of pavement or other surfacing. Exterior edges of subbase material shall be placed and compacted at uniform slope of one foot vertical-to-one foot horizontal away from top edge of subbase down to subgrade.
 2. Where bottom of pavement or surfacing of other traveled way will be at elevation greater than preconstruction ground surface, after required preparation of subgrade, provide required fill material and subbase material to required depth. At underside of pavement or other surfacing of traveled way, subbase material shall extend horizontally six inches beyond edges of pavement or other surfacing. Exterior edges of subbase material and fill material shall be placed and compacted at uniform slope of one foot vertical-to-one foot horizontal away from top edge of subbase down to subgrade.
- E. Temporary Pavement:
1. Provide not less than 1.5 inches of temporary bituminous pavement immediately after filling excavations in paved roads and other pavement subject to vehicular traffic, where such pavement will remain permanently.

2. Maintain surface of paved area over the fill in good and safe condition during progress of the Work, and promptly fill depressions over and adjacent to the fill area caused by settlement of fill.
3. Permanent replacement pavement shall be equal to that of the existing roadways, unless otherwise shown or specified.

F. Compaction Density Requirements:

1. Compaction Requirements for Sitework (including civil, grading, and Underground Facilities):

LOCATION	COMPACTION DENSITY	MOISTURE CONTENT
Under Pavement, Other Traveled Ways, Curbs, Gutters, Sidewalks, and Buried Utilities:		
Cohesive soils	95% per ASTM D698	-2 to +3% of optimum
Cohesionless soils	75% relative density per ASTM D4253 and ASTM D4254	
Sitework Not Covered by the Above Category or Classification:		
Cohesive soils	90% of ASTM D698	-2 to +3% of optimum
Cohesionless soils	65% relative density per ASTM D4253 and ASTM D4254	

2. Compaction Requirements for Materials Supporting Buildings and Structures:

LOCATION	COMPACTION DENSITY	MOISTURE CONTENT
Inside buildings and structures, under foundations, under equipment support pads, under slabs-on-grade, and scarified existing subgrade under fill material	98% per ASTM D698	-2 to +3% of optimum
Outside buildings and structures adjacent to walls, piers, columns, and other structure exterior member	92% per ASTM D698	-2 to +3% of optimum

3. Place fill in trenches, below piping, below foundations, or under paved areas in horizontal uncompacted layers not exceeding eight inches deep, and thoroughly compact each before next layer is placed. In other pipe trenches, horizontal uncompacted layers shall be six inches deep.
 4. Fill Moisture Content: Fill shall be wetted and thoroughly mixed to achieve moisture content to within the required range indicated in the applicable table, above, with the following exception(s):
 - a. On-site clayey soils: Optimum to plus three percent (moisture less than optimum is unacceptable).
 5. Replace natural, undisturbed soils or compacted soil subsequently disturbed or removed by construction operations with materials compacted as indicated.
 6. Field quality control testing for density; to verify that specified density was obtained, will be performed during each day of compaction Work. Responsibility for field quality control testing is indicated in this Section's "Field Quality Control" Article.
 7. When field quality control testing indicates unsatisfactory compaction, provide additional compaction necessary to obtain the required compaction. Perform additional compaction Work at no additional cost to Owner until required compaction is achieved. Such work includes complete removal of unacceptable (as determined by Engineer) fill areas and replacement and re-compaction until acceptable fill is provided in accordance with the Contract Documents.
- G. Replacement of Unacceptable Excavated Materials: In cases where over-excavation to replace unacceptable soil materials is required, backfill the excavation to required subgrade with soil structural fill material and thoroughly compact in accordance with applicable table in this provision. Slope the sides of excavation in accordance with the maximum allowable inclinations specified for each structure location.

3.9 GRADING

A. Grading - General:

1. Uniformly grade areas within limits of grading under this Section, including adjacent transition areas.
2. Smooth subgrade surfaces within specified tolerances, compact with uniform levels or slopes between points where elevations are shown, or between such points and existing grades.

B. Grading Outside Building Lines:

1. Grade areas adjacent to building lines to drain away from structures.
2. Grade to prevent ponding of water. Provide grades and slopes as shown on the Drawings and to allow effective drainage to proper drainage routes, such as catch basins, ditches, or swales intended to convey storm water, and other storm water drainage routes. Where intended grade for effective drainage is unclear, promptly submit to Engineer request for interpretation and obtain Engineer's interpretation or clarification before proceeding,
3. Provide final surfaces free of irregular surface changes, in accordance with the following:

- a. Grassed Areas and Areas Covered with Gravel, Stone, Wood Chips, or Other Special Cover: Finish areas to receive topsoil or special cover to within not more than one inch above or below the required subgrade elevations.
 - b. Sidewalks: Shape surface of areas under sidewalks to line, grade, and cross section, with finish surface not more than one inch above or below the required subgrade elevation.
 - c. Pavement (including hard-surfaced pavement and areas with stone surfacing): Shape surface of areas under pavement to line, grade, and cross section, with finish surface not more than 0.5-inch above or below required subgrade elevation.
- C. Grading Surface of Fill Under Concrete Slabs-on-Grade and Concrete Mats:
- 1. Grade smooth and even, free of voids, compacted as specified, and to required elevation.
 - 2. Provide final grades within tolerance of 0.5-inch when tested with a ten foot straight edge.

3.10 PAVEMENT SUBBASE COURSE

- A. Pavement Subbase - General:
- 1. Place subbase material, in layers of specified thickness, over subgrade to support pavement base course.
 - 2. Prepare subgrade underlying subbase course in accordance with this Section's general requirements for subgrades.
- B. Grade Control:
- 1. During construction, maintain lines and grades including crown and cross-slope of subbase course.
- C. Placing of Pavement Subbase Course:
- 1. Provide subbase material where required to the limits shown or indicated.
 - 2. Place subbase course material on prepared subgrade in layers of uniform thickness, in accordance with indicated cross-section and thickness. If the Contract Documents do not show or indicate required section of replacement paving (if any), replacement subbase course shall be of thickness equal to existing subbase course.
 - 3. Maintain optimum moisture content for compacting subbase material during placing operations.
 - 4. After completing compaction, other than that necessary for bringing material for the next course, do not haul or drive over compacted subbase.
 - 5. To prevent softening of subgrade, do not install pavement subbase in excess of 500 feet in length without compacting.
 - 6. If subgrade material becomes churned up into or mixed with subbase material, remove the mixed material and replace with clean, compacted subbase material.

3.11 DISPOSAL OF EXCAVATED SPOIL MATERIALS

- A. Spoil Disposal - General:
- 1. Contractor shall haul away excavated material that does not comply with requirements for fill, or is in excess of quantity required for fill.
 - 2. Disposal of materials shall comply with Laws and Regulations, at no additional cost to Owner.

3.12

3.13 FIELD QUALITY CONTROL

A. Site Tests and Inspections:

1. Contractor will employ a testing laboratory to perform field quality control testing.
2. Testing Laboratory Scope:
 - a. Perform field moisture content tests (in accordance with ASTM D2216 or ASTM D6938) and density tests (in accordance with ASTM D1556 or ASTM D6938) to verify that required compaction of fill materials was provided.
 - b. Tests of actual unconfined compressive strength or bearing tests (in accordance with ASTM D2850 or ASTM D2166) on each stratum.
 - c. Furnish to Engineer and Contractor written results of each test.
3. Authority and Duties of Testing Laboratory:
 - a. Testing laboratory representatives ("technician") shall inspect the materials in the field, perform testing, and report findings to Engineer and Contractor. When the Work is defective, technician will direct attention of Engineer and Contractor to such defective Work.
 - b. Technician will not supervise performance of any of Contractor's Work. Technician shall not perform other duties for Contractor.
 - c. Work will be tested and inspected by testing laboratory as the Work progresses, but failure to detect defective Work (including defective materials) shall not, in any way, prevent later rejection when defect is discovered, nor shall it obligate Engineer to certify the Work as substantially complete or final acceptance. Technicians are not authorized to revoke, alter, relax, enlarge, or release requirements of the Contract Documents, or to approve or accept any portion of the Work.
4. Responsibilities and Duties of Contractor:
 - a. Use of testing laboratory in no way relieves Contractor of responsibility to provide materials and Work in compliance with the Contract Documents.
 - b. [When Owner furnishes services of testing laboratory, special inspector, or both, for excavation and fill Work, Owner and Engineer do not represent that the sampling and testing performed by Owner-hired testing laboratory or inspections by Owner-hired special inspectors, is sufficient for Contractor's purposes, or to monitor all aspects of the excavation and fill Work. If additional quality control is needed to verify that the Work performed and materials delivered to the Site are in accordance with the Contract Documents, Contractor may retain its own, independent testing laboratory to perform additional sampling and testing for Contractor's purposes.]
 - c. To facilitate testing laboratory and special inspectors, Contractor shall advise testing laboratory and special inspectors not less than [two] days in advance of filling operations to allow for completion of field quality control testing and for assignment of personnel.
 - d. Contractor shall be responsible for providing required compaction for fill and other earthwork. Contractor shall control construction operations by performing confirming tests to verify that Contractor has complied with the Contract Documents relative to compaction.
 - e. Contractor shall demonstrate adequacy of compaction equipment and procedures before exceeding one or more of the following quantities of earthwork. Each test location shall include tests for each layer, type, or class of fill to finish grade.
 - 1) 200 linear feet of trench fill.
 - 2) 10 cubic yards of granular structural fill.
 - 3) 100 cubic yards of suitable soil material.
 - 4) 50 cubic yards of subbase material.

5. Testing laboratory will inspect and indicate acceptable subgrades and fill layers before construction work is performed thereon. Testing of subgrades and fill layers shall be as follows:
 - a. Footing Subgrade: For each stratum of soil on which footings will be placed, perform not less than 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.
 - b. For Granular Structural Fill: Once per lift for each 5,000 square feet placed and compacted.
 - c. For Soil Structural Fill:
 - 1) On 30-foot intervals on all sides of the building or structure for every compacted lift, but not less than one per lift on each side of the building or structure for buildings or structures less than 60 feet long on a side.
 - 2) For material not used as fill against buildings or structures, once per lift for each 1,000 square feet placed and compacted.

B. Defective Work:

1. If testing laboratory reports or inspections indicate subgrade, fill, or bedding compaction less than specified density, Contractor shall remove unacceptable materials as necessary and replace with specified materials and provide additional compaction at Contractor's cost until subgrades, bedding, and fill are acceptable.
2. Costs for retesting of subgrade, fill, or bedding materials that did not originally comply with the Contract Documents, including required density, shall be paid by Contractor.

3.14 RESTORATION

A. Restoration - General:

1. Perform finish grading, including providing topsoil, in accordance with the Contract Documents.
2. Provide replacement paving, sidewalks, curbs, gutters, and similar items in accordance with the Contract Documents including the Specifications of Division 32 - Exterior Improvements.
3. Restore landscaping including lawn and meadow areas. in accordance with the Contract Documents including the Specifications of Division 32 - Exterior Improvements.

END OF SECTION

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SECTION 31 23 33
TRENCHING, BACKFILLING, AND COMPACTING FOR UTILITIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Excavation, trenching, backfilling and compacting for all underground utilities.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Division 26 - Electrical.
 - 2. Section 31 10 00 – Site Clearing.
 - 3. Section 31 20 01 – Earth Moving.
 - 4. Division 33 – Utilities.
 - 5. Division 40 - Process Interconnections.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. ASTM International (ASTM):
 - a. D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 feet-LBF/FT³ (600 kN-M/M³)).
 - b. D4253, Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.
 - c. D4254, Standard Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.
- B. Qualifications: Hire an independent soils laboratory to conduct in-place moisture-density tests for backfilling to assure that all work complies with this Specification Section.

1.3 DEFINITIONS

- A. Excavation: All excavation will be defined as unclassified.

1.4 SUBMITTALS

- A. Shop Drawings:
 - 1. Product technical data including:
 - a. Acknowledgement that products submitted meet requirements of standards referenced.
 - b. Manufacturer's installation instructions.
 - 2. Submit respective pipe or conduit manufacturer's data regarding bedding methods of installation and general recommendations.
 - 3. Submit sieve analysis reports on all granular materials.
- B. Informational Submittals:
 - 1. Trench shield (trench box) certification if employed:
 - a. Specific to Project conditions.
 - b. Re-certified if members become distressed.
 - c. Certification by registered professional structural engineer, registered in the state where the Project is located.
 - d. Engineer is not responsible to, and will not, review and approve.

1.5 SITE CONDITIONS

- A. Avoid overloading or surcharge a sufficient distance back from edge of excavation to prevent slides or caving.
 - 1. Maintain and trim excavated materials in such manner to be as little inconvenience as possible to public and adjoining property owners.
- B. Provide full access to public and private premises and fire hydrants, at street crossings, sidewalks and other points as designated by Owner to prevent serious interruption of travel.
- C. Protect and maintain bench marks, monuments or other established points and reference points and if disturbed or destroyed, replace items to full satisfaction of Owner and controlling agency.
- D. Verify location of existing underground utilities

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Backfill Material:
 - 1. As approved by Engineer.
 - a. Free of rock cobbles, roots, sod or other organic matter, and frozen material.
 - b. Moisture content at time of placement: $\pm 3\%$ of optimum moisture content as specified in accordance with ASTM D698.
- B. Bedding Materials:
 - 1. As specified on the Contract Drawings.
 - 2. Granular bedding materials:
 - a. ASTM D2321 Class 1B.
 - 1) Well-graded crushed stone.
 - 3. Flowable fill:
 - a. Description: Flowable fill shall be a mixture of cement, fly ash, fine sand, water, and air having a consistency which will flow under a very low head.
 - b. Material characteristics:
 - 1) The approximate quantities of each component per cubic yard of mixed material shall be as follows:
 - a) Cement (Type I or II): 50 pounds.
 - b) Fly ash: 200 pounds.
 - c) Fine sand: 2,700 pounds.
 - d) Water: 420 pounds.
 - e) Air content: 10%.
 - 2) Actual quantities shall be adjusted to provide a yield of 1 cubic yard with the materials used.
 - 3) Approximate compressive strength should be 85 to 175 psi.
 - 4) Fine sand shall be an evenly graded material having not less than 95% passing the No. 4 sieve and not more than 5% passing the No. 200 sieve.
 - 5) Mixing and handling of the material shall be in accordance with Specification Section 03 31 31.

PART 3 - EXECUTION

3.1 EXCAVATION

- A. Unclassified Excavation: Remove rock excavation, clay, silt, gravel, hard pan, loose shale, and loose stone as directed by Geotechnical Engineer.
- B. Excavation for Appurtenances:
 - 1. 12 inches (minimum) clear distance between outer surface and embankment.
- C. Groundwater Dewatering:
 - 1. Where groundwater is, or is expected to be, encountered during excavation, install a dewatering system to prevent softening and disturbance of subgrade to allow subgrade stabilization, pipe, bedding and backfill material to be placed in the dry, and to maintain a stable trench wall or side slope.
 - 2. Groundwater shall be drawn down and maintained at least 2 feet below the bottom of any trench or manhole excavation prior to excavation.
 - 3. Review soils investigation before beginning excavation and determine where groundwater is likely to be encountered during excavation.
 - a. Employ dewatering specialist for selecting and operating dewatering system.
 - 4. Keep dewatering system in operation until dead load of pipe, structure and backfill exceeds possible buoyant uplift force on pipe or structure.
 - 5. Dispose of groundwater to an area which will not interfere with construction operations or damage existing construction.
 - 6. Install groundwater monitoring wells as necessary.
 - 7. Shut off dewatering system at such a rate to prevent a quick upsurge of water that might weaken the subgrade.
 - 8. Cost of groundwater dewatering shall be included in the lineal foot unit price of the pipe installation.
- D. Trench Excavation:
 - 1. Excavate trenches by open cut method to depth shown on Drawings and necessary to accommodate work.
 - a. Support existing utility lines where proposed work crosses at a lower elevation.
 - 1) Stabilize excavation to prevent undermining of existing utility.
 - 2. Open trench outside buildings, units, and structures:
 - a. No more than the distance between two manholes, structures, units, or 300 LF, whichever is less.
 - b. Field adjust limitations as weather conditions dictate.
 - 3. Any trench or portion of trench, which is opened and remains idle for [seven] calendar days, or longer, as determined by the Owner, may be directed to be immediately refilled, without completion of work, at no additional cost to Owner.
 - a. Said trench may not be reopened until Owner is satisfied that work associated with trench will be prosecuted with dispatch.
 - 4. Observe following trenching criteria:
 - a. Trench size:
 - 1) Excavate width to accommodate free working space.
 - 2) Maximum trench width at top of pipe or conduit may not exceed outside diameter of utility service by more than the following dimensions:

OVERALL DIAMETER OF UTILITY SERVICE	EXCESS DIMENSION
33 inches and less	18 inches
more than 33 inches	24 inches

- 3) Cut trench walls vertically from bottom of trench to 1 foot above top of pipe, conduit, or utility service.
- 4) Keep trenches free of surface water runoff.
 - a) Include cost in Bid.
 - b) No separate payment for surface water runoff pumping will be made.

E. Trenching for Electrical Installations:

1. Observe the preceding Trench Excavation paragraph in PART 3 of this Specification Section.
2. Modify for electrical installations as follows:
 - a. Open no more than 600 linear foot of trench in exterior locations for trenches more than 12 inches but not more than 30 inches wide.
 - b. Any length of trench may be opened in exterior locations for trenches which are 12 inches wide or less.
 - c. Do not over excavate trench.
 - d. Cut trenches for electrical runs with minimum 30 inches cover, unless otherwise specified or shown on Drawings.
 - e. See Division 26 for additional requirements.

F. Flowable Fill:

1. Flowable fill shall be:
 - a. Discharged from a mixer by any means acceptable to the Engineer into the area to be filled.
 - b. Placed in 4 feet maximum lifts to the elevations indicated.
 - 1) Allow 12 hour set-up time before placing next lift or as approved by the Engineer.
 - 2) Place flowable fill lifts in such a manner as to prevent flotation of the pipe.
2. Flowable fill shall not be placed on frozen ground.
3. Subgrade on which flowable fill is placed shall be free of disturbed or softened material and water.
4. Conform to appropriate requirements of Specification Section 31 23 00.
5. Flowable fill batching, mixing, and placing may be started if weather conditions are favorable, and the air temperature is 34 degrees F and rising.
6. At the time of placement, flowable fill must have a temperature of at least 40 degrees F.
7. Mixing and placing shall stop when the air temperature is 38 degrees F or less and falling.
8. Each filling stage shall be as continuous an operation as is practicable.
9. Prevent traffic contact with flowable fill for at least 24 hours after placement or until flowable fill is hard enough to prevent rutting by construction equipment.
10. Flowable fill shall not be placed until water has been controlled or groundwater level has been lowered in conformance with the requirements of the preceding Groundwater Dewatering paragraph in PART 3 of this Specification Section.

3.2 PREPARATION OF FOUNDATION FOR PIPE LAYING

A. Over-Excavation:

1. Backfill and compact to 90% of maximum dry density per ASTM D698.
2. Backfill with granular bedding material as option.

B. Rock Excavation:

1. Excavate minimum of 6 inches below bottom exterior surface of the pipe or conduit.
2. Backfill to grade with suitable earth or granular material.
3. Form bell holes in trench bottom.

C. Subgrade Stabilization:

1. Stabilize the subgrade when directed by the Owner.
2. Observe the following requirements when unstable trench bottom materials are encountered.
 - a. Notify Owner when unstable materials are encountered.
 - 1) Define by drawing station locations and limits.
 - b. Remove unstable trench bottom caused by Contractor failure to dewater, rainfall, or Contractor operations.
 - 1) Replace with subgrade stabilization with no additional compensation.

3.3 BACKFILLING METHODS

A. Do not backfill until tests to be performed on system show system is in full compliance with specified requirements.

B. Carefully Compacted Backfill:

1. Furnish where indicated on Drawings, specified for trench embedment conditions and for compacted backfill conditions up to 12 inches above top of pipe or conduit.
2. Comply with the following:
 - a. Place backfill in lifts not exceeding 8 inches (loose thickness).
 - b. Hand place, shovel slice, and pneumatically tamp all carefully compacted backfill.
 - c. Observe specific manufacturer's recommendations regarding backfilling and compaction.
 - d. Compact each lift to specified requirements.

C. Common Trench Backfill:

1. Perform in accordance with the following:
 - a. Place backfill in lift thicknesses capable of being compacted to densities specified.
 - b. Observe specific manufacturer's recommendations regarding backfilling and compaction.
 - c. Avoid displacing joints and appurtenances or causing any horizontal or vertical misalignment, separation, or distortion.

D. Water flushing for consolidation is not permitted.

E. Backfilling for Electrical Installations:

1. Observe the preceding Carefully Compacted Backfill paragraph or Common Trench Backfill paragraph in PART 3 of this Specification Section or when approved by the Engineer.
2. Modify for electrical installation as follows:
 - a. Observe notes and details on electrical drawings for fill in immediate vicinity of direct burial cables.

3.4 COMPACTION

A. General:

1. Place and assure bedding, backfill, and fill materials achieve an equal or higher degree of compaction than undisturbed materials adjacent to the work.
2. In no case shall degree of compaction below minimum compactions specified be accepted.

3.5 FIELD QUALITY CONTROL

A. Testing:

1. Perform in-place moisture-density tests as directed by the Owner.
2. Perform tests through recognized testing laboratory approved by Owner.
3. Costs of "Passing" tests paid by Owner.
4. Perform additional tests as directed until compaction meets or exceeds requirements.
5. Cost associated with "Failing" tests shall be paid by Contractor.
6. Reference to Engineer in this Specification Section will imply Geotechnical Engineer when employed by Owner and directed by Engineer to undertake necessary inspections as approvals as necessary.
7. Assure Owner has immediate access for testing of all soils related work.
8. Ensure excavations are safe for testing personnel.

END OF SECTION

SECTION 32 12 16
ASPHALTIC CONCRETE VEHICULAR PAVING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Asphaltic concrete vehicular paving.
- B. Related Specification Sections include but are not necessarily limited to:

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. Kentucky Transportation Cabinet (KYTC) Standard Specifications for Road and Bridge Construction.

1.3 SUBMITTALS

- A. Shop Drawings:
 - 1. Product technical data including:
 - a. Acknowledgement that products submitted meet requirements of standards referenced.
 - b. Manufacturer's installation instructions.
 - c. Asphalt design mix.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Asphaltic Concrete: Per KYTC Standard Specifications for Road and Bridge Construction, 2019 Ed.

2.2 MIXES

- A. Comply with KYTC Standard Specifications

PART 3 - EXECUTION

3.1 APPLICATION

- A. Construct to line, grade and section as shown on Drawings and in accordance with referenced State Specifications.
- B. Seam sealer at cuts or tie-ins to existing pavements shall conform to KYTC Standard Specifications.
- C. Tolerance of Finished Grade: +0.10 feet from required elevations.

END OF SECTION

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SECTION 32 31 00
FENCES AND GATES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section Includes:
 - 1. Decorative aluminum fences.
 - 2. Swing gates.
 - 3. Aluminized-steel chain link fabric.
 - 4. Galvanized-steel framework.
 - 5. Gates including hardware.
- B. Related Sections include the following:

1.2 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 ALUMINUM

- A. Aluminum, General: Provide alloys and tempers with not less than the strength and durability properties of alloy and temper designated in paragraphs below for each aluminum form required.
- B. Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T5.
- C. Tubing: ASTM B 429, Alloy 6063-T6.
- D. Plate and Sheet: ASTM B 209 (ASTM B 209M), Alloy 6061-T6.
- E. Die and Hand Forgings: ASTM B 247 (ASTM B 247M), Alloy 6061-T6.
- F. Castings: ASTM B 26/B 26M, Alloy A356.0-T6.

2.2 FABRIC

- A. Selvage: Knuckled on both selvages.
- B. Steel Chain-Link Fence Fabric: Fabricated in one-piece widths for fencing 12 feet and less in height to comply with Chain Link Fence Manufacturers Institute (CLFMI) "Product Manual" and with requirements indicated below:
 - 1. Mesh and Wire Size: 2-inch mesh, 0.148-inch diameter (9 gauge).
 - 2. Coating: ASTM A 817, Type 1, aluminized.

2.3 FRAMING

- A. Round member sizes are given in actual outside diameter (OD) to the nearest thousandth of inches. Round fence posts and rails are often referred to in ASTM standard specifications by nominal pipe sizes (NPS) or the equivalent trade sizes in inches. The following indicates these equivalents all measured in inches:

Actual OD	NPS Size	Trade Size
1.315	1	1-3/8
1.660	1-1/4	1-5/8
1.900	1-1/2	2

2.375	2	2-1/2
2.875	2-1/2	3
3.500	3	3-1/2
4.000	3-1/2	4
6.625	6	6-5/8
8.625	8	8-5/8

- B. Posts and other appurtenances used in the construction of fence shall be high strength SS40 (minimum yield 50,000 psi) hot dipped galvanized pipe conforming to ASTM F1043, Group IC. Type A coating inside and outside according to ASTM F 1234, as determined by ASTM A 90.
- C. Top Rail: Manufacturer's longest lengths (17 to 21 feet) with swaged-end or expansion-type coupling, approximately 6 inches long for joining. Provide rail ends by heavy pressed steel brace bands and malleable rail end connections for attaching top rail securely to each gate corner, pull, and end post.
 - 1. Round Steel: 1.660-inch OD Type I steel pipe.
- D. Steel posts for fabric heights up to 6 feet:
 - 1. Round Line or Intermediate Posts: 2.375-inch OD Type I steel pipe.
 - 2. Round End, Corner, and Pull Posts: 2.875-inch OD Type I steel pipe.
- E. Steel posts for fabric heights over 6 feet:
 - 1. Round Line or Intermediate Posts: 2.875-inch OD Type I steel pipe.
 - 2. Round End, Corner, and Pull Posts: 3.50-inch OD Type I steel pipe.
- F. Swing Gate Posts: Furnish posts to support single gate leaf, or one leaf of a double-gate installation, according to ASTM F 900, sized as follows for steel and aluminum pipe posts:
 - 1. Steel posts for fabric height of 6 feet or less and gate leaf width:
 - a. Up to 10 Feet: 2.875-inch OD pipe weighing at least 5.79 lb per ft.
 - 2. Steel posts for fabric height over 6 feet and gate leaf width:
 - a. Over 6 to 12 Feet: 4.000-inch OD pipe weighing at least 9.11 lb per ft.
 - b. Over 12 to 18 Feet: 6.625-inch OD pipe weighing at least 10.02 lb per ft.
 - c. Over 18 to 24 Feet: 8.625 OD pipe weighing at least 28.55 lb per ft.

2.4 FITTINGS AND ACCESSORIES

- A. Material: Comply with ASTM F 626 steel to suit manufacturer's standards.
 - 1. Steel and Iron: Unless specified otherwise, hot-dip galvanize pressed steel or cast-iron fence fittings and accessories with at least 1.2 oz. zinc per sq. ft. as determined by ASTM A 90.
- B. Post and Line Caps: Provide weathertight closure cap for each post. Provide line post cap with loop to receive tension wire or top rail.
- C. Post Brace Assembly: Manufacturer's standard adjustable brace. Use material specified below for brace, and truss to line posts with 3/8-inch-diameter rod and adjustable tightener. Provide manufacturer's standard galvanized-steel, cast-iron or cast-aluminum cap for each end.
 - 1. Round Steel: 1.66-inch OD Type I steel pipe.
- D. Bottom and Center Rail: Same material as 2.0-inch OD top rail. Provide manufacturer's standard galvanized-steel, cast-iron or cast-aluminum cap for each end.
- E. Tension or Stretcher Bars: Hot-dip galvanized steel with a minimum length 2 inches less than the full height of fabric, a minimum cross section of 3/16 inch by 3/4 inch, and a minimum of 1.2 oz. of zinc coating per sq. ft. Provide one bar for each gate and end post, and two for each corner and pull post, except where fabric is integrally woven into the post.

- F. Tension and Brace Bands: 3/4-inch-wide minimum hot-dip galvanized steel with a minimum of 1.2 oz. of zinc coating per sq. ft.
 - 1. Tension Bands: 0.074 inch thick (14 gage) minimum.
 - 2. Brace Bands: 0.105 inch thick (12 gage) minimum.
- G. Tension Wire: 0.192-inch-diameter (6-gage) mill-finished aluminum wires, ASTM B 211, alloy 6061-T94 with 50,000-psi minimum tensile strength. Attach to fence fabric with hog rings every 24 inches on center.
- H. Tie Wires: (9-gage) galvanized security steel tie wire with a minimum of 0.80 oz. per sq. ft. of zinc coating according to ASTM A 641. Each security tie shall have three complete twist around the fence fabric with spaced 12 -inches on-center. Minimum of 9 ties for an 8 foot fence.
- I. Bend end of all wires down to prevent end from sticking out.

2.5 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
 - 1. For aluminum, provide type and alloy as recommended by producer of metal to be welded and as required for strength and compatibility in fabricated items.
- B. Concrete: Normal-weight, air-entrained, ready-mix concrete complying with requirements in Division 03 Section "Concrete" with a minimum 28-day compressive strength of 3000 psi (20 MPa), 3-inch (75-mm) slump, and 1-inch (25-mm) maximum aggregate size.
- C. Nonshrink Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107 and specifically recommended by manufacturer for exterior applications.

2.6 DECORATIVE ALUMINUM FENCES

- A. Decorative Aluminum Fences: Fences made from aluminum extrusions.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Echelon II Genesis Aluminum Gate by Ameristar Fencing or a comparable product by one of the following:
 - a. Alumi-Guard, Inc.
 - b. Ameristar Fence Products.
 - c. Carfaro, Inc.
 - d. Delair Group, L.L.C.
 - e. Elegant Aluminum Products, Inc.
 - f. Elite Fence Products, Inc.
 - g. Iron Eagle Industries, Inc.
 - h. Japra Group International.
 - i. Jerith Manufacturing Company, Inc.
 - j. Master Halco.
 - k. Merchants Metals; a division of MMI Products, Inc.
 - l. Royal Aluminum and Steel, Inc.
 - m. Specrail; a division of Porcelen LLC.
 - n. Or approved equal.
- B. Posts: Square extruded tubes.
 - 1. Line Posts: 3 by 3 inches (76.2 by 76.2 mm) with 0.0808-inch (2.05-mm) wall thickness.
 - 2. End and Corner Posts: 3 by 3 inches (76.2 by 76.2 mm) with 0.0808-inch (2.05-mm) wall thickness.
 - 3. Swing Gate Posts: 6 by 6 inches (152 by 152 mm) with 0.1875-inch (4.76-mm) wall thickness.

- C. Post Caps: Aluminum castings that cover entire top of posts.
- D. Rails: Extruded-aluminum channels, 1-3/4 by 1-3/4 inches (45 by 45 mm), with 0.070-inch (1.78- mm-) thick sidewalls and 0.070-inch (1.78-mm) thick top.
- E. Pickets: Extruded-aluminum tubes, 1 inch (25 mm) square, with 0.062-inch (1.57-mm) wall thickness.
 - 1. Extend pickets beyond top rail as indicated and press flat and trim to produce spear point shape.
 - 2. Picket Spacing: 3-3/4 inches (95 mm) clear, maximum.
 - 3. Adornments to include "Quad Flare" picket caps and "Rings".
- F. Fasteners: Manufacturer's standard concealed fastening system.
- G. Fabrication: Assemble fences into sections by concealed fastening pickets to rails.
 - 1. Fabricate sections with clips welded to rails for fastening to posts in field.
 - 2. Drill clips for fasteners before finishing.
- H. Finish exposed welds to comply with NOMMA Guideline 1, Finish #2 - completely sanded joint.
- I. Finish: Baked enamel or powder coating.

2.7 ALUMINUM SWING GATES

- A. Gate Configuration: Single leaf.
- B. Gate Frame Height: As indicated.
- C. Gate Opening Width: 14'-0" Vehicular, 3'-0" Pedestrian.
- D. Aluminum Frames and Bracing: Fabricate members from square extruded-aluminum tubes 1-3/4 by 1-3/4 inches (45 by 45 mm), with 0.125-inch (3.18-mm) wall thickness.
- E. Frame Corner Construction: Assembled with corner fittings and 5/16-inch (7.9-mm) diameter, adjustable truss rods for panels 5 feet (1.52 m) wide or wider.
- F. Additional Rails: Provide as indicated, complying with requirements for fence rails.
- G. Infill: Comply with requirements for adjacent fence.
- H. Picket Size, Configuration, and Spacing: Comply with requirements for adjacent fence.
 - 1. Treillage: Provide aluminum castings of pattern indicated between each pair of pickets. Finish as specified for adjacent fence.
- I. Hardware: As specified per manufacturer's recommendations.
- J. Hinges: specified per manufacturer's recommendations.
- K. Adornments: "Quad Flare" picket caps and "Rings".

2.8 ALUMINUM FINISHES

- A. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 2 mils (0.05 mm). Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
 - 1. Color and Gloss: Match existing adjacent.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, construction layout, and other conditions affecting performance of the Work.

- B. Gate and Fence installer/contractor shall field verify locations of underground utility lines with the surveyor and general contractor prior to digging/excavating for the fence and gate post footings. Installation locations of the fence/gate posts MUST NOT damage or break the buried utility lines. Repair of the damaged utility lines will be the responsibility of the fencing contractor.
- C. Do not begin installation before final grading is completed unless otherwise permitted by Architect.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet (152.5 m) or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

1.

3.3 INSTALLATION - CHAIN LINK

- A. Install fence to comply with ASTM F 567. Do not begin installation and erection before final grading is completed, unless otherwise permitted.
 - 1. Apply fabric to outside of framework. Install fencing on boundary lines inside of property line established by survey as required by Division 1.
 - 2. Installer advertising signage is not allowed on fencing.
 - 3. Use mechanical device to set line post per ASTM F567 is not permitted.
- B. Excavation: Drill or hand-excavate (using post-hole digger) holes for posts to diameters and spacings indicated, in firm, undisturbed or compacted soil.
 - 1. If not indicated on Drawings, excavate holes for each post to minimum diameter recommended by fence manufacturer, but not less than four times the largest cross section of post.
 - 2. Unless otherwise indicated, excavate hole depths approximately 3 inches lower than post bottom, with bottom of posts set as indicated on drawings.
- C. Setting Posts: Center and align posts in holes 3 inches above bottom of excavation. Space a maximum of 10 feet o.c., unless otherwise indicated.
 - 1. Protect portion of posts above ground from concrete splatter. Place concrete around posts and vibrate or tamp for consolidation. Check each post for vertical and top alignment, and hold in position during placement and finishing operations.
 - 2. Unless otherwise indicated, install concrete footings flush with grade and trowel to a crown to shed water.
 - 3. Concrete shall be a minimum of 4000 PSI with a maximum 3" +/- 1" slump.
- D. Top Rails: Run rail continuously through line post caps, bending to radius for curved runs and at other posts terminating into rail end attached to posts or post caps fabricated to receive rail. Provide expansion couplings as recommended by fencing manufacturer.
- E. Center Rails: Install center rails in one piece between posts and flush with post on fabric side, using rail ends and special offset fittings where necessary.
- F. Brace Assemblies: Install braces at end and gate posts and at both sides of corner and pull posts. Locate horizontal braces at mid-height of fabric on fences with top rail and at two thirds fabric height on fences without top rail. Install so posts are plumb when diagonal rod is under proper tension.
- G. Bottom Tension Wire: Install tension wire within 6 inches of bottom of fabric before stretching fabric and tie to each post with not less than same gage and type of wire. Pull wire taut, without sags. Fasten fabric to tension wire with 0.120-inch-diameter (11-gage) hog rings of same material and finish as fabric wire, spaced a maximum of 24 inches o.c.

- H. Fabric: Leave approximately 2 inches between finish grade and bottom selvage unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Install fabric on security side of fence, and anchor to framework so that fabric remains under tension after pulling force is released.
- I. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull, and gate posts with tension bands spaced not over 15 inches o.c.
- J. Security Tie Wires: Use wire of proper length to secure fabric firmly to posts and rails. Bend ends of wire to minimize hazard to persons or clothing. Wire ties shall be twisted a minimum of two complete twist.
 - 1. Maximum Spacing: Tie fabric to line posts 12 inches o.c. and to rails and braces 24 inches o.c.
- K. Fasteners: Install nuts for tension bands and carriage bolts on the side of the fence opposite the fabric side. Peen ends of bolts or score threads to prevent removal of nuts for added security. Tighten all bolts and grind off all galvanized spurs flush and smooth.

3.4 DECORATIVE FENCE INSTALLATION

- A. Install fences according to manufacturer's written instructions.
- B. Install fences by setting posts as indicated and fastening rails and infill panels to posts.
- C. Post Excavation: Drill or hand-excavate holes for posts in firm, undisturbed soil. Excavate holes to a diameter of not less than 4 times post size and a depth of not less than 24 inches (600 mm) plus 3 inches (75 mm) for each foot (300 mm) or fraction of a foot (300 mm) that fence height exceeds 4 feet (1200 mm).
- D. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil.
 - 1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
 - 2. Concrete Fill: Place concrete around posts and sleeves and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.
 - a. Exposed Concrete: Extend 2 inches (50 mm) above grade. Finish and slope top surface to drain water away from post. For installations located in paved areas.
 - b. Concealed Concrete: Top 2 inches (50 mm) below grade to allow covering with surface material. Slope top surface of concrete to drain water away from post. For installations located in landscaped areas.
 - 3. Posts Set in Concrete: Extend post to within 6 inches (150 mm) of specified excavation depth, but not closer than 3 inches (75 mm) to bottom of concrete.
 - 4. Posts Set into Concrete in Sleeves: Use galvanized-steel pipe sleeves with inside diameter at least 3/4 inch (20 mm) larger than outside diagonal dimension of post, preset and anchored into concrete for installing posts. Where gate/fence posts are indicated to be removable. Provide lockable cotter pin with pad lock provision for securing removable pole section.
 - a. Extend posts at least 5 inches (125 mm) into sleeve.
 - b. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink grout, mixed and placed to comply with grout manufacturer's written instructions; shape and smooth to shed water. Finish and slope top surface of grout to drain water away from post.
 - 5. Space posts uniformly at 8 feet (2.44 m)o.c.

END OF SECTION

SECTION 32 92 00
SEEDING, SODDING AND LANDSCAPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Seeding, sodding and landscape planting:
 - a. Soil preparation.
- B. Related Specification Sections include but are not necessarily limited to:

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
1. American Nursery and Landscape Association/American National Standards Institute (ANLA/ANSI):
 - a. Z60.1, American Standard for Nursery Stock.
 2. AOAC International (AOAC).
 3. ASTM International (ASTM):
 - a. D2028, Standard Specification for Cutback Asphalt (Rapid-Curing Type).
 - b. D5276, Standard Test Method for Drop Test of Loaded Containers by Free Fall.

1.3 SUBMITTALS

- A. Shop Drawings:
1. Product technical data including:
 - a. Acknowledgement that products submitted meet requirements of standards referenced.
 - b. Manufacturer's installation instructions.
 - c. Copies of vendor's statement for seed mixture required, stating botanical and common name, place of origin, strain, percentage of purity, percentage of germination, and amount of Pure Live Seed (PLS) per bag.

PART 2 - PRODUCTS

2.1 MANUFACTURERS AND SUPPLIERS

- A. Subject to compliance with the Contract Documents, the manufacturers and suppliers listed in the applicable Articles below are acceptable.

2.2 MATERIALS

- A. Lawn-Type Seed Mixture:

BOTANICAL AND COMMON NAME	PERCENT BY WEIGHT (PLS)	MINIMUM PERCENT GERMINATION	MINIMUM PERCENT PURITY
Kentucky Bluegrass (Poa pratensis)	60	85	95
Fescue, Tall, KY 31 (Festuca arundinacea 'KY 31 feet)	30	85	98
Ryegrass, Perennial (Lolium perenne)	10	90	95

B. Sod:

1. Viable, dense, strongly rooted, not less than two years old.
2. 60% Kentucky Bluegrass, 30% Fescue, and 10% other grasses.
3. Free of weeds and undesirable native grasses.
4. Strips 12 to 18 inches wide.
5. Mow prior to stripping from field.
6. Cut so 3/4 inches of soil is firmly attached to roots.
7. Not frozen or dormant.

A. Native Grass Seeding: Certified seed of locally adapted strains.

1. Seed mixture:

GRASSES	LBS PLS PER ACRE	APPROXIMATE NUMBER OF SEEDS PER LB (PLS)
Big bluestem(Andropogon gerardi)	2.4	165,000
Blue grama(Bouteloua gracilis)	0.1	825,000
Green needlegrass(Stipa viridula)	0.6	181,000
Indian grass(Sorghastrum nutans)	1.2	175,000
Little bluestem 'Blaze' (Andropogon scoparius 'Blaze')	1.4	260,000
Sideoats grama(Bouteloua curtipendula)	0.8	191,000
Switchgrass(Panicum virgatum)	1.0	389,000
Western wheatgrass(Agropyron smithii)	1.5	110,000
Sand reedgrass(Calamovilfia gigantea)	1.0	273,000
Sand bluestem(Andropogon hallii)	2.5	113000
Sand Lovegrass(Eragrostis trichodes)	0.3	1300000
Reed canarygrass(Phalaris arundinacea)	2.0	533000

PART 3 - EXECUTION

3.1 SOIL PREPARATION

A. General:

1. Limit preparation to areas which will be planted soon after.
2. Provide facilities to protect and safeguard all persons on or about premises.
3. Protect existing trees designated to remain.
4. Verify location and existence of all underground utilities.
 - a. Take necessary precaution to protect existing utilities from damage due to construction activity.
 - b. Repair all damages to utility items at sole expense.
5. Provide facilities such as protective fences and/or watchmen to protect work from vandalism.
 - a. Contractor to be responsible for vandalism until acceptance of work in whole or in part.

B. Preparation for Lawn-Type Seeding, Sprigging, Plugging or Sodding:

1. Loosen surface to minimum depth of 4 inches.

2. Remove stones over 1 inch in any dimension and sticks, roots, rubbish, and other extraneous matter.
3. Prior to applying fertilizer, loosen areas to be seeded with a double disc or other suitable device if the soil has become hard or compacted.
4. Correct any surface irregularities in order to prevent pocket or low areas which will allow water to stand.
5. Distribute fertilizer uniformly over areas to be seeded:
 - a. For lawn-type seeding: 30 pounds per 1000 square feet.
 - b. For pasture seeding: 200 pounds per acre.
6. Incorporate fertilizer into soil to a depth of at least 2 inches by disking, harrowing, or other approved methods.
7. Remove stones or other substances from surface which will interfere with turf development or subsequent mowing operations.
8. Grade lawn areas to a smooth, even surface with a loose, uniformly fine texture.
 - a. Roll and rake, remove ridges and fill depressions, as required to meet finish grades.
 - b. Limit fine grading to areas which can be planted soon after preparation.
9. Restore lawn areas to specified condition if eroded or otherwise disturbed after fine grading and before planting.

3.2 INSTALLATION

A. Lawn-Type and Pasture Seeding:

1. Do not use seed which is wet, moldy, or otherwise damaged.
2. Perform seeding work from April 20 to May 15 for spring planting, and August 1 to September 15 for fall planting, unless otherwise approved by Engineer.
3. Employ satisfactory methods of sowing using mechanical power-driven drills or seeders, or mechanical hand seeders, or other approved equipment.
4. Distribute seed evenly over entire area at rate of application not less than 4 pounds (PLS) of seed per 1000 square feet, 50% sown in one direction, remainder at right angles to first sowing.
5. Stop work when work extends beyond most favorable planting season for species designated, or when satisfactory results cannot be obtained because of drought, high winds excessive moisture, or other factors.
 - a. Resume work only when favorable conditions develop.
6. Lightly rake seed into soil followed by light rolling or cultipacking.
7. Immediately protect seeded areas against erosion by mulching.
 - a. Spread mulch in continuous blanket using 1-1/2 tons per acre to a depth of 4 or 5 straws.
8. Protect seeded slopes against erosion with erosion netting or other methods approved by Engineer.
 - a. Protect seeded areas against traffic or other use by erecting barricades and placing warning signs.
9. Immediately following spreading mulch, anchor mulch using a rolling coulter or a wheatland land packer having wheels with V-shaped edges to force mulch into soil surface, or apply evenly distributed emulsified asphalt at rate of 10-13 GAL/1000 square feet.
 - a. SS-1 emulsion in accordance with ASTM D5276 or RC-1 cutback asphalt in accordance with ASTM D2028 are acceptable.
 - b. If mulch and asphalt are applied in one treatment, use SS-1 emulsion with penetration test range between 150-200.
 - c. Use appropriate shields to protect adjacent site improvements.

3.3 MAINTENANCE AND REPLACEMENT

A. General:

1. Begin maintenance of planted areas immediately after each portion is planted and continue until final acceptance or for a specific time period as stated below, whichever is the longer.
2. Provide and maintain temporary piping, hoses, and watering equipment as required to convey water from water sources and to keep planted areas uniformly moist as required for proper growth.
3. Protection of new materials:
 - a. Provide barricades, coverings or other types of protection necessary to prevent damage to existing improvements indicated to remain.
 - b. Repair and pay for all damaged items.
4. Replace unacceptable materials with materials and methods identical to the original specifications unless otherwise approved by the Engineer.

B. Seeded or Sodded Lawns:

1. Maintain seeded lawns: 90 days, minimum, after installation and review of entire project area to be planted.
2. Maintenance period begins at completion of planting or installation of entire area to be seeded or sodded.
3. Engineer will review seeded or sodded lawn area after installation for initial acceptance.
4. Maintain lawns by watering, fertilizing, weeding, mowing, trimming, and other operations such as rolling, regrading, and replanting as required to establish a smooth, uniform lawn, free of weeds and eroded or bare areas.
5. Lay out temporary lawn watering system and arrange watering schedule to avoid walking over muddy and newly seeded areas.
 - a. Use equipment and water to prevent puddling and water erosion and displacement of seed or mulch.
6. Mow lawns as soon as there is enough top growth to cut with mower set at recommended height for principal species planted.
 - a. Repeat mowing as required to maintain height.
 - b. Do not delay mowing until grass blades bend over and become matted.
 - c. Do not mow when grass is wet.
 - d. Time initial and subsequent mowings as required to maintain a height of 1-1/2 to 2 inches.
 - e. Do not mow lower than 1-1/2 inches.
7. Remulch with new mulch in areas where mulch has been disturbed by wind or maintenance operations sufficiently to nullify its purpose.
 - a. Anchor as required to prevent displacement.
8. Unacceptable plantings are those areas that do not meet the quality of the specified material, produce the specified results, or were not installed to the specified methods.
9. Replant bare areas using same materials specified.
10. Engineer will review final acceptability of installed areas at end of maintenance period.
11. Maintain repaired areas until remainder of maintenance period or approved by Engineer, whichever is the longer period.

END OF SECTION



DIVISION 33

UTILITIES



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SECTION 33 05 07.23
UTILITY BORING AND JACKING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Providing casing pipes under rights-of-way or other facilities, including:
 - a. Casing pipe.
 - b. Bulkheads at ends of casing pipes.
 - c. Exterior and interior coatings of casing pipes.
 - d. Additional requirements for carrier pipe installed within casing pipes.
 - e. Supports for carrier pipe, within casing pipe.
 - f. Material required to fill annulus between casing pipe and carrier pipe.
 - g. Cathodic protection for casing pipes.
 - h. Permanent signage at ends of casing pipes.
- B. Related Requirements: Include but are not necessarily limited to:
1. Section 03 00 05 - Concrete.
 2. Section 31 23 33 - Trenching and Backfilling.
 3. Section 40 05 01 - Common Work Results for Process Piping.
 4. Section 33 05 19 – Ductile-Iron Utility Pipe.

1.2 REFERENCES

- A. Reference Standards: Standards referenced in this section include, but are not necessarily limited to, the following:
1. American Water Works Association (AWWA)
 - a. C203 - Coal-Tar Protective Coatings and Linings for Steel Water Pipe.
 2. American Welding Society (AWS)
 - a. B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification.
 - b. D1.1/D1.1M - Structural Welding Code —Steel.
 - c. D1.3/D1.3M - Structural Welding Code—Sheet Steel.
 3. ASTM International (ASTM):
 - a. A139/A139M - Standard Specification for Electric-Fusion (Arc)-Welded Steel Pipe (NPS 4 and Over).
 - b. A252/A252M - Standard Specification for Welded and Seamless Steel Pipe Piles.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
1. Coordinate with owners of rights-of-way across which casing pipes will be installed, and coordinate with operators using facilities within such right-of-way as necessary in performing the Work.
 2. When right-of-way owner will furnish services of construction observers, inspectors, or similar personnel, or traffic control personnel, at the Site during construction, coordinate directly with such personnel while complying with associated work permits and occupancy permits.

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements:

1. Owners of rights-of-way and their associated, basic requirements concerning the Contractor's obligation to obtain work permits for construction are indicated in Section 01 14 33 - Work in Rights-of-Way.
- B. Qualifications:
1. Manufacturers:
 - a. Manufacturers of materials and products required by this Section shall be entities regularly engaged and experienced in manufacturing items of the type required, and shall possess not less than five years of experience manufacturing items similar to those required in this Section.
 - b. Upon Engineer's request, submit documentation of manufacturers' compliance with qualifications requirements.
 2. Installer:
 - a. Installer of casing pipes by boring and jacking, and associated Work required by this Section shall be entities regularly engaged and experienced in installing casing pipes by boring and jacking, installing carrier pipes within casing pipes, and related Work of the type required, and shall possess not less than five years of experience performing construction similar to that required in this Section.
 - b. When the Work involves providing casing pipes by boring and jacking at more than one location, a single installer shall perform all utility boring and jacking Work, unless otherwise acceptable to Engineer.
 - c. Installer's site superintendent or foreman (as applicable) and operators of boring and jacking construction equipment and machinery, shall each have not less than one year of active experience operating and supervising types of boring and jacking construction equipment and machinery that will be used in the Work.
 - d. Submit documentation of installer's compliance with qualifications requirements.
 3. Welders:
 - a. Qualify welding procedures and welding operators in accordance with AWS B2.1/B2.1M, AWS D1.1/D1.1M, and AWS D1.3/D1.3M.
 - b. Upon Engineer's request, submit documentation of welders' qualifications and certifications.

1.5 SUBMITTALS

- A. Action Submittals: Submit the following:
1. Shop Drawings:
 - a. Drawings showing, for each casing pipe, proposed layout of casing pipe, boring and receiving pits, and adjacent work areas, including locations of buried utility piping (and adjacent Underground Facilities, if any) to be installed through casing pipe.
 - b. Proposed detail drawings showing and indicating casing pipe appurtenances, including carrier pipe supports, bulkheads at ends of casings, and locations and means of attaching to casing pipe passive cathodic protection.
 - c. Show and indicate locations of required, permanent signage, including details of signage construction and installation.
 - d. Layout of proposed permanent signage, indicating sign dimensions, text, font, colors, and arrangement, for each sign required under this Section. Indicate materials of proposed signage. Show and indicate proposed installation details, including attachment of sign panels to braces, arrangement of braces and vertical support posts and foundations, and proposed height of signs above finished grade.
 2. Product Data:
 - a. Casing pipe manufacturer's published information, including specifications, material properties, dimensions, indication of third-party reference standards with which materials comply, and other pertinent data.

- b. Supplier's published information for protective coatings required for casing pipes, indicating proposed materials, application methods, dry film thickness, third-party reference standards with which materials comply.
- c. Supplier's product information for material proposed for filling annulus between casing pipe and carrier pipe, including material properties, gradation (when applicable), compressive strength (when applicable), certification of compliance with applicable third-party reference specifications (when applicable) and reference standards, and location from which materials will be obtained.
- d. Supplier's published information indicating proposed materials, sizes, strength, third-party reference standards with which materials comply, and jointing of carrier pipe supports within the casing pipe.
- e. Supplier's published information for materials proposed for bulkheads required at each end of casing pipes, indicating materials, material properties, and other pertinent information.
- f. Supplier's published information for materials proposed for permanent signage (including sign panels, reflective sheeting, supports, and hardware) required at each end of casing pipes, indicating materials, material properties, sizes, performance, and other pertinent information

B. Informational Submittals: Submit the following:

1. Procedure Submittals:

- a. Indication of basic, proposed method for installing casing pipe (for example, via open-cut, via boring and jacking, or other).
- b. Proposed, basic method, for filling annulus between casing pipe and carrier pipe.
- c. Detailed time-based schedule for installing required casing pipes, when sufficient detail is not included in Contractor's construction Progress Schedule.
- d. Copy of work permit issued to Contractor by owner of right-of-way or facility underneath which casing pipe will be installed.
- e. Engineer's review, comments upon, and acceptance of Contractor's procedure Submittals are only for the limited purposes indicated in the Contract Documents. Engineer's review, comments upon, action, or inaction concerning such Submittals, shall not, in any way, reduce or mitigate Contractor's sole responsibility for construction means, methods, techniques, procedures, and sequences, or associated safety and protection measures.

2. Field Quality Control Submittals:

- a. Submit results of field quality control tests and inspections required in the "Field Quality Control" Article of this Section.

3. Qualification Statements:

- a. Manufacturers, when requested by Engineer.
- b. Installer.
- c. Welders, when requested by Engineer.

C. Closeout Submittals: Submit the following:

1. Record Documentation:

- a. Submit as-constructed survey and drawings of completed casing pipes and related Work.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Handling of Casing Pipes:

- 1. Deliver casing pipes to the Site without damage, whether to casing pipe or shop-applied coatings and linings, and in good condition.
- 2. Handle and protect casing pipes to maintain diameter within two percent of intended, nominal diameter.

1.7 FIELD CONDITIONS

A. Existing Conditions:

1. 31 23 33 - Trenching and Backfilling.

PART 2 - PRODUCTS

2.1 SYSTEM REQUIREMENTS

A. Description:

1. Contractor shall provide all labor, materials, construction equipment and machinery, tools, services (including professional services when necessary), and incidentals necessary to furnish and install casing pipes, carrier pipes, and related Work required for buried utilities to be conveyed under rights-of-way.
2. Location, length, and elevation of each casing pipe is shown on the Drawings.
3. Schedule of System Requirements:
 - a. Provide casing pipe and carrier pipe systems in accordance with requirements of this Section.

2.2 CASING PIPES

A. Performance Criteria:

1. Provide steel casing pipes with strength sufficient to withstand the following:
 - a. Handling stresses.
 - b. Stresses imposed by boring and jacking during casing pipe installation.
 - c. Structural loading imposed by soils, ground water, and other materials imposing loading on casing pipes, plus dead load and live loads imposed by facilities within the right-of-way, such as roadways, railroads, and their associated traffic.
 - d. Water seepage.
 - e. When necessary, protecting personnel who may potentially enter casing pipe during installation or at other times.
 - f. When necessary, to allow advancement of casing pipe through caving substrata.

B. Casing Piping Materials and Fabrication:

1. Casing pipes shall be weldable, rigid steel, smooth, clean, free of rust, and watertight, in accordance with ASTM A139/A139M Grade B, or ASTM A252/A252M Grade 2.
2. Material Strength:
 - a. Minimum tensile strength: 60,000 psi.
 - b. Minimum yield strength: 35,000 psi.
3. Required sizes and wall thickness are indicated in Table 33 05 07.23-A of this Section.

C. Bulkheads:

1. Bulkheads – General:
 - a. Installed bulkheads shall be watertight and prohibit entry of wildlife.
 - b. Installed bulkhead systems shall prevent galvanic action between carrier pipe, casing pipe, and other system components.
2. Rubber End Seals:
 - a. Description: Provide rubber end seal at each end of casing pipe, completely enclosing end of casing pipe, with centralized opening sufficient to accommodate carrier pipe.
 - b. Products and Manufacturers: Subject to compliance with the Contract Documents, rubber end seals of the following are acceptable:
 - 1) PSI End Seals, by Allied Corrosion Industries.

- 2) End Seals, by Advance Products and Systems.
- 3) Or equal.
- c. Materials:
 - 1) End Seals: EPDM rubber, not less than 1/8-inch thick.
 - 2) Banding (for clamping end seal to associated carrier pipe or casing pipe): Type 316 stainless steel.
- d. Fabrication:
 - 1) End seals may be pull-on, molded, or wrap-around type.
 - 2) Provide concentric type where casing spacers result in carrier pipe installed in centerline of casing pipe.
 - 3) End seals may be permanently attached to casing pipe by appropriate adhesive furnished or recommended by manufacturer of rubber end seals.
3. Welded Steel End Plates:
 - a. Materials: same material and wall thickness as associated casing pipe.
 - b. Fabrication: Steel fabricated to fit end of casing pipe, with central opening sufficient for penetration of carrier pipe. Where necessary, central opening for carrier pipe shall include collar perpendicular to bulkhead and paralleling direction of installed carrier pipe. Provide continuous welds in accordance with AWS B2.1/B2.1M, AWS D1.1/D1.1M, and AWS D1.3/D1.3M.
 - c. Arrangement and Construction:
 - 1) Bulkhead shall cover entire end diameter of casing pipe. Provide bulkhead at each end of each casing pipe.
 - 2) Opening in bulkhead shall be sufficient for carrier pipe and seal. After installation, casing pipe shall not touch any part of opening in steel bulkhead.
 - 3) Provide appropriate seal where carrier pipe penetrates bulkhead. Such seals shall be either modular mechanical seals, or boot-seal of EPDM rubber. Where boot-seal is provided, boot-seal attachment to bulkhead shall be permanent and watertight, and hardware securing end of boot-seal to piping shall be Type 316 stainless steel.
4. Concrete:
 - a. Concrete material: normal weight concrete fill, in accordance with Section 03 00 05 - Concrete.
 - b. Reinforcing: In accordance with Specifications of Division 03 - Concrete, and as shown on the Drawings.
 - c. Arrangement and Construction:
 - 1) Provide concrete bulkheads at ends of steel casing pipes. Before placing concrete, steel casing pipe surfaces that will be in permanent contact with concrete, both inside and outside of casing pipe, shall be clean and free of rust, contamination, and foreign matter, and shall be provided with required coating and lining of casing pipe.
 - 2) Completely fill with concrete outermost two feet of casing pipe.
 - 3) Dimensions and arrangement of concrete bulkhead outside ends of steel casing pipe shall be as shown and indicated on the Drawings. If not shown or indicated on the Drawings, concrete bulkheads shall extend one foot beyond ends of casing pipe, and shall extend one foot outward from outside diameter of casing pipe, and shall cover outside circumference of casing pipe for one foot along lengths of casing pipe from end.
- D. Shop-Applied Finishes:
 1. Before applying coatings to casing pipe surfaces, perform surface preparation in accordance with written instructions of coating system manufacturer.

2. Provide coal-tar primer and hot coal-tar enamel finish coat in accordance with AWWA C203, apply to exterior and interior surfaces of casing pipes [including steel bulkheads]. Total dry film thickness of completed coating system shall be not less than 16 mils.

2.3 CARRIER PIPES

A. Carrier Pipes – General:

1. Carrier pipe requirements are indicated in Table 33 05 07.23-A of this Section.
2. In general, requirements for carrier pipe material are indicated in the associated pipe Specifications in Division 33 - Utilities, or Division 40 - Process Interconnections, as applicable. Where requirements of such Specifications and this Section appear to conflict, comply with requirements of this Section for carrier pipe installed within associated casing pipe.

B. Carrier Pipe Supports:

1. Carrier Pipe Supports - General:

- a. Provide carrier pipe supports, within casing pipe, to adequately support casing pipe without stress, leakage, or adverse effect on service life of carrier pipe.
- b. Carrier pipe supports shall prevent galvanic action between carrier pipe, casing pipe, and other system components.
- c. Support carrier pipe at approximate centerline of casing pipe.
- d. Spacing:
 - 1) Ductile iron, steel, stainless steel, or concrete carrier pipe.

Pipe Sizes (inches)	Maximum Span (feet)
1.5 and less	5
2 and larger	8

- 2) In addition to the foregoing, provide carrier pipe support within two feet of each specialty (such as couplings, expansion joints, fittings, or similar items) within casing pipe, and provide carrier pipe supports within two feet of each end of each casing pipe.

2. Casing Spacers:

a. Casing Spacers – General

- 1) Carrier pipe supports shall be casing spacers, specifically manufactured, by entity regularly engaged in manufacturing casing pipe spacers, for supporting carrier pipe within casing pipe at approximate casing pipe centerline.
- 2) Allow sufficient space between interior, upper half of casing pipe and risers protruding above carrier pipe to allow casing pipe sufficient space for deflection under anticipated deadload, live load, and dynamic loads, and to allow carrier pipe installation in event of minor irregularities at field-welded joints in casing pipe.
- 3) Where necessary or required, provide casing spacers with field-adjustable risers to accommodate carrier pipes that must be installed on continuous slope, such as gravity sewers and carrier pipes required to drain to a specific drainage point.
- 4) Factory-fabricate casing spacer components.

b. Manufacturers: Subject to compliance with the Contract Documents, casing spacers by the following are acceptable:

- 1) Pipeline Seal and Insulator, by Allied Corrosion Industries.
- 2) Advance Products and Systems.
- 3) Cascade Waterworks.
- 4) Or equal.

- c. Spacers for ductile iron carrier pipes:
 - 1) Materials:
 - a) Band around carrier pipe: 14-gauge hot rolled, pickled and oiled carbon steel, with fusion-bonded thermoplastic powder coating, size as recommended by casing spacer manufacturer for the installation. Fully passivate welds to stainless steel.
 - b) Liner inside band: 0.09 inch thick PVC for carrier pipe service temperature up to 120 degrees F, or 0.09 inch thick EPDM rubber for carrier pipe service temperature above 120 degrees F up to 250 degrees F.
 - c) Risers and runners outside of band: FRP or polyethylene, sizing and configuration as recommended by casing spacer manufacturer as necessary for the installation.
 - d) Fasteners: Same material as band.
 - 3. Provide restrained joints for carrier pipe within casing pipe.

2.4 FILL MATERIAL WITHIN CASING PIPES

- A. Fill Material Within Casing Pipes – General:
 - 1. When fill material is required within annulus, completely fill annulus with required fill material.
 - 2. Provide riser pipe for venting casing pipe adjacent to bulkhead at near end of casing pipe. Upon completion of filling, completely fill venting riser pipe with non-shrink grout.
- B. Non-shrink Grout:
 - 1. Provide non-shrink grout to completely fill annular space between casing pipe and carrier pipe.
 - 2. Provide non-shrink grout, as well as construction equipment and machinery and appurtenances, including pump, hoses, pressure gauges, valves, and fittings.
 - 3. Material: Comply with Section 03 00 05 - Concrete.

2.5 ACCESSORIES

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions:
 - 1. Prior to commencing installation of casing pipes, verify field conditions at each jacking and receiving pit needed for installing casing pipes.
 - 2. Comply with requirements of Section 31 23 33 - Trenching and Backfilling, regarding field conditions and examination.
- B. Installing the Work constitutes Contractor's approval of underlying work, subsurface conditions, and other field conditions prevailing at the time of the Work.

3.2 INSTALLATION

- A. Installation Requirements:
 - 1. Installation – General:
 - a. Provide casing pipes at locations shown and indicated on the Drawings.
 - b. Perform utility boring and jacking in accordance with the Contract Documents; occupancy permit, work permit, and other requirements of right-of-way owner; Laws and Regulations; and written instructions of manufacturers of materials provided. In event of conflicting requirements, obtain interpretation or clarification from Engineer before proceeding.
 - c. Comply with Section 01 55 26 - Traffic Control, for utility boring and jacking involving roadways and highways.

- d. Obtain consent of right-of-way owner before performing required field tests on carrier pipes and placing carrier pipes into operation for Substantial Completion.
2. Earth Work and Restoration:
- a. Perform earth Work, including excavating and filling of jacking and receiving pits, in accordance with Section 31 23 33 - Trenching and Backfilling. Provide temporary support of excavations and dewatering of excavations in accordance with the Contract Documents.
 - b. Sizes of jacking and receiving pits shown on the Drawings are approximate. When sufficient land area is available, and Contractor has appropriate permission to access desired property, jacking and receiving pits may, at Contractor's option, be larger than indicated on the Drawings. Contractor is solely responsible for excavating, backfilling, and restoring jacking and receiving pits, as well as protecting adjacent property.
 - c. Contractor may, at Contractor's option, provide jacking pit at location shown on the drawings for receiving pit, and vice-versa, when the following apply: (1) sufficient land and access is available for the alternative jacking pit location, and (2) when approved by Engineer via Field Order or other Contract modification. Owner is not obligated, in any way, to furnish additional lands for alternative jacking pit location. Neither Owner nor Engineer are obligated, in any way, to authorize alternative locations of jacking and receiving pits.
 - d. When required by the Contract Documents or by right-of-way owner, provide temporary or permanent (as applicable) sheeting at ends of jacking and receiving pits closest to facilities occupying the right-of-way, such as roadway, railroad track, or other such facility.
 - e. Following backfilling, perform restoration in accordance with Specifications of Division 32 - Exterior Improvements.
3. Casing Pipe Installation:
- a. Casing Pipe Installation Method:
 - 1) Unless otherwise allowed via permit issued by right-of-way owner and associated Contract modification, install casing pipe by simultaneously boring and jacking, by dry augering.
 - 2) Do not use water, other fluid, or compressed air, whether to advance auger or casing pipe, or to remove spoil from casing pipe.
 - 3) Once commenced, perform boring and jacking continuously until entire, required casing pipe installation is complete.
 - b. Boring and Jacking Equipment and Machinery:
 - 1) Provide and use boring and jacking construction equipment and machinery specifically intended for boring and jacking casing pipes.
 - 2) Such equipment and machinery shall possess sufficient jacking capacity to push jacking shield and pipe string between jacking and receiving pits.
 - 3) Properly design and construct jacking frame and thrust blocks and have capacity equal to maximum anticipated jacking loads with factor of safety of not less than 2.0.
 - 4) Such equipment and machinery shall possess hydraulic cylinder extension rates synchronized with boring and jacking rate appropriate for subsurface conditions.
 - 5) Boring and jacking equipment shall develop uniform distribution of jacking forces on end of casing pipe, using spreader rings and packing.
 - 6) Provide and use laser and control system for measuring location of auger's cutting head and distance from boring and jacking equipment during installation.
 - c. Provide full-length sections of casing pipe, until achieving final length of casing pipe. Final section of casing pipe installed may be cut to required length.
 - d. Field Welding:

- 1) Provide butt welded joints between adjacent sections of casing pipe in accordance with AWS B2.1/B2.1M, AWS D1.1/D1.1M, and AWS D1.3/D1.3M. Provide full depth welds.
 - 2) Welds shall be airtight and continuous over entire circumference of pipe.
 - 3) Welds shall not increase outside pipe diameter by more than 0.5 inch. Prevent intrusion of weld metal into inside diameter of casing pipe.
 - 4) Casing pipe 36-inch diameter and larger shall be welded both inside and outside the casing pipe. Following welding inside casing pipe, grind excess weld material inside casing pipe flush with casing pipe's inside diameter.
- e. Field-applied coatings: After field welding, joint and surrounding damaged or uncoated area shall be coated with same materials and to same thickness as shop-applied coatings.
 - f. During installation, provide hardened steel temporary protective "shoe" around entire circumference of leading edge of casing pipe, to protect leading edge of casing pipe from damage during jacking.
 - g. During installation, do not advance auger beyond leading edge of casing pipe. Provide means that physically prevents auger and cutting head from creating unsupported excavation ahead of leading edge of casing pipe.
 - h. During casing pipe installation, verify line, grade, and location of leading end of casing pipe installation as indicated in this Section's "Field Quality Control" Article and record such data. In event data obtained appear to indicate casing pipe may deviate from required installation tolerances, promptly endeavor to remedy such apparent deviations without interrupting casing pipe installation.
 - i. During installation of casing pipe, adjust line or grade of casing pipe at rate not more than one inch per 25 feet of casing pipe length.
 - j. Position jacks so that resultant force is applied along centerline of casing pipe, and force is applied evenly to entire end of casing pipe.
 - k. Provide compression ring/jacking strips for cushioning between pushed end of casing pipe and jacking equipment.
 - l. Provide backstops that adequately distribute jacking thrust without deforming subsurface material or other damage.
 - m. Monitor and control jacking pressure/force applied so that casing pipe manufacturer's recommended limits are not exceeded.
 - n. Match rate of advance of jacking shield with rate of casing pipe augering to avoid over-excavating.
 - o. Provide appropriate, non-polluting lubricant, such as bentonite, on casing exterior when excessive friction between subgrade material and casing pipe exterior jeopardizes installation in accordance with the Contract Documents.
 - p. Immediately advise Engineer upon encountering obstruction that stops forward progress of the Work
 - q. Completely fill voids outside of casing, including abandoned or misaligned holes, with non-shrink grout, placed by pressure grouting, in accordance with Section 03 00 05 - Concrete. While grouting exterior voids, grouting pressure shall not exceed 0.5 psig per vertical foot of subsurface material over grouting location.
 - r. When grouting external voids is necessary, provide threaded access port in casing pipe. Following grouting, provide permanent steel, threaded plug in access port, and field-apply required coatings to interior of casing pipe (when casing pipe is of sufficient size to allow entry by properly trained and equipped personnel).
 - s. When Contractor's personnel are not active at location of casing pipe installation, provide properly secured, temporary, removeable bulkheads completely enclosing each end of each casing pipe until permanent bulkheads are provided.
4. Carrier Pipe Installation:

- a. Prior to installing carrier pipe, provide at installation location all lengths and fittings, and casing spacers, necessary and required for carrier pipe installation. Where appropriate, furnish additional materials at the Site to reduce potential interruptions and delays during carrier pipe installation.
 - b. Commence installing carrier pipe only upon Engineer's acceptance of required field quality control test and inspection Submittals specific to casing pipe.
 - c. Perform carrier pipe installation in a single, continuous operation commenced following completion of casing pipe installation. Carrier pipe installation need not be continuous immediately following carrier pipe installation.
 - d. Install casing spacers in accordance with manufacturer's written instructions and requirements of the Contract Documents, including Article 2.3 ("Carrier Pipes") of this Section.
 - e. Install carrier pipe at approximate centerline of casing pipe, consistent with bulkheads required at ends of casing pipe.
 - f. Provide complete dielectric isolation of carrier pipe from casing pipe and appurtenances, to reduce potential for galvanic action.
5. Installing Fill Material in Annulus Between Carrier Pipe and Casing Pipe:
- a. When filling annulus between casing pipe and carrier pipe is required, provide required fill material in accordance with requirements of Article 2.3 ("Carrier Pipes") of this Section, in one, continuous operation per casing pipe, without associated voids or air pockets within casing pipe.
 - b. Prior to installing fill material, provide required bulkhead at each end of casing pipe where fill material is required. At start of filling, extend fill pipe from placing equipment, through inside of casing pipe, to bulkhead at opposite end of casing pipe. During placing, position fill pipe so that fill material pipe's discharge end remains constantly buried in fill material, so that fill material becomes built up over crown of fill pipe.
6. Permanent Bulkhead Installation:
- a. Provide bulkhead at each end of each casing pipe in accordance with Article 2.2 ("Casing Pipes") of this Section.
 - b. Rubber End Seals:
 - 1) Install rubber end seals in accordance with manufacturers' written instructions.
 - 2) Permanently and securely attach rubber end seals to casing pipe and carrier pipe.
 - c. Welded Steel Plates:
 - 1) Continuously field-weld steel plate bulkheads to ends of casing pipe in accordance with AWS B2.1/B2.1M, AWS D1.1/D1.1M, and AWS D1.3/D1.3M.
 - 2) Install seals between steel plate bulkhead and carrier pipe in accordance with seal manufacturer's written instructions.
 - 3) Ensure complete dielectric isolation of steel plate bulkhead/casing pipe and carrier pipe, to preclude galvanic action.
 - d. Concrete Bulkheads:
 - 1) Provide concrete bulkheads as required by the Contract Documents, including this Section, the Drawings, and Section 03 00 05 - Concrete.
- B. Installation Tolerances:
- 1. Lateral Deviation:
 - a. Lateral deviation, of any and all points along casing pipe from required location, shall not exceed two feet.
 - b. In no event shall casing pipe be closer to limits of Owner-furnished permanent easement than five feet.
 - 2. Vertical Deviation:
 - a. Elevation of casing pipe at jacking pit (where boring and jacking commenced) shall not deviate from required elevation by more than 0.3 feet.

- b. Elevation of casing pipe at receiving pit (where boring and jacking ends) shall not deviate from required elevation by more than [one] foot.
- 3. Slope: When the Drawings show or indicate required slope of carrier pipe (such as when carrier pipe is a gravity sewer or pressure pipe designed to drain to a specific location), installed slope of carrier pipe shall be not less than 0.50 percent, in sloped direction required by the Drawings.
- 4. Out-of-roundness for installed casing pipes: Shall not exceed one percent of nominal diameter along installed casing pipe.

3.3 FIELD QUALITY CONTROL

A. Field Tests and Inspections:

- 1. Field Welding:
 - a. Visually inspect and perform ultrasonic testing, of each field weld for casing pipes, in accordance with AWS B2.1/B2.1M, AWS D1.1/D1.1M, and AWS D1.3/D1.3M.
 - b. Record results of tests and inspections of field welds in accordance with AWS B2.1/B2.1M, AWS D1.1/D1.1M, and AWS D1.3/D1.3M and furnish as Submittals promptly upon completion of casing pipe installation.
- 2. Location and elevation of casing pipes and carrier pipes:
 - a. During casing pipe installation, record exact position of jacking shield per 50-foot length of casing pipe installed or once per eight-hour work shift, whichever is less, to determine whether alignment is in accordance with required installation tolerances. Immediately remedy misalignment before required installation tolerances are exceeded. Guidance system may be used, however, select times to measure and record such information after ambient air temperature has stabilized throughout casing pipe.
 - b. Establish as-constructed locations and elevations as required by "Closeout Activities" Article of this Section and furnish to Engineer as Submittal.
- 3. Out-of-roundness for installed casing pipes:
 - a. Using calipers or other appropriate measuring tools, measure maximum and minimum outside diameters of each end of each section of casing pipe immediately prior to performing field welding of casing pipe sections.
 - b. Record data obtained and furnish as Submittal within [two] days of casing pipe installation.
- 4. Voids between casing pipe exterior and subsurface material:
 - a. Inspect entire length of installed casing pipe for voids between casing pipe exterior and subsurface material.
 - b. When casing pipe is of size sufficient to allow personnel entry (including appropriate personal protective equipment and provisions for confined space entry), check interior surfaces of installed casing pipe by sounding.
 - c. When casing pipe size is insufficient to allow personnel entry, or, at Contractor's option, for larger casing pipes, inspect for voids using ground-penetrating radar equipment.
 - d. Record results of inspections, including apparent size and location of voids. Promptly submit such results to Engineer, together with Contractor's proposed methods for completely filling apparent voids.
- 5. Testing of Carrier Pipe:
 - a. Perform required field tests and inspections of carrier pipe in accordance with applicable Specifications of Division 33 - Utilities, and Division 40 - Process Interconnections, including Section 40 05 01 - Common Work Results for Process Piping. Submit results of such field tests and inspections to Engineer under the associated Specifications of Division 33 and Division 40, as applicable.

B. Defective Work:

- 1. One or more of the following for a given casing pipe or carrier pipe will be sufficient basis for Engineer to reject as defective Work:

- a. Non-compliance with required installation tolerances.
 - b. Obvious or apparent deflection of casing pipe under dead load, live load, or dynamic load, following installation.
 - c. Casing pipe diameter less than diameter required by the Contract Documents, unless smaller diameter is authorized by appropriate Contract modification.
 - d. Installed casing pipe is damaged, corroded, or otherwise not in required condition.
 - e. Damaged, missing, or otherwise non-conforming coatings and linings required for casing pipes.
 - f. Apparent leakage from groundwater or other fluid into casing pipe from outside of casing pipe.
 - g. Apparent leakage from carrier pipe.
 - h. Other substantive non-conformity with the Contract Documents or damage to the utility boring and jacking Work.
- 2. In event casing pipe goes off-course during installation to extent greater than required installation tolerances, and Contractor is unable or unwilling to remedy the defective Work, abandon casing pipe installation, completely fill abandoned casing pipe with flowable fill and provide new casing pipe. Replacement casing pipe location shall be in reasonable proximity to abandoned casing pipe and at location acceptable to Owner, right-of-way owner, and Engineer.
 - 3. In event casing pipe goes off-course during installation to extent greater than required installation tolerances, and Contractor is able and willing to implement remedy, prepare Submittal fully describing proposed remedy and promptly furnish to Engineer. Submittal shall present, both via written narrative description and Contractor-prepared Shop Drawings and sketches, proposed plan for modifying casing pipe so that completed installation of carrier pipe and casing pipe will comply with Engineer's design intent as shown and indicated in the Contract Documents. Engineer has the right to require revisions to Contractor's plan to remedy defective Work. Neither Engineer nor Owner are under any obligation to accept Contractor-proposed remedy and, at Engineer's sole discretion, may require abandoning and filling defective casing pipes.
 - 4. Contractor is not eligible for an increase in the Contract Price or additional Contract Times relative to remedies for defective Work or abandoning and filling defective casing pipes that cannot be remedied.
- C. Supplier's Services:
- 1. For manufactured items, such as casing spacers and casing pipe rubber end seals (when required), provide services of factory-trained manufacturer's representative experienced with performing field services and providing consultation to installers for the types of Work required, for the following:
 - a. Upon delivery of items to the Site, assist Contractor with determining whether furnished items comply with Submittals approved by Engineer, and are in required quantity, quality, and condition.
 - b. Instruct installer's personnel in handling, storing, and installing the items.
 - c. Assist Contractor in verifying proper installation of items.
 - d. Providing to Contractor consultation, including visiting the Site as necessary, in the event of defective Work and identifying appropriate remedies.
 - 2. Prepare and promptly furnish to Contractor written report of visits to the Site, including recommendations. When recommendations are regarding means of remedying defective Work relative to casing pipes, carrier pipes, or other Work under this Section, Contractor shall furnish as Informational Submittal, upon Engineer's request.

3.4 CLOSEOUT ACTIVITIES

- A. As-Constructed Survey and Drawings of Completed Casing Pipes and Related Work:

1. Promptly following completion of carrier pipe installation, and prior to backfilling ends of casing pipe and trench in which Underground Facilities were installed, retain services of licensed, professional land surveyor to survey and document final location of each casing pipe and associated Underground Facilities installed adjacent to casing pipe on property of right-of-way owner, on the Project's site plan in the Drawings:
 - a. Location of each end of each casing pipe.
 - b. Location of buried piping and other Underground Facilities provided on property of right-of-way owner, including fittings (horizontal and vertical), valves, manholes, and similar items. Also locate and indicate on same drawing positions of required signage associated with casing piping provided.
 - c. Indication of size (diameter) and wall thickness of each casing pipe.
 - d. Indication of elevations of top and invert of each end of each casing pipe, in accordance with Project datum.
 - e. GPS coordinates of location of each end of each casing pipe provided.
 - f. Other information required by right-of-way owner.
2. Submit as-constructed record drawings of casing pipes and related Work..

END OF SECTION

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SECTION 33 05 19
DUCTILE-IRON UTILITY PIPE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Ductile iron piping, fittings, specials, and appurtenances.
- B. Related Sections include but are not necessarily limited to:
 - 1. Section 31 23 33 - Trenching and Backfilling.
 - 2. Section 33 05 07.23 - Utility Boring and Jacking.
 - 3. Section 33 11 13 - Water Main Construction.
 - 4. Section 40 05 01 - Common Work Results for Process Piping.

1.2 REFERENCES

- A. Referenced Standards:
 - 1. American Society of Mechanical Engineers (ASME):
 - a. B1.1 - Unified Inch Screw Threads (UN and UNR Thread Form).
 - b. B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.
 - c. B16.21 - Nonmetallic Flat Gaskets for Pipe Flanges.
 - 2. ASTM International (ASTM):
 - a. A47 - Standard Specification for Ferritic Malleable Iron Castings.
 - b. A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
 - c. A307 - Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
 - d. A536 - Standard Specification for Ductile Iron Castings.
 - e. B695 - Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel.
 - 3. American Water Works Association (AWWA):
 - a. C203 - Standard for Coal-Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape - Hot Applied.
 - b. C217 - Microcrystalline Wax and Petrolatum Tape Coating Systems for Steel Water Pipe.
 - 4. American Water Works Association/American National Standards Institute (AWWA/ANSI):
 - a. C104/A21.4 - Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings.
 - b. C105/A21.5 - Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems.
 - c. C110/A21.10 - Standard for Ductile-Iron and Gray-Iron Fittings.
 - d. C111/A21.11 - Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
 - e. C115/A21.15 - Standard for Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
 - f. C150/A21.50 - Standard for Thickness Design of Ductile-Iron Pipe.
 - g. C151/A21.51 - Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water.
 - h. C153/A21.53 - Standard for Ductile-Iron Compact Fittings for Water Service.
 - i. C217 - Microcrystalline Wax and Petrolatum Tape Coating Systems for Steel Water Pipe and Fittings.

- j. C219 - Bolted Sleeve-Type Couplings for Plain-End Pipe.
- k. C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.

1.3 SUBMITTALS

A. Action Submittals:

1. Submit shop drawings for ductile iron pipe, fittings and appurtenances as one package.
2. Submit the class and wall thickness for all pipe and pressure rating and wall thickness of all fittings.
3. Submit standard and restrained joints details indicating all pertinent dimensions and manufacturing tolerances.
4. Submit a materials list indicating the anticipated number of straight lengths of pipe to be used and all fittings and specials
5. Submit separate shop drawing for fittings only if manufactured by a separate supplier.
6. Material list.
7. Manufacturing Information.
 - a. Pipe and fitting details for temporary and permanent facilities indicating:
 - 1) Manufacturing tolerances.
 - 2) Maximum angular deflection limitations of field joints.
 - 3) Closure sections and cutoffs for field length adjustment.
 - 4) Bulkheads, including details for removal of test bulkheads and repair of linings.
 - 5) All other pertinent information required for the manufacture and installation of the product.
 - b. Joint Details:
 - 1) Push-on joints.
 - 2) Restrained joints.
 - 3) Flanged joints.
 - 4) Mechanical Joints.
8. Submit a pipe laying schedule showing line layout and marking diagrams for all areas.
 - a. Indicate on schedule pipe number and length, the station of all appurtenances, and the station and invert elevation of all bell ends.
9. Product data for the following:
 - a. Pipe and fittings:
 - 1) Material data.
 - 2) Chemical and physical test reports.
 - 3) Manufacturer's recommendation for maximum allowable joint deflection.
 - b. Coatings and Linings:
 - 1) Technical data sheets itemizing chemical composition, technical and performance information that indicates compliance with this Specification.
 - 2) Color chart, if applicable.
 - 3) Surface preparation requirements.
 - 4) Curing requirements.
 - 5) Manufacturer's name, product number or name.
 - 6) Coating or lining thickness.
 - c. Gaskets and Bolting: Technical data sheets itemizing chemical composition, technical and performance information that indicates compliance with this Specification.
10. Pipe handling equipment and methods for loading and unloading pipe.
 - a. Pipe support requirements for storage.

- 1) Minimum allowable width, quantity, and location of contact points to prevent excess deflections.
 - b. Pipe moving support requirements: Minimum allowable sling width.
 11. If mechanical coupling system is used, submit piping, fittings, and appurtenant items which will be utilized to meet system requirements.
- B. Informational Submittals:
1. Certificates.
 - a. Manufacturer's Certificate of Compliance that products furnished meet requirements of this Specification.

1.4 QUALITY ASSURANCE

- A. Buy America Requirement:
1. Provide steel pipe, fittings and specials permanently incorporated in the work where all steel pipe manufacturing processes, including the application of a coating, have occurred in the United States of America.
 - a. All manufacturing processes are defined as "processes required to change the raw ore or scrap metal into the finished, in-place steel product".
 2. This requirement will not prevent a minimal use of foreign steel provided the total project delivered cost of all such steel which includes the cost of delivering the steel to the project, does not exceed one-tenth of one percent of the total contract cost or \$2,500, whichever is greater.
 - a. If there is any foreign steel permanently incorporated into the project, provide documentation of the project delivered cost of that foreign steel.
 3. Maintain on file certifications that every process, including the application of a coating, performed on steel products either has or has not been carried out in the United States of America.
 - a. This certification applies to every steel product that requires pre-inspection, pretesting, certified test results, or a certificate of compliance.
 - b. Obtain such a certification from each supplier, distributor, fabricator, and manufacturer that has handled each steel product.
 - c. These certifications shall create a chain of custody trail that includes every supplier, distributor, fabricator, and manufacturer that handles the steel product.
 - d. Lack of these certifications will be justification for rejection of the steel product.
 4. Allow Owner and Owner representatives access to this documentation upon request.
 5. Prior to the permanent incorporation into the project of steel products certify in writing that the documentation on file and the steel products are in compliance with this requirement.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
1. Pipe and Fittings, and Specials:
 - a. American Ductile Iron Pipe.
 - b. McWane Ductile.
 - c. US Pipe.
 - d. Or equal.
 2. Compression Sleeve Coupling:
 - a. Smith Blair, Style 411 (steel).
 - b. Dresser, Style 38 (steel).

- c. Romac Industries, Style 400 (steel).
 - d. Or equal.
- 3. Reducing Couplings:
 - a. Smith Blair, Style 415.
 - b. Dresser, Style 62.
 - c. Romac, Style RC501 (ductile).
 - d. Or equal.
- 4. Transition Coupling:
 - a. Smith Blair, Style 413.
 - b. Dresser, Style 62.
 - c. Romac, Style TC400.
 - d. Georg Fischer Waga N.V., Multi-Joint® 3000 Plus, Type 3007.
 - e. Or equal.
- 5. Polyethylene Encasement Tape:
 - a. Chase, Chasekote 750.
 - b. Kendall, Polyken 900.
 - c. 3 M, Scotchrap 50.
 - d. V-Bio Polywrap.
 - e. Or equal.
- 6. Restrained joints:
 - a. American (Flex-Ring).
 - b. U.S. Pipe (TR-Flex)
 - c. Or equal.
- 7. Expansion joints:
 - a. Smith-Blair (Style 611).
 - b. Dresser (Style 63).
 - c. Or equal.
- 8. Dismantling joints:
 - a. Smith-Blair (Style 975).
 - b. Dresser (Style 131).
 - c. Or equal.
- 9. Joint restraints (MJ Fittings):
 - a. EBAA Iron, Inc., Megalug®.
 - b. Star Pipe Products, Stargrip®.
 - c. Or equal.

2.2 MATERIALS

- A. Ductile Iron Pipe:
 - 1. AWWA/ANSI C115/A21.15.
 - 2. AWWA/ANSI C150/A21.50.
 - 3. AWWA/ANSI C151/A21.51.
 - 4. Wall Thickness:
 - a. Pressure Class:
 - 1) Pipe Size 12 inches and smaller: 350 psi unless otherwise noted.
 - 2) Pipe size over 12 inches: 250 psi unless otherwise noted.
- B. Fittings and Flanges:

1. AWWA/ANSI C110/A21.10.
 2. AWWA/ANSI C153/A21.53.
 - a. Do not use for pump suction piping.
 3. AWWA/ANSI C115/A21.15.
 4. Flanges drilled and faced per ASME B16.1 for both 125 and 250 psi applications.
- C. Nuts and Bolts:
1. Buried:
 - a. Tee-head bolts for mechanical joints: Per AWWA/ANSI C111/A21.11.
 - b. Other bolts and nuts: ASTM A307.
 - c. Wax tape Coatings per AWWA C217.
 2. Heads and dimensions per ASME B1.1.
 3. Threaded per ASME B1.1.
 4. Project ends 1/4 to 1/2 inches beyond nuts.
- D. Gaskets:
1. Flanged Joints:
 - a. For pipe sizes between 4 and 64 inches and maximum working pressures not exceeding 250 psig: SBR in accordance with AWWA C111.
 - b. For pipe sizes between 4 and 24 inches and maximum working pressures greater than 250 psig: In accordance with ASME B16.21.
 2. Mechanical and push-on joints: in accordance with AWWA C-111.
 - a. Maximum pressure: 350 psi.
- E. Polyethylene Encasement: Per AWWA/ANSI C105/A21.5.
- F. See Piping Schedules in Section 40 05 01 - Common Work Results for Process Piping.

2.3 MANUFACTURED UNITS

- A. Couplings:
1. Compression sleeve coupling:
 - a. Unit consisting of steel sleeve, followers, Grade 30 rubber gaskets.
 - b. Provide units specified in the MANUFACTURERS Article.
 - c. Supply flanges meeting standards of adjoining flanges.
 - d. The working pressure rating of the entire assembly shall be greater than or equal to the test pressure specified on piping schedule for each respective piping application.
 - e. Provide field coating for buried couplings per AWWA C203.
 1. Restrained Coupling:
 - a. Body and clamp ring: Ductile iron, ASTM A536 grade 65-45-12.
 - b. Gaskets:
 - 1) Potable water: EDPM, NSF 61 approved.
 - 2) Other uses: NBR.
 - c. Bolts, nuts and washers: Type 316 stainless steel.
 - d. Uni/Fiks ring:
 - 1) Polyoxymethylene (POM) and/or glass fiber filled Polyamide.
 - 2) Uni/Fiksers: Type 316 stainless steel.
- B. Joint restraints (MJ Fittings):
1. Gland body, wedges and wedge actuating components: ASTM A536 grade 65-45-12 ductile iron.
 2. Coating: Manufacturer's standard epoxy.

2.4 FABRICATION

- A. Furnish and install without outside coatings of bituminous material any exposed pipe scheduled to be painted.
- B. Furnish cast parts with lacquer finish compatible with finish coat.
- C. Minimum Pressure Class: See article 2.2 A.

2.5 LININGS AND COATINGS

- A. Cement mortar lining: Per AWWA/ANSI C104/A21.4.
 - 1. Standard thickness.
- B. Coating: Manufacturer's standard bituminous coating.
 - 1. Minimum dry film thickness: 1 mil.

2.6 ACCESSORIES

- A. Couplings:
 - 1. For pipe with plain end by plain end (Bolted Sleeve Coupling):
 - a. In accordance with AWWA C219.
 - b. Coupling linings for use in potable water systems: conformance with NSF 61B.
 - c. Rated for appropriate operating pressure and restraint.
 - 2. For pipe with flange by flange ends (Dismantling Joints).
 - a. Self-contained flanged restrained joint fitting, including both flange components and sufficient harness bars to withstand the imposed thrust.
 - b. Design pressure rating: equal to or greater than flange rating.
 - 3. Provide bolts, nuts, and washers (when required) of suitable quality, workmanship, and yield strength to ensure compatibility with the coupling design and rated pressure.
 - a. Select materials to minimize the possibility of galvanic corrosion.
 - 4. See Paragraph 2.2 of this Specification for gasket requirements.
- B. Pipeline Markers and Pipe Locating Tape: See Section 10 14 00 - Identification Devices.
- C. Cathodic Protection: See Section 40 05 01 – Common Work Results for Process Piping.

2.7 SOURCE QUALITY CONTROL

- A. Factory Test:
 - 1. Subject pipe to hydrostatic test of not less than 500 psi with the pipe under the full test pressure for at least 10 seconds.

PART 3 - EXECUTION

3.1 GENERAL

- A. Install piping complete with jointing materials and accessories, anchors, and other appurtenances.
- B. Prepare trench as required in the Contract Documents, including Section 31 23 33 - Trenching and Backfilling.
- C. Unless otherwise permitted by Engineer, maximum length of open trench: 300 linear feet or the amount of pipe that can be installed in a single day, whichever is less.
- D. A. Handling and Storage:
 - 1. Stack pipe no higher than the maximum height given in AWWA C600.
 - a. Alternate bell ends with spigot ends.
- E. Protection of Appurtenances:

1. Wrap buried ductile iron pipe appurtenances with polyethylene, following the procedures of AWWA C600.
- F. Installation of buried bolted joints:
1. Coat buried bolted joints with wax tape then wrap in polyethylene.

3.2 LAYING PIPE

- A. Trenching, bedding material, and backfilling of buried piping: comply with Section 31 23 33 - Trenching and Backfilling, and other relevant requirements of the Contract Documents.
- B. Install piping in accordance with the following:
1. Section 40 05 01 – Common Work Results for Process Piping.
 2. Install piping that will serve as carrier pipe inside casing pipe in accordance with Section 33 05 07.23 - Utility Boring and Jacking.
 3. Install piping that will convey potable water, or water that will be treated to become potable, in accordance with Section 33 14 11 – Water Utility Transmission and Distribution Piping.
- C. Handle pipe with proper equipment in a manner to prevent distortion or damage.
1. Use of hooks, chains, wire ropes, or clamps that could damage pipe, damage coating or lining is not permitted.
 2. Use heavy canvas, or nylon slings of suitable strength for lifting and supporting materials.
- D. Lift pipe during unloading or lifting into trench using one or more slings as required to prevent uncontrolled swinging, damage to pipe, or harm to workers.
1. Design slings to bear uniformly against pipe.
- E. Locate horizontal deflections on alignment as shown on the Drawings.
- F. Locate vertical deflections on alignment, and match pipe angle point locations indicated on the Drawings.
- G. For grades exceeding 10 percent lay pipe in an uphill direction except for short runs that may be allowed by Engineer.
1. Block pipe laid on a downhill grade and hold in place until sufficient support is provided by subsequently installed pipe segment to prevent movement.

3.3 JOINTING

- A. Jointing – General:
1. Join pipe segments and fittings together in accordance with relevant requirement of the Contract Documents, including the Specifications referenced in this Section's "Laying Pipe" Article.
- B. Joining Method – Push-On Mechanical (Gland-Type) Joints:
1. Install in accordance with AWWA/ANSI C111/A21.11.
 2. Assemble mechanical joints carefully according to manufacturer's recommendations.
 3. If effective sealing is not obtained, disassemble, thoroughly clean, and reassemble the joint.
 4. Do not overstress bolts.
 5. Where piping utilizes mechanical joints with tie rods, align joint holes to permit installation of harness bolts.
 6. Apply wax tape per C217, Microcrystalline Wax and Petrolatum Tape Coating Systems for Steel Water Pipe and Fittings.
- C. Joining Method – Push-On Joints:
1. Install in accordance with AWWA/ANSI C151/A21.51.
 2. Assemble push-on joints in accordance with manufacturer's directions.

3. Bevel and lubricate spigot end of pipe to facilitate assembly without damage to gasket.
 - a. Use lubricant that is non-toxic, does not support the growth of bacteria, has no deteriorating effects on the gasket material, and imparts no taste or odor to water in pipe.
4. Assure the gasket groove is thoroughly clean.
5. Flex rubber gasket inward and insert in the gasket recess of the bell socket.
 - a. For cold weather installation, warm gasket prior to placement in bell.
6. Enter spigot end of the pipe into the socket with care used to keep the joint from contacting the ground.
 - a. Complete the joint by forcing the plain end to the bottom of the socket in a manner approved by the Engineer.
7. Check each joint with a feeler gauge to ensure proper installation of the gasket.
8. Mark pipe that is not furnished with a depth mark before assembly to assure that the spigot end is inserted to the full depth of the joint.
9. File or grind field cut pipe joints to resemble a spigot end as recommended by the manufacturer.
 - a. Field cutting allowed only on gauged.
10. Field-cut end repairs are to be done in accordance with the pipe manufacturer's recommendations.
 - a. Taper of bevel: approximately 30 degrees with centerline of pipe and approximately ¼ inches back.

D. Joining Method – Mechanical Joints:

1. Thoroughly clean the last 8 inches outside of the spigot and the inside of the bell to remove oil, grit, excess coating, and other foreign matter from the joint and then paint with a thin film of non-toxic, water soluble gasket lubricant.
2. After preparation of the spigot, slip gland onto the spigot end of the pipe with the lip extension of the gland toward the plain end.
3. Paint the rubber gasket with the gasket lubricant and place on the spigot end with the thick edge toward the gland.
4. Push the entire section of the pipe forward to seat the spigot end in the bell, then press the gasket into place within the bell.
 - a. Locate the gasket evenly around the entire joint.
5. Move the gland toward the bell and center with the gland lip against the gasket.
 - a. Insert all of the bolts and finger tighten nuts.
 - b. Tighten all nuts with a torque limiting wrench following the range of torque given in AWWA C600.
 - 1) Tighten bolts spaced 180 degrees apart alternately in order to produce an equal pressure on all parts of the gland.
6. Deflect joints scheduled for deflection after joint assembly but before tightening the bolts.
 - a. Maximum deflection for mechanical joints: 50-percent of the manufacturers maximum recommended deflection.
7. Apply wax tape per AWWA C217, Microcrystalline Wax and Petrolatum Tape Coating Systems for Steel Water Pipe and Fittings.

E. Cutting:

1. Do not damage interior lining material during cutting.
2. Use abrasive wheel cutters or saws.
3. Make square cuts.
4. Bevel and free cut ends of sharp edges after cutting.

- F. Install polyethylene encasement on all buried piping in full compliance to AWWA/ANSI C105/A21.5.
1. Encase underground appurtenances required as part of installation.
 2. Clean all material to be wrapped prior to wrapping operations.
 3. Do not trap soil or embedment material shall not be trapped between the polyethylene material and the item to be protected during installation.
 4. Secure polyethylene encasement at ends, seams, overlaps and folds by adhesive tape or plastic tie straps approved for such purpose.
 5. Provide sufficient slack in contouring the encasement around buried items to prevent stretching the material where it bridges irregularities and to prevent damage by backfilling operations.
 - a. Make sections 2 feet longer than pipe section to be covered.
 6. Where tapping polyethylene encased pipe, first wrap location of tap with three layers of polyethylene adhesive tape.
 - a. Make tap through tape.
 7. Slip tube over pipe while pipe is suspended immediately before placing in trench.
 8. After installing in trench, pull tube ends over joint and overlap.
 9. Fasten securely in-place on each side of each joint with joint tape or strapping.
 10. Pull loose tube along pipe barrel up snugly around pipe and fasten in-place with joint tape at 3 feet intervals.
 11. Completely cover fittings and connections with film held snugly in-place with joint tape or strapping.
 12. Repair cuts, tears, punctures and other damage to the polyethylene material with adhesive tape and a short length of additional polyethylene material, if needed.
 - a. Allow Engineer to inspect all repairs prior to all backfilling activities.
- G. Install restrained joint systems where shown on the drawings.

3.4 FIELD QUALITY CONTROL

- A. Test piping systems in accordance with Section 40 05 01 - Common Work Results for Process Piping, and requirements of the Specifications cross-referenced in this Section's "Laying Pipe" Article.

END OF SECTION

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SECTION 33 14 11
WATER UTILITY TRANSMISSION AND DISTRIBUTION PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. General provisions applicable to all water transmission and distribution piping, valves and hydrants.
2. Appurtenant Work required for buried piping used for water transmission and distribution, including:
 - a. Water service laterals, two-inch diameter and smaller, including connections to waterlines, corporation stops, piping, curb stops, and appurtenances.
 - b. Tapping sleeves and valves, three-inch diameter and larger.
 - c. Blow-off assemblies.

B. Related Requirements: Include, but are not necessarily limited to:

1. Section 02 41 00 - Demolition.
2. Section 03 00 05 - Concrete.
3. Section 10 14 00 - Identification Devices.
4. Section 31 20 01 - Earth Moving.
5. Section 31 23 33 - Trenching and Backfilling.
6. Section 33 05 19 - Ductile-Iron Utility Pipe.
7. Section 40 05 01 - Common Work Results for Process Piping.
8. Section 40 05 51 - Common Requirements for Process and Utility Valves.
9. Section 40 05 52 - Miscellaneous Valves.
10. Section 40 05 61 - Gate Valves.
11. Section 40 05 64 – Butterfly Valves.

1.2 REFERENCES

A. Terminology:

1. Terminology indicated below are not defined terms and are not indicated with initial capital letters, but when used in this section have the meaning indicated below:
 - a. "Service lateral" means piping and appurtenances conveying potable water between water distribution piping and a building or structure to which potable water will be supplied. In this Section, "service lateral" refers only to piping two-inch diameter and smaller. Service laterals include a connection to the water distribution piping, corporation stop, buried service lateral piping, a curb stop and box, and other appurtenances. In this Section, the terms "service lateral" and "water service lateral" have the same meaning.
 - b. "Water transmission and distribution piping" means the principal piping conveying potable water under pressure. Transmission piping generally refers to larger-diameter piping intended to convey greater quantities of water over distance, whereas distribution piping generally refers to piping delivering water to service laterals. However, service laterals and branch connections may also be connected to transmission piping. In this Section, the terms "water transmission and distribution piping", "waterline", "water main", and, unless obviously intended otherwise, "pipe", and derivative terms, have the same meaning.

B. Reference Standards: Standards referenced in this section include, but are not necessarily limited to, the following:

1. American Association of State Highway and Transportation Officials (AASHTO):
 - a. Load and Resistance Factor Design (LRFD) Bridge Design Specifications.
2. American Water Works Association (AWWA):
 - a. C223, Fabricated-Steel and Stainless-Steel Tapping Sleeves.
 - b. C600, Installation of Ductile-Iron Mains and Their Appurtenances.
 - c. C604, Installation of Buried Steel Water Pipe - 4 In. (100 mm) and Larger.
 - d. C605, Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings.
 - e. C800, Underground Service Line Valves and Fittings.
 - f. C810, Replacement and Flushing of Lead Service Lines.
 - g. Manual M55, PE Pipe, Design and Installation.
3. Manufacturers Standardization Society (MSS) of the Valve and Fittings Industry:
 - a. SP-60, Connecting Flange Joints between Tapping Sleeves and Tapping Valves.
 - b. SP-111, Gray-Iron and Ductile-Iron Tapping Sleeves.
4. National Sanitation Foundation International (NSF):
 - a. 61, Drinking Water System Components – Health Effects.
5. Plastics Pipe Institute (PPI):
 - a. Polyethylene Piping Systems Field Manual for Municipal Water Applications.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Drinking water utility owner (when other than the Owner):
 - a. Coordinate with water utility owner affected by the Work and obtain from such entity requirements for connecting to existing waterlines, when such connections are part of the Work.
 - b. Obtain and pay for work permits, street opening permits, and other permits required by water utility owner and owners of affected streets, highways, and other rights of way.
 - c. Give written notices required by water utility owner and owners of streets, highways, and other rights of way.
2. Notice to Emergency Services:
 - a. Give required advance, oral and written notices to fire departments, police departments having jurisdiction, ambulance services, and other emergency services as applicable, of proposed construction operations that may impact or affect emergency services' ability to perform their respective functions.
 - b. Give such notices as indicated immediately below for notice to affected water utility customers.
3. Notice to affected water utility customers:
 - a. Give reasonable, advance written notice to owners and occupants of properties directly affected by water service lateral Work, regardless of size of water service piping.
 - b. Give such notice not less than two days prior to when such property will or may be affected by water service lateral Work (regardless of size of water service piping) and again not less than 24 hours prior to such property being affected by the Work.
 - c. Such notices to properties shall clearly indicate intended dates the properties water service will be affected and scheduled end-date of such activity, and a brief summary of the ways the property will be affected during the Project's construction. Provide notices on Contractor's letterhead and indicate the Project name, Owner, Owner's project or contract number (if any), and Contractor's contact person with telephone number and office hours.
 - d. Promptly furnish copies of such notices, as Submittal, upon request of Owner, Engineer, or other authority having jurisdiction.

B. Sequencing and Scheduling:

1. Existing service laterals connected to existing waterlines shall remain in place and fully operational until new waterline to which service laterals will be connected is substantially complete and ready for its intended use.
2. Do not interrupt water service to buildings and structures for longer than eight continuous hours, with only one shut down per service lateral (regardless of size of piping). Disinfect service laterals (regardless of size of piping) in accordance with the Contract Documents prior to conclusion of associated service shut down for transferring the service lateral (regardless of size of piping) to the new waterline.
3. The Work will not be eligible to be certified as substantially complete until service laterals (regardless of size of piping) associated with existing buildings and structures served by existing water line, are completed in accordance with the Contract Documents and operational.
4. Sequencing requirements for testing, disinfecting, and connecting new service laterals (regardless of size of piping) to waterlines are in this Section's "Installation" Article.

1.4 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer of Service Saddles, Corporation Stops, Service Lateral Piping, Curb Stops, and Tapping Sleeves and Valves:
 - a. Obtain service saddles from a single service saddle manufacturer unless otherwise acceptable to Engineer. Such manufacturer shall be a business regularly engaged in manufacturing service saddles of the size, material, and pressure capacity required. Upon request, furnish Submittal documenting manufacturer's record of furnishing required service saddles, in quantities similar to those required for the Work, for not less than five projects during the five year period immediately prior to the Effective Date of the Contract.
 - b. Obtain corporation stops from a single corporation stop manufacturer unless otherwise acceptable to Engineer. Such manufacturer shall be a business regularly engaged in manufacturing corporation stops of the size, material, and pressure capacity required. Upon request, furnish Submittal documenting manufacturer's record of furnishing required corporation stops, in quantities similar to those required for the Work, for not less than five projects during the five year period immediately prior to the Effective Date of the Contract.
 - c. Obtain service lateral piping of each type proposed from a single pipe manufacturer unless otherwise acceptable to Engineer. Such manufacturer shall be a business regularly engaged in manufacturing service lateral pipe of the size, material, and pressure capacity required. Upon request, furnish Submittal documenting manufacturer's record of furnishing required materials, in quantities similar to those required for the Work, for not less than five projects during the five year period immediately prior to the Effective Date of the Contract.
 - d. Obtain curb stops from a single curb stop manufacturer unless otherwise acceptable to Engineer. Such manufacturer shall be a business regularly engaged in manufacturing curb stops of the size, material, and pressure capacity required. Upon request, furnish Submittal documenting manufacturer's record of furnishing required curb stops, in quantities similar to those required for the Work, for not less than five projects during the five year period immediately prior to the Effective Date of the Contract.
 - e. Obtain tapping sleeves and valves (TS&V) from a single TS&V manufacturer unless otherwise acceptable to Engineer. Such manufacturer shall be a business regularly engaged in manufacturing TS&Vs of the size, material, and type required. Upon request, furnish Submittal documenting manufacturer's record of furnishing required TS&Vs, in quantities similar to those required for the Work, for not less than five projects during the five year period immediately prior to the Effective Date of the Contract. Tapping sleeves and associated valves may be obtained from separate manufacturers.

2. Installer of Water Transmission and Distribution Piping:
 - a. Installer of water transmission and distribution piping shall be entity possessing not less than five years of similar, relevant experience to the water transmission and distribution piping Work required under this Section and shall have completed not less than five projects installing substantively similar piping materials (including lining) of similar size to that required for the Work. Installer shall be able to document having installed not less than 5,000 linear feet combined total of such projects, excluding piping six-inch diameter and smaller.
 - b. Submit documentation of compliance with qualifications requirements of this provision. For each project, indicate water utility owner (including organization name, current contact person knowledgeable concerning installers work, city and state, telephone number, and email address), project designation, and narrative summary of quantities of water transmission and distribution piping work performed, including indication of sizes, pipe materials, and pipe lining (if any), together with other pertinent information.
3. Installer of taps in existing water transmission and distribution piping:
 - a. Installer of taps in existing water transmission and distribution piping, provided by drilling or otherwise penetrating through wall of existing piping, shall be entity possessing not less than five years of similar, relevant experience to the tapping Work required under this Section, and shall have completed not less than 50 water service laterals tapped into existing water transmission or distribution piping similar in size, pipe material, pipe wall thickness, and lining material during the past five years and five tapping sleeves and valves into existing water transmission or distribution piping similar in size, pipe material, pipe wall thickness, and lining material where tapping sleeves are required for the Work, during the past five years.
 - b. Submit documentation of compliance with qualifications requirements of this provision. For each project, indicate water utility owner (including organization name, current contact person knowledgeable concerning installers work, city and state, telephone number, and email address), project designation, and narrative summary of quantities of relevant tapping work performed, including indication of sizes, pipe materials, and pipe lining (if any), together with other pertinent information.

1.5 SUBMITTALS

A. Action Submittals: Submit the following:

1. Product Data:
 - a. Submit manufacturer's published information, including catalogs, specifications, and indication of specific reference standards with which materials comply, for each item specified in this Section, unless such information is furnished as part of a Submittal under another Specifications section. Furnish such information for each size and type of item required.
 - b. Clearly mark on product data Submittals proposed items and clearly indicate, via cross-outs or other method, items not proposed for the Work.

B. Informational Submittals: Submit the following:

1. Manufacturer Instructions:
 - a. Instructions for handling, storing, installing, and startup of items furnished under this Section.
 - b. Instructions of pipe manufacturer for tapping water transmission and distribution piping.
 - c. Instructions of manufacturer of equipment, machinery, and tools used for tapping pipe.
2. Field Quality Control Submittals:
 - a. Written results of field tests and inspections required under this Section, including clear indication whether such results comply with criteria for acceptance indicated in the Contract Documents.
3. Qualifications:
 - a. Manufacturers, when requested by Engineer.

C. Closeout Submittals: Submit the following:

1. Operation and Maintenance Data:
 - a. Submit, for operable items such as valves, where operation and maintenance data is not otherwise furnished under other Specifications sections.
2. Record Documentation:
 - a. Clearly and accurately indicate location of each service lateral, tapping sleeve and valve, blow-off assembly, and appurtenances, as applicable, on record drawings required in accordance with the Contract Documents.
 - b. Furnish record drawing details of individual service laterals provided when service lateral installation involved unique conditions, such as adjacent Underground Facilities, and for service laterals three-inch diameter and larger.

PART 2 - PRODUCTS

2.1 WATER TRANSMISSION AND DISTRIBUTION SYSTEMS

A. Description:

1. Provide all materials, equipment, labor, construction equipment and machinery, tools, services, and incidentals necessary, required, or both, to furnish and install water transmission and distribution systems in accordance with the contract documents.
2. Specifications for such Work are in this Section and other sections of the Contract Documents.
3. Required water transmission and distribution Work is shown on the Drawings.

B. Materials and Equipment:

1. Materials and equipment furnished under this Section shall be certified in accordance with NSF 61.
2. Wetted surfaces of piping, including fittings, valves, and similar items, shall contain not more than 0.25 percent lead by average weight.
3. The following are indicated in other Specifications:
 - a. Water Transmission and Distribution Piping (other than service laterals): Specifications on waterline piping in Division 33 - Utilities [and Division 40 - Process Interconnections].
 - b. Thrust Restraint for Water Transmission and Distribution Piping (other than service laterals): Specifications on waterline piping in Division 33 - Utilities and Division 40 - Process Interconnections (regarding restrained gaskets and proprietary joint restraint systems), and Section 40 05 01 - Common Work Results for Process Piping (relative to thrust blocking and harnessing).
 - c. Detectable Warning Tape for Buried Piping: Section 10 14 00 - Identification Devices.
 - d. Inline Valves (unless otherwise specified in this Section): Specifications for valves in Division 40 - Process Interconnections.
 - e. Air/Vacuum Valves, Air Release Valves, and Combination Air Valves: Section 40 05 52 - Miscellaneous Valves.
 - f. Aggregates for Earth Work and other types of backfill: Section 31 20 01 - Earth Moving and Section 31 23 33 - Trenching and Backfilling.
 - g. Concrete: Section 03 00 05 - Concrete.
4. The types of Work expressly indicated in this Section are set forth in Paragraph 1.1.A of this Section.

2.2 SERVICE LATERALS

A. Manufacturers:

1. Service Saddles: Subject to compliance with the Contract Documents, provide required quantity of one of the following:
 - a. A.Y. McDonald Mfg

- b. Ford Meter Box.
 - c. Mueller.
 - d. Robar.
 - e. Romac.
 - f. Smith-Blair.
 - g. Or equal.
 - 2. Corporation Stops: Subject to compliance with the Contract Documents, provide required quantity of one of the following:
 - a. A.Y. McDonald Mfg.
 - b. Ford Meter Box.
 - c. Mueller.
 - d. Cambridge Brass.
 - e. Or equal.
 - 3. Service Fittings: Subject to compliance with the Contract Documents, provide required quantity of one of the following:
 - a. Ford Meter Box.
 - b. Mueller.
 - c. Cambridge Brass.
 - d. Or equal.
- B. Description:
- 1. Provide materials, equipment, services, and all other Work necessary, required, or both, to furnish and install water service laterals.
 - 2. Unless otherwise shown or indicated, or directed by Engineer, each water service lateral provided under this Article shall include service saddle, corporation stop, service fittings, and service lateral piping.
 - 3. For each water service connection three-inch diameter and larger, provide tapping sleeve and valve rather than water service lateral as required in this Article. For such connections, provide water service piping of the required size to property right-of-way line, unless otherwise indicated, and provide watertight end coupling on piping serving such property.
 - 4. Quantity of Required Service Laterals:
 - a. In general, locations of required service laterals to individual residences, businesses, buildings, and structures, are not shown. Provide water service lateral to each residence, business, building, structure, and property, regardless whether such property is occupied by existing residence, business, building, or structure.
 - b. Unless shown or indicated otherwise in the Contract Documents, service laterals shall be nominal 0.75-inch diameter.
 - c. For multi-residence buildings where service laterals will be connected directly to public waterline, provide one service lateral for each residence therein when such building has four or fewer residential units, unless otherwise shown on the Drawings. When required size and location of service lateral for multi-residence building is greater in number than indicated in this paragraph, is not shown or indicated on the Drawings, provide one 2-inch diameter service lateral for such building, at location directed at the Site by Engineer, in consultation with owner of such property.
 - d. For buildings with multiple business or institutional occupants, where service laterals will be connected directly to public waterline, provide one service lateral for each business or institutional occupant therein when such building has 10 or fewer business or institutional occupants, unless otherwise shown on the Drawings. When required size and location of service lateral for building with business or institutional occupants greater in number than indicated in this paragraph, is not shown or indicated on the Drawings, provide one 3-inch diameter service lateral for such building, at location directed at the Site by Engineer, in consultation with owner of such property.

- e. When size and location of service laterals for industrial, office, and other types of buildings, structures, or properties is not shown or indicated on the Drawings, obtain interpretation or clarification from Engineer before proceeding with associated service laterals Work.
 - f. When service lateral is provided for vacant property, size of service lateral will be based on property's existing zoning. Provide service laterals at locations directed at the Site by Engineer, in consultation with owner of such property (when reasonably available).
- C. Performance Criteria:
- 1. Pressure Classification:
 - a. Water service lateral components shall be appropriate for working pressure of 150 psig at 100 degrees F, unless shown or indicated otherwise in the Contract Documents.
- D. Materials and Fabrication:
- 1. Materials and Fabrication – General:
 - a. Provide service laterals two-inch diameter and smaller, in accordance with AWWA C800.
 - b. Materials of service lateral components shall minimize corrosion resulting from galvanic action.
 - c. Threaded connections, where provided: NPT.
 - 2. Service Saddles:
 - a. Service Saddles – General:
 - 1) Provide service saddles with bodies with threaded outlets, seals, and suitable means for attachment to water distribution pipe.
 - 2) Bodies shall conform to outside configuration of water distribution pipe.
 - 3) Provide drip-tight connection when used as service connection to water distribution pipe.
 - b. Flow passage through service saddle outlet shall be of sufficient size to accommodate drilling or tapping equipment used to provide water service lateral of nominal diameter required.
 - c. Service saddle dimensions and size restrictions shall be in accordance with AWWA C800.
 - d. Appropriate for material and size of water distribution pipe on which service saddle will be installed and in accordance with service saddle manufacturer's written instructions for associated water distribution pipe.
 - e. Saddle Attachment to Host Pipe:
 - 1) Type:
 - a) Single strap extending around entire circumference of host pipe, with two-piece with fastening hardware].
 - 2) Materials:
 - a) Strap: Bronze with manufacturer's standard fastening hardware.
 - f. Tapping Boss:
 - 1) Materials:
 - a) Brass.
 - b) Ductile iron with nylon protective exterior coating or fusion-bonded epoxy coating.
 - 2) O-ring gasket, service saddle manufacturers standard material.
 - 3) Service saddle manufacturers standard fastening hardware and appurtenant materials.
 - 3. Corporation Stops:

- a. Watertight under operating pressure equal to required pressure classification when fully closed.
 - b. Size: Sufficient to accommodate drilling or tapping water distribution piping to provide service lateral nominal diameter not less than that required by the Contract Documents.
 - c. Corporation stops up to and including two-inch diameter shall be ball corporation valves.
 - d. Material: Brass alloy, unless otherwise approved by Engineer. Fluorocarbon coated ball.
 - e. Provide corporation stops 1.5-inch diameter and larger with O-ring or other gasket type.
 - f. Connections: Inlet connection shall be threaded. Provide compression-type outlet connections unless otherwise approved by Engineer.
4. Service Fittings:
- a. Provide service fittings as necessary for the Work, including requirements (if any) on the Drawings. Service fittings include compression, pack joint, copper flare, straight couplings, threaded, service tees, U-branch, Y-branch, pipe plugs, bushings, insert stiffeners, other adapters, and similar items necessary, required, or both, for a complete, functional water service lateral system.
 - b. Provide insert stiffeners for polyethylene service lateral piping.
 - c. Material: Copper alloy appropriate for service conditions and environment, unless other material is approved by Engineer.
 - d. Size: Sufficient for required nominal diameter of water service lateral.
 - e. End connections: Threaded, compression, or flared, as appropriate.
 - f. Compression connections, copper tube flare connections, and swivel connections, when provided, shall seal to retain service lateral piping without slippage at pressure classification required for the associated service lateral.
5. Service Lateral Piping:
- a. Unless shown or indicated otherwise in the Contract Documents, provide water service lateral piping as indicated in this provision.
 - b. Polyethylene, in accordance with AWWA C901 and AWWA C906.
6. Installation Markers:
- a. Provide watertight plug, end coupling, or similar item, compatible with material to which plug or end coupling is connected, removeable when private water service lateral piping is extended to associated building or structure.
 - b. When curb stop is located within right-of-way, provide water service lateral piping to right-of-way boundary.
 - c. Where water service lateral end is within lawn or landscaped area, provide hardwood stake, with head not less than two square inches, to mark surface location of end of water service lateral provided. Such stake shall be not less than 12 inches long and, after installation, shall protrude above finished grade by not more than 0.75-inch.
 - d. Where water service lateral end is within area other than lawn or landscaped area, provide no. 4 reinforcing steel rod to mark surface location of end of water service lateral provided. Such rod shall be not less than one foot long and, after installation, shall protrude above finished grade by not more than 3/8-inch. Do not provide in areas paved with Portland cement concrete, asphalt concrete, or other hard surfacing; for such areas, obtain interpretation or clarification from Engineer before marking end of water service lateral.

2.3 TAPPING SLEEVES AND VALVES

A. Products and Manufacturers:

- 1. Tapping Sleeves: Subject to compliance with the Contract Documents, provide required quantity of one of the following:
 - a. Ford Meter Box.

- b. Mueller.
 - c. Robar.
 - d. Tyler Union.
 - e. American Flow Control.
 - f. Or equal.
 - 2. Tapping Valves: Subject to compliance with the Contract Documents, provide required quantity of one of the following:
 - a. Mueller (wedge type gate valves).
 - b. American Flow Control (resilient wedge gate valve).
 - c. M&H Valve (resilient wedge gate valve, four-inch through 12-inch diameter).
 - d. Matco-Norca (resilient wedge gate valve, four-inch through 12-inch diameter).
 - e. Or equal.
- B. Description:
- 1. Provide tapping sleeve and valve at each location where new waterline or water service lateral larger than two-inch diameter is required, when connected to waterline, three-inch diameter through 24-inch diameter, existing prior to the Effective Date of the Contract.
 - 2. Provide watertight tapping sleeves and valves suitable for operating pressures and hydrostatic test pressures required.
 - 3. Where connecting piping will be smaller than three-inch diameter, provide service lateral in accordance with service lateral requirements of this Section.
- C. Performance Criteria:
- 1. Pressure Classification:
 - a. Tapping sleeves working pressure rating: 200 psig at 100 degrees F, unless shown or indicated otherwise in the Contract Documents.
 - b. Tapping valves working pressure:
 - 1) Valves 3-inch through 12-inch diameter: 350 psig at 100 degrees F, unless shown or indicated otherwise in the Contract Documents.
 - 2) Valves larger than 12-inch diameter: 250 psig at 100 degrees F, unless shown or indicated otherwise in the Contract Documents.
- D. Materials and Fabrication:
- 1. Tapping Sleeves and Valves Materials and Fabrication - General:
 - a. Tapping sleeves and their associated tapping valves shall be suitable for use as a system, providing watertight connections and free of galvanic corrosion potential.
 - b. Tapping sleeves and valves shall be suitable for the tapping equipment used and shall support providing required nominal outlet diameter in existing pipe.
 - 2. Tapping Sleeves:
 - a. Type: Tee-type with one outlet per tapping sleeve. Tapping crosses are unacceptable.
 - b. Reference Standards:
 - 1) Type 316 stainless steel, in accordance with AWWA C223.
 - 2) Ductile iron in accordance with MSS SP-111.
 - c. Size:
 - 1) Suitable for existing pipe size and material that will be tapped, nominal diameter as shown or indicated on the Drawings. If information is available regarding existing pipe material and outside diameter, Owner will furnish such information to Contractor via Engineer, upon Contractor's written request. Contractor is responsible for field-verifying dimensions prior to purchasing tapping sleeves.
 - 2) Outlet nominal diameter as shown or indicated on the Drawings.
 - d. Outlet Connection Type: Flanged, in accordance with MSS SP-60.

- e. Provide 0.75-inch diameter, threaded plug on outlet suitable for testing.
 - f. Gasket Type: 360 degrees around entire, interior surface of tapping sleeve with integral gap bridge. Provide tapping sleeve with bridging plate, coordinated with gasket providing watertight interface between tapping sleeve halves at rated pressure classification. Provide gasket at outlet connection.
 - g. Gasket Material: EPDM rubber.
 - h. Fastening Hardware: Manufacturer's standard for tapping sleeve furnished. Fastening hardware material shall not result in galvanic corrosion with tapping sleeve or other, connected material.
3. Tapping Valves:
- a. Tapping valve shall be compatible with tapping equipment used for tapping existing pipe and associated tapping sleeve.
 - b. Valve Type: Resilient seated, wedge-type, gate valves.
 - c. Size: Nominal diameter equal to required size of tapping sleeve outlet.
 - d. Joint Connections: Mechanical joint-by-flanged.
 - e. Non-rising stem.
 - f. Provide valve box and cover as required in accordance with Section 40 05 57 - Actuators for Process Valves and Gates.
 - g. Unless otherwise required in this Section, comply with Section 40 05 51 - Common Requirements for Process and Utility Valves and Section 40 05 61 - Gate Valves.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions:
- 1. Comply with requirements of the General Conditions, as may be modified by the Supplementary Conditions relative to locating and protecting existing Underground Facilities.
 - 2. Field-verify material, outside diameter, and condition of existing water transmission and distribution piping where service laterals, tapping sleeves and valves, and similar Work will connect to, or otherwise affect, existing Underground Facilities.
 - 3. When connecting new transmission or distribution piping to existing transmission or distribution piping, expose existing piping joints where such connection is required to verify joint types and whether joints are restrained, prior to performing the required connection.
- B. Installing the Work constitutes Contractor's approval of underlying work, subgrades, substrates, and field conditions prevailing at the time of the Work.

3.2 PREPARATION

- A. Demolition and Removal:
- 1. Perform removals of site improvements, such as pavement, sidewalks, curbs, gutters, and similar areas, as well as removal of existing Underground Facilities (when required) in accordance with Section 02 41 00 - Demolition.
- B. Excavation and Related Work:
- 1. Perform excavating and filling Work in accordance with Section 31 20 01 - Earth Moving and Section 31 23 33 - Trenching and Backfilling].

3.3 INSTALLATION

- A. Installation Requirements – General:
- 1. Install the Work in accordance with the Contract Documents, Laws and Regulations, permits and approvals issued by authorities having jurisdiction, and manufacturer's written

instructions. In event of conflict among such requirements, obtain Engineer's interpretation or clarification before proceeding with the associated Work.

2. Install water transmission and distribution piping, including thrust restraints, in accordance with Section 40 05 01 - Common Work Results for Process Piping, and the Specifications for the associated type of piping in Division 33 – Utilities, Division 40 - Process Interconnections, and this Section.
3. Install inline valves, including valves on hydrant service piping, in accordance with Section 40 05 51 - Common Requirements for Process and Utility Valves and the Specifications for the associated type of valve in Division 40 - Process Interconnections.
4. Install air valves (such as air/vacuum valves, air release valves, and combination air valves), in accordance with Section 40 05 51 - Common Requirements for Process and Utility Valves, Section 40 05 52 - Miscellaneous Valves, and other requirements of the Contract Documents.
5. When portion of existing water transmission or distribution piping is required to be cut and disconnected from adjacent, existing water transmission or distribution piping, prior to cutting such piping, expose pipe joints and determine extent, if any, of restrained joints on existing piping that will remain in service following such Work. Engineer may direct providing additional restraints on existing pipe joints, via appropriate Contract modification or allowance authorization (when applicable). Provide temporary bracing of existing piping to remain in service until permanent joint restraints are provided.
6. Proximity of Waterlines and Sewers or Other Sources of Potential Contamination:
 - a. Unless otherwise shown or indicated in the Contract Documents, install water transmission and distribution piping, including service laterals not less than 10 feet horizontally from existing and proposed gravity or pressurized sanitary sewers, combined sewers, storm sewers, septic tanks, absorption fields, surface water treatment systems (whether for wastewater or stormwater), petroleum or other liquid hydrocarbons piping and storage tanks and other, similar, facilities, as measured from exterior surfaces of such facilities and piping. Similarly, provide not less than 1.5 feet vertical separation between water transmission and distribution piping and such sources of potential contamination, with waterline preferably above, unless otherwise shown or indicated.
 - b. At crossings of waterlines and sewers or similar sources of potential contamination, center a full (18-foot or 20-foot, as applicable) section of waterline pipe on the sewer or other potential contamination source, with waterline joints equidistant from the other, crossing piping. For such crossings, backfill entire width of trench at crossing of piping with granular structural fill above required top of pipe bedding material. Unless shown or indicated, provide the fill material required in this paragraph up to horizontal centerline of the upper piping.
 - c. Waterline may be installed a horizontal distance less than 10 feet from sewer or other potential source of contamination when crown of sewer piping or top of other sources of potential contamination is not less than 1.5 feet below invert of waterline.
 - d. Waterlines shall not pass through or physically touch manholes, chambers, or vaults, whether at ground surface, buried, or partially buried, serving existing or proposed sanitary sewer, combined sewer, storm sewer, or other source of potential contamination.
 - e. When Contractor is unable to comply with this provision's requirements concerning separation of waterlines and sewers or other sources of potential contamination, promptly give written notice of differing subsurface or physical conditions as required elsewhere in the Contract Documents.
7. Cleanliness of Piping Interior and Temporary Capping of Piping:
 - a. Continuously maintain interior of all water transmission and distribution piping, service laterals, and related piping and appurtenances free of dirt, foreign material, and other deleterious matter.

- b. If, in Engineer's opinion, piping, appurtenances, or any combination thereof, contains dirt, foreign material, or other deleterious matter that cannot be removed by flushing, remove such matter by other means and swab pipe interior with bactericidal solution.
- c. At end of each workday, and when Contractor's workers are absent from Site, plug, cap or otherwise provide watertight covering over open ends of pipe to prevent ingress of foreign material, liquid, humans, animals, and insects.
- d. Maintain such secure, watertight temporary covers when Contractor has failed to maintain groundwater surface level below bottom of excavation as required by the Specifications on earth work and temporary dewatering of excavations in Division 31 - Earthwork.

B. Installation Requirements – Service Laterals:

1. Service Lateral Installation – General:

- a. Requirements in this "Installation Requirements – Service Laterals" provision are generally intended for service laterals two-inch diameter and smaller. Provide service laterals three-inch diameter and larger, when required, by providing tee and valve on outlet, or tapping sleeves and valves on associated water transmission or distribution piping, rather than service saddles, corporation stops, and curb stops and boxes.
- b. Provide service laterals perpendicular to street or right-of-way boundary.
- c. Perform service lateral connections to water transmission and distribution piping in the presence of Owner, Engineer, or Owner's Representative.

2. Tapping of Pipes and Corporation Stop Installations:

a. Locations:

- 1) Refer to "Description" provision of this Section's "Service Laterals" Article.
- 2) Unless otherwise directed, provide service lateral connections at 2 o'clock and 10 o'clock locations on circumference of water transmission or distribution piping.
- 3) When not shown on the Drawings, provide service lateral connection at locations as directed by Owner, Engineer, or Owner's Representative at the Site, in consultation with owner of property that will be served by associated service lateral (when such property owner is reasonably available for such consultation). Physically mark such locations on water transmission and distribution piping prior to commencing tapping.
- 4) When multiple taps are required in proximity to each other, provide taps not less than two feet apart along length of associated water transmission or distribution piping and staggered (on pipe circumference) so that spacing of taps at same orientation on pipe circumference are not closer than four feet.
- 5) Do not tap pipe within three feet of pipe joint.
- 6) Do not tap pipe on fittings.

b. Equipment:

- 1) Provide and use for tapping water transmission and distribution piping only construction equipment and machinery specifically manufactured for use in tapping piping, suitable for the pipe material and lining.
- 2) Cutting heads shall be sharp and appropriate for the intended purpose.

c. Tapping – General:

- 1) Properly disinfect tapping equipment, machinery, tools, corporation stops, and service fittings before each comes into contact with potable water or water that will be treated to become potable.
- 2) Comply with written operating instructions of manufacturer of tapping equipment, machinery, and tools.
- 3) Provide and use smooth-jawed adjustable wrenches that fully and evenly engage corporation stop wrenching flats. Loose-fitting wrenches and pipe wrenches are unacceptable. Place wrenches only on corporation stop body wrench flats. Do not

use rounded areas of corporation stop body for tightening into pipe or saddle. Wrenching on other areas of corporation stop is unacceptable.

- 4) During tapping, cover pipe adjacent to tap with protective blanket.
- 5) Tapping Using Service Saddles:
 - a) Center service saddle tapping boss over intended location of tapped connection.
 - b) Attach service saddle to pipe, seat at intended location, and tighten fastening hardware in accordance with manufacturer's written instructions.
 - c) Install corporation stop using pipe thread sealant.
 - d) Install tapping equipment through installed corporation stop and cut hole in pipe.
 - e) Remove tapping equipment and close corporation stop.
- 6) Direct Tapping:
 - a) Center tapping equipment over intended location of tapped connection.
 - b) Install tapping equipment through corporation stop and cut hole in pipe.
 - c) Fully install corporation stop threads through pipe wall using pipe thread sealant.
 - d) Remove tapping equipment and close corporation stop.
- 7) To maximum extent practicable:
 - a) Avoid discharging cuttings into water transmission or distribution pipe.
 - b) Remove "coupon" cut from pipe wall.
 - c) Avoid damaging pipe lining, except as necessary to provide clean, square-edged hole in pipe wall.
- 8) Visually confirm absence of leakage at tapped connection and corporation stop.
- d. Tapping of PVC Pipe:
 - 1) Tap PVC pipe for service laterals in accordance with AWWA C605, unless otherwise indicated in this Section.
- e. Tapping of Ductile Iron and Cast Iron Pipe:
 - 1) Tap ductile iron pipe and cast iron pipe for service laterals in accordance with AWWA C600, unless otherwise indicated in this Section.

3. Service Lateral Piping Installation:

- a. Excavation and backfilling for water service lateral piping, including requirements for pipe bedding material, shall be in accordance with Section 31 23 33 - Trenching and Backfilling.
- b. Installed depth of crown of service lateral piping shall be in accordance with Laws and Regulations and, in no event, shall be less than one foot below elevation sufficient to prevent freezing and damage from cold temperatures.
- c. Install service lateral piping in accordance with AWWA C800, this Section and other relevant requirements of the Contract Documents.
- d. Provide service lateral fittings installation in accordance with fitting manufacturer's written instructions.
- e. When connecting service lateral piping to corporation stop, use two wrenches in making the connection. Use one wrench to support corporation stop or curb stop (as applicable) and use second wrench to tighten service connection.
- f. For polyethylene tubing and copper tubing, snake piping in trench to compensate for thermal expansion and contraction.
- g. For polyethylene service lateral piping, provide underground detectable warning tape in accordance with Section 10 14 00 - Identification Devices.
- h. Perform service lateral piping hydrostatic testing before backfilling, to facilitate leak detection and remedial actions.

4. Surface Markings:
 - a. For each service lateral provided, provide surface marking, visible at finished grade, indicating location of end of service lateral provided by Contractor.
 - b. Provide surface markings in accordance with "Service Laterals" Article in this Section.
- C. Installation Requirements – Tapping Sleeves and Valves:
 1. This provision applies to providing new piping connection to existing water transmission or distribution piping, where new, connected piping will be three-inch diameter or larger, regardless of whether such new, connected piping will serve a single property or multiple properties.
 2. Locations:
 - a. Provide tapping sleeves and valves at locations shown or indicated on the Drawings.
 - b. Provide tapping sleeves not less than [three] feet from bell end, spigot end, or other, applicable type of pipe joint. When insufficient space is available for tapping sleeve installation, obtain interpretation or clarification from Engineer before proceeding. When applicable, comply with the Contract's requirements concerning giving notice of different subsurface or physical conditions.
 - c. Unless otherwise shown or indicated, provide tapping sleeve outlet oriented in same horizontal plane as horizontal centerline of associated water transmission or distribution piping.
 3. Tapping Sleeves and Valves - General:
 - a. Connections to cast iron pipe, ductile iron pipe, PVC pipe, polyethylene pipe, and asbestos cement pipe:
 - 1) Such connections may be performed while existing piping remains in service and pressurized.
 - 2) Clean exterior surfaces of pipe at connection point to provide smooth surface for tapping sleeve installation.
 - 3) Properly secure tapping sleeve to pipe to prevent movement during tapping.
 - 4) Prior to tapping, test tapping sleeve as follows:
 - a) Hydrostatically test tapping sleeve at the greater of 1.5 times local static pressure of existing piping or 150 psig.
 - b. Operate tapping equipment, machinery, and tools in accordance with manufacturer's written operating instructions. During setup, tapping, and removal of tapping equipment and machinery, support tapping equipment and machinery independent of piping, tapping sleeve, and valve.
 - c. Comply with MSS SP-60.
 - d. During tapping, cover pipe adjacent to tap with protective blanket.
 - e. To extent applicable, install valve with valve box and cover in accordance with Section 40 05 51 - Common Requirements for Process and Utility Valves and Section 40 05 61 - Gate Valves.
 4. Installation Requirements by Type of Pipe:
 - a. Tapping of PVC Pipe:
 - 1) Tap PVC pipe in accordance with AWWA C605, unless otherwise indicated in this Section.
 - b. Tapping of Ductile Iron and Cast Iron Pipe:
 - 1) Tap ductile iron pipe and cast iron pipe in accordance with AWWA C600, unless otherwise indicated in this Section.
 - 2) When tapping sleeve is installed on piping with polyethylene encasement, remove polyethylene encasement from area where tapping sleeve is required. Following installation of tapping sleeve and valve, replace polyethylene encasement over new tapping sleeve and valve and area of existing piping exposed, in accordance with AWWA C105.

c. Tapping of Steel Pipe:

- 1) Tap steel pipe in accordance with AWWA C604, unless otherwise indicated in this Section.

3.4 FIELD QUALITY CONTROL

A. Field Tests and Inspections:

1. Water Transmission and Distribution Piping:

- a. Perform field tests and inspections of water transmission and distribution piping in accordance with the Specifications for the associated type of pipe in Division 33 - Utilities and Division 40 - Process Interconnections, including Section 40 05 01 - Common Work Results for Process Piping, together with applicable piping schedules included in the Contract Documents.
- b. Apparent leakage at joints of piping, fittings, couplings, specials, adapters, and taps is unacceptable.
- c. Apparent leakage through body or bearings of valves, curb stops, and corporation stops is unacceptable.
- d. In presence of Owner, Engineer, or Owner's Representative demonstrate full range of operation of valves, curb stops, and corporation stops following installation. In presence of same entity, upon completion of finish grading of adjacent areas, verify that valve box covers and curb stop covers are within specified tolerances, relative to adjacent, finished grade.

2. Service Laterals:

- a. Perform hydrostatic testing of service lateral piping prior to covering service lateral piping with backfill. Provide backfill in accordance with the Contract Documents following Engineer's acceptance of hydrostatic test results for associated service lateral.
- b. During testing of ground key curb stops, outlet may be capped to eliminate leakage through curb stop's closed port opening.
- c. When hydrostatically testing water transmission or distribution piping, when capping corporation stop is impractical, hydrostatically test to curb stop with corporation stop in open position.
- d. Prior to performing hydrostatic testing, obtain from Engineer clarification or interpretation concerning required hydrostatic test pressures when required hydrostatic test pressures on service saddles for attachment to PVC or polyethylene pipe exceed 100 percent of manufacturer's pressure rating of lowest-rated component.

3. Tapping Sleeves and Valves:

- a. Comply with this Section's "Installation Requirements – Tapping Sleeves and Valves" provision in "Part 3 – Execution" relative to testing installed tapping sleeve for leakage prior to tapping the associated pipe.
- b. In addition, hydrostatically test tapping sleeves and valves as part of the associated water transmission and distribution piping.

B. Defective Work:

1. The following are reasons for Engineer to reject water transmission and distribution Work as defective:
 - a. Providing Work of size, material, type, or any combination thereof, inconsistent with the Contract Documents.
 - b. Providing the Work not in accordance with required tolerances.
 - c. Failure of the Work to comply with required tests, inspections, or any combination thereof.
 - d. Apparent evidence of leakage when the Work is pressurized.
 - e. Unacceptable deformation of the Work under typical operating conditions.

- f. Damage to the Work while Contractor is responsible for protecting the Work, including damage resulting from freezing, damage to exterior surfaces of piping and appurtenances, damage to piping linings beyond that normally associated with appropriate tapping equipment and methods, and others.
 - g. Other non-compliance with the Contract Documents.
- 2. Remedy Defective Work in accordance with the Contract Documents, Laws and Regulations, written instructions of manufacturers of items incorporated into the Work and written instruction of manufacturers of construction equipment and machinery used.

END OF SECTION

SECTION 33 14 43
PACKAGED BOOSTER PUMP STATION

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. This section includes the work for providing one (1) factory built, factory delivered, above-ground water booster pump station in a modular building with base with all necessary internal piping, valves, fittings, supports, meters, control valves, pumps, motors, controls, and other necessary appurtenances installed on a fabricated steel base and enclosed in a structure as shown on the plans and specified herein at the Payneville Pump Station Site.
- B. The manufacturer shall be responsible for final hydraulic design for the pumping units inclusive of all piping and interconnects.
- C. The design of the pumping station and the supervision of the assembly and installation shall be the responsibility of pump station manufacturer and shall not be subcontracted or otherwise assigned. All shop drawings and designs for the pump station shall be designed, prepared, and sealed by a professional engineer registered in the State of Kentucky.
- D. Unless specifically indicated as combined scope (i.e., equipment, installation, labor, work) for both pump stations, this Specification applies to the Payneville water booster pump station provided by the station manufacturer.
- E. Related Sections include but are not necessarily limited to:
 - 1. Division 01 - General Requirements.
 - 2. Section 26 05 00 – Common Work Results for Electrical
 - 3. Section 26 05 09 – Motors
 - 4. Section 26 05 19 – Low Voltage Electrical Power Conductors
 - 5. Section 26 05 26 – Grounding and Bonding
 - 6. Section 26 05 33 – Raceways and Boxes
 - 7. Section 26 08 13 – Acceptance Testing
 - 8. Section 26 09 13 – Electrical Metering Devices
 - 9. Section 26 24 16 – Panelboards
 - 10. Section 26 27 26 – Wiring Devices
 - 11. Section 26 29 23 - Variable Frequency Drives: Low Voltage
 - 12. Section 26 28 00 – Overcurrent and Short Circuit Protective Devices
 - 13. Section 26 43 13 – Surge Protection Devices for Low Voltage Devices
 - 14. Section 26 50 00 – Interior and Exterior Lighting
 - 15. Section 40 90 05 – Control Loop Description

1.2 WORK BY OWNER

- A. Coordination will be required by the Pump Station Manufacturer, Sewell Electronics (or an approved equal) and the Owner during shop drawing submittals and reviews for compatibility and functionality of equipment.

1.3 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 station. As such, the Manufacturer shall accept and hold complete responsibility for the functionality of the pump station and its workings.

1.4 MANUFACTURERS

A. Packaged Pump Station Manufacturers

1. Engineered Fluid, Inc (EFI).
2. USEMCO
- 3.
4. Or approved equal.

B. Centrifugal Pump

1. Cornell.
2. Patterson
3. Or approved equal.

C. Flange Coupling Adapter

1. Dresser, Style 128
2. Or approved equal.

D. Expansion Coupling

1. Proco, Style 231
2. Or approved equal.

E. Combination Air Valve

1. A.R.I, model D-040
2. Or approved equal.

F. Flow Meter

1. Krohne
2. Or Owner approved equal.

G. Check Valve

1. Val-Matic
2. Dezurik
3. Or approved equal.

H. Butterfly Valve

1. Dezurik
2. Keystone
3. Or approved equal.

I. Gate Valve

1. Kennedy.
2. Mueller.
3. Or approved equal.

J. Chlorine Analyzer

1. Chemtrac, model HydroACT2 (HA2-FCL), free chlorine measurement package (0-5 PPM Range), dual open flow cell (17210A), pH sensor with temp (17605)
2. Or approved equal.

1.5 REFERENCED STANDARDS

A. Referenced Standards:

1. ASTM International (ASTM):

- a. A36, Standard Specification for Carbon Structural Steel.
- 2. American Welding Society (AWS):
 - a. A5.1/A5.1M, Specification for Carbon Steel Electrodes for Shielded Metal Arc Welding.
 - b. D1.1, Structural Welding Code - Steel.
- 3. American Water Works Association (AWWA)
 - a. Flanged Ductile Iron Pipe with Ductile Iron or Gray Iron Threaded Flanges – C115
 - b. Rubber-gasket Joints for Ductile Iron Pressure Pipe and Fittings – C111
 - c. Protective Fusion-bonded Epoxy Coating for the Interior and Exterior Surfaces of Ductile Iron and Gray Iron Fittings for Water Supply Service – C116
 - d. Stainless Steel Pipe, 1/2" and Larger – C 220
 - e. Stainless Steel Fittings for Waterworks Service, Sizes 1/2" through 72" – C 226
 - f. Protective Epoxy Interior Coatings for Valves and Hydrants – C550
 - g. Cement-Mortar Lining for Ductile Iron Pipe and Fittings for Water – C104
 - h. Ductile Iron and Gray Iron Fittings for Water – C110
 - i. Steel Pipe Flanges for Waterworks Service Sizes 4-inches through 144-inches – C207
 - j. Steel Water Pipe – 6in and larger – C200
 - k. Cold Water Meters – Turbine Type – C701
 - l. Disinfecting Water Mains – C651
 - m. Swing-Check Valves for Waterworks Services – C508
 - n. Resilient-Seated Gate Valves for Water Supply Services – C509
- 4. ANSI/NSF 61 – Drinking Water Components – Health Effects
- 5. Hydraulic Institute (HI)
- 6. National Electrical Manufacturers Association (NEMA):
 - a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
 - b. ICS 6, Industrial Control and Systems Enclosures.
- 7. National Fire Protection Association (NFPA):
 - a. 70, National Electrical Code (NEC).
- 8. Occupational Safety and Health Administration (OSHA).
- 9. Underwriters Laboratories, Inc. (UL).

1.6 QUALITY ASSURANCE

- A. Manufacturers shall be regularly engaged in the manufacture of packaged booster pump stations for not less than ten years. A list of five installations similar in size and type, complete with the name, address and phone number for the owner / operator responsible for the operation and maintenance of the equipment.
- B. Structural design of the pumping station shall be accomplished by a structural engineer registered in the state of Kentucky.
- C. The equipment and materials covered by these specifications are intended to be standard equipment of proven reliability and as manufactured by reputable manufacturers having experience in the production of such equipment. The equipment furnished shall be designed, constructed, and installed in accordance with the best practices and methods and shall operate satisfactorily when installed as shown on the contract drawings and operated in accordance with the manufacturer's recommendations.
- D. The manufacturer of the selected equipment shall be regularly engaged in the manufacture, assembly, construction, start-up and maintenance of water distribution equipment of the type required for this project.
- E. Provide single source responsibility for all station components and systems through supplier of package booster pump station. The station manufacturer shall warrant the station against

defects in quality and workmanship for a period of at least one year from the date of owner acceptance, but not to exceed eighteen months from the original ship date.

- F. After assembly on site, and before connection to the existing water main, the pump system shall be hydrostatically tested to 150 psig for a minimum one (1) hour. The control system shall be tested, and all sequences and alarms shall be simulated during this test.

1.7 SUBMITTALS

A. Shop Drawings:

1. See Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
2. Scaled (1/4 IN = 1 FT minimum) fabrication and/or layout drawings (plan(s) and Specification Section(s)) showing all equipment piping, mechanical and electrical components.
3. Information as required by other related narrow-scope Specification Sections.
4. Submit Shop Drawing for station and all mechanical, electrical, and instrumentation components, complete, in single, coordinated submittal.
 - a. Provide separate tabs for each major section of work being provided.
5. Shop drawings shall minimally include the following:
 - a. System design information sheet with description of how proposed equipment satisfies specification requirements.
 - b. Description of package pump station system with detailed sequence of operation.
 - c. Packaged system dimension drawing drawn to scale.
 - d. Base plans showing anchor bolt locations and base details.
 - e. Electrical power and control wiring diagram, and equipment layout.
 - f. Pump material and construction drawing.
 - g. Pump curves showing design point.
 - h. Catalog information on valves, strainers, and control components.
 - i. Bill of materials.
 - j. Pump operation and maintenance instructions.
 - k. Service and installation instructions.
 - l. Operations and maintenance data.
 - m. Special electrical component operation instructions.
 - n. As-built wiring diagrams, shall be included in O&M manual including the values of all field set parameters upon completion of start-up.
6. Certifications:
 - a. Provide Owner with a written certification that station has been installed properly and started up and is ready for operation by Owner's personnel.
 - b. Factory checkout certification for all systems in pump station.

B. Submittal Documents

1. Equipment submittals shall be bound and in a minimum of two (2) hard paper copy bound and two (2) electronic copies uploaded to FTP Site.
 - a. The submittal booklets will be complete with data sheets covering all major components that make up the booster pump station and the UL/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.
2. The submittals shall contain a minimum of two (2) full size drawings, size 24" x 36";
 - a. Minimum one (1) booster pump station
 - 1) Minimally three (3) scaled different views

- 2) Drawing must illustrate the National Electrical Code (NEC) clearances per Section 110-26 of the Code.
 - b. Minimum one (1) electrical control schematic.
3. The submittal shall meet all requirements of Section 01 33 00.
- C. Two (2) submittal reviews of this item will be accomplished at no cost to the submitting contractor. However, all subsequent reviews will be charged to the submitting contractor at the design engineer's standard hourly billing rate.
- D. Contract Closeout Information:
 1. Operation and Maintenance Data: See other sections.

1.8 WARRANTY

- A. The warranty is the sole responsibility of the station 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. The station warranty shall 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 station manufacturer. Third party suppliers, service contractors, "Pass-through" warranties and service by the representative are not acceptable.
- C. A period of one (1) year commencing upon successful start-up, after authorized manufacturer's start-up, not to exceed eighteen (18) months from the date of shipment.
- D. The manufacturer's warranty shall cover all equipment, components and systems provided in or with the station by the manufacturer of the station, exclusive of those components supplied by and/or installed by others independent of the manufacturer of record for this station.
- E. 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.

1.9 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.

PART 2 - PRODUCTS

2.1 BUILDING STRUCTURE

- A. A modular structure with minimum exterior dimensions as shown on the drawings shall be provided to protect the equipment, controls and operating equipment from the environment. The dimensions shown on the drawings for the building enclosure are a minimum. Building sizes less than those shown will not be allowed.
- B. The modular building enclosure shall be sized to maintain the National Standards mandated clearances below and around equipment for proper and safe servicing, removal, and reinstallation of this equipment.
- C. The station building enclosure shall be a factory assembled, modular structure of compartment(s) all attached to the station base structure and requiring no additional assembly at the job site.
- D. The building shall be constructed directly on the fabricated steel base and shipped to the project site or nearest passable road as one complete unit, requiring only unloading, placement on an approved concrete slab, connecting the underground piping and electrical service to finish the installation.

E. Building Design Criteria:

1. The structure design and manufacture shall, as a minimum conform to ASCE current edition of "Minimum Design Loads for Buildings and Other Structures" and to the MBMA (Metal Building Manufacturers Association) Recommended Design Practices Manual. Building shall be manufactured and built to satisfy current editions of the Kentucky Building Code (KBC), International Building Code, and National Electrical Code (NEC).
2. To withstand snow load based on ASCE 7-05 Ground Snow Loads for Meade County, Kentucky.
3. To withstand wind loads based on ASCE 7-05 for wind speeds Meade County, Kentucky.
4. To withstand ice loads based on 1-inch nominal ice thickness (4psf).
5. Be designed for site specific seismic requirements based on Meade County, Kentucky as dictated by the Available Ground Motion Parameters according to ASCE 7 and IBC 2006 and 2009 established by zip code and a live floor load of 125 PSF.
6. Be designed to IECC 2015 version of the energy code.

F. Building Construction:

1. Insulation:
 - a. Insulation values for the walls shall be a minimum R-21.
 - b. Insulation values for the roof structure shall be a minimum R-30.
 - c. Insulation within the roof and wall panels shall be foam-in-place polyurethane material applied between the interior and exterior sheathing forming a closed cell bounded by the steel framing.
 - d. The insulation shall have an ASTM E-84 flame spread index of <10 and smoke developed of <195.
 - e. Metal-clad, foam insulated panels or SIPS will not be allowed.
2. Building Framing / Walls:
 - a. A framing design incorporating the members covered by the listed specifications and standards shall develop a structure meeting or exceeding the building design criteria listed previously.
 - b. The size, placement and spacing of studs and joists shall be in accordance with the design criteria and material standards.
 - c. Building framing shall comply with the metal standard or wood standard detailed below depending on the manufacturer's preferred material.
 - 1) Metal framing:
 - a) Building framing materials shall comply with the A.I.S.I. Specification for the Design of Cold-formed Steel Structural Members and to Standards ASTM C-955, ASTM C-1007, ASTM C-645, ASTM C-754 and ICBO 4782P. and 4784P.
 - b) The building structure shall be fabricated using steel C-studs as wall framing members and C-joists for roof support.
 - c) The wall C-studs shall be a minimum 2" x 3 5/8" / 2" x 6" size of 16 gauge material minimum.
 - d) The roof C-joists shall be a minimum 1-5/8" x 8" size of 16 gauge material minimum.
 - 2) Wood framing:
 - a) Wall framing will be 2x6 standard wood studs.
 - b) The size and placement and spacing of studs and joist shall be in accordance with material standards listed below and building design criteria.
 - c) At a minimum, the wall stud grade shall be SPF and shall be installed on 16" centers.
 - d) The walls will include a single bottom plate and a double top plate.

- e) All openings in the side walls shall be fully framed out and supported using framing members sufficient to support and fasten the equipment requiring a framed opening.
 - d. The exterior wall sheathing shall be 1/2" thick, exterior, CDX grade plywood.
 - e. The exterior roof sheathing shall be 5/8" thick, exterior, CDX grade plywood.
 - f. The interior wall and ceiling sheathing shall be 3/4" thick, exterior, CDX grade plywood. OSB or particle board sheathing is not acceptable.
 - g. All interior wall & ceiling surfaces shall be covered with .090" thick FRP (fiberglass reinforced plastic) sheeting of pebble grain, gloss, white finish. The individual wall faces shall be covered with one continuous sheet.
 - h. The FRP sheets shall be glued to the sheathing requiring no fasteners.
 - i. Corner moldings of like FRP material shall be installed & finished in a workmanlike manner.
 - j. Openings in the sidewalls and/or roof shall be as shown and be fully framed out and supported using single or multiple framing members sufficient to support and fasten those devices or equipment items requiring a framed opening, these being access hatches, HVAC equipment, pipe passages, conduit passages, door and window openings and other special purpose openings as might be shown and required.
 - k. Attaching devices or equipment to the building at a framed opening shall be done fully according to the device manufacturers mounting instructions.
3. Doors:
- a. Doors, single and double leaf and of the size shown, are manufactured of 18-gauge galvanized steel.
 - b. All doors shall be full flush construction and 1-3/4 inches thick.
 - c. Doors shall be reinforced, stiffened, insulated, and sound deadened with a solid polystyrene foam board permanently bonded to the inside of each face skin.
 - d. The lock and hinge edge of each door shall be welded with a center hairline seam the full height of the door.
 - e. The lock edge shall be reinforced full height by a 14-gauge continuous one-piece channel extruded templating.
 - f. The hinge edge shall be reinforced full height by a 14-gauge continuous one-piece channel, formed and tapped for hinges.
 - g. Top and bottom of the door shall be closed with 16-gauge channels.
 - h. Doors shall be thoroughly cleaned and receive an iron phosphate treatment prior to receiving one coat of prime paint.
 - i. Door closures and rim panics are reinforced with 14-gauge channels.
 - j. Doors shall be fully-mounted in frames produced for pre-hanging of commercial 1-3/4" doors.
 - k. Frames are formed to 16-gauge commercial quality cold rolled steel conforming to ASTM A366 or A620 and A568.
 - l. Frames are produced in two welded units, to be mechanically joined during installation.
 - m. The base side is prepared for all required hardware.
 - n. Both units, base and trim, are furnished with welded mitered faces.
 - o. Frame anchoring includes compression anchors and stud screws.
 - p. Door hinges shall be continuous gear hinges, fabricated of extruded 6063-T6 aluminum alloy/temper with pinless assembly.
 - q. The doors shall have a lockset, exterior handle, and top mounted-door closer with hold-open device.
 - r. Doors and frames shall be finished with a two-component, aliphatic/acrylic polyurethane coating, white in color, with a high gloss finish. The coating shall be resistant to a wide

range of solvents and chemicals under splash and spill conditions. The coating system is V.O.C. compliant.

s. Door sizes and locations are as shown on the drawings.

4. Mounting and Fastening:

- a. The building shall be fabricated up from and securely attached to a framework fabricated of 2" x 6" steel tubing welded at each corner to form a base frame serving as a stable base for handling and transporting the building prior to attaching the building to the station base skid.
- b. To hold the building framing to the 2" x 6" base frame, 5/8" anchor studs will be welded to the base frame.
- c. In assembling the building framing to the base frame a 3 1/4" x 4" x 1/4" thick anchor plate under a flat washer, lock washer and 5/8" nut shall be used to fasten the building framing to the framing base as shown.
- d. The base frame shall be grit blasted to a SP-6 finish and coated with the specified coating material.
- e. The building enclosure shall be firmly and securely attached to the steel base structure by lag bolting from inside the station, through evenly spaced 9/32" holes pre-drilled into a 2" by 1-1/2" by 1/8" thick angle piece that has been continuously welded to the steel floor.
- f. The lag bolts shall screw into the 2" x 6" tubular base frame upon which the building has been built.
- g. The lag bolts shall be plated steel, size 5/16" diameter x 2" long.
- h. The number and location of the lag bolts shall be as determined by structural analysis so as to maintain the live load and wind load ratings as specified and to resist shearing and tearing in the process of transporting and placing the finished station.

5. Exterior Finish:

- a. Exterior façade shall be a complete system.
- b. Color to be approved by Owner prior to purchase or installation.
- c. Brick Exterior:
 - 1) The station manufacturer shall apply at the factory and prior to shipment fabricated veneer panels with an exterior face in a running bond pattern of kiln-fired clay brick finish applied with polymer epoxy resin on mineral fiber reinforced cement board.
 - 2) Kiln-fired clay brick finish shall be manufactured with sanded epoxy giving deep rake joints between bricks.
 - 3) Epoxy color to be similar to face brick color unless otherwise specified.
 - 4) All material shall be obtained from one source to match in color as nearly as possible.
 - 5) Epoxy resin finish shall conform to requirements of MIL Spec. MIL-R-9300B and MIL-R-21931A.
 - 6) Mineral fiber reinforced cement board (M.F.B.) substrate shall meet the following minimum requirements:
 - a) 7000 lb/in² Compressive Strength
 - b) 2000 lb/in² Flexural Strength
 - c) 0.15 Thermal "R" Value
 - d) 0/5 Flame/Smoke Burn Character
 - 7) Brick veneer shall be kiln-fired clay brick of severe weather exterior grade meeting requirements of ASTM C-1088-94 and shall be modular sized (7-5/8" x 2-1/4" x 1/2").
 - 8) Panel substrate and brick finish shall withstand the following tests without noted change in appearance or material failure:
 - a) 1000 hours in Atlas Twinarc weatherometer;
 - b) 14 cycles of salt, fog and thermal shock;

- c) 100 cycles at -50 to +150°F.
- 9) The panels shall be installed according to the manufacturer's Installation Guide with the necessary accessories recommended by the manufacturer.
- 10) Material shall be manufactured by Fullerton Finish Systems, Inc. Sand Springs, Oklahoma or be "approved" equivalent.
- 6. Trussed Roof System:
 - a. The building manufacturer shall provide Wooden roof trusses, plywood sheathing, underlaying felt to be factory applied and be covered by the finished roof surface which shall be factory applied to the building to form a gabled roof system as shown.
 - b. When installed, the trusses shall be covered by 1/2" thick C-C Grade plywood.
 - c. When required, the roof structure shall include the roof hatches being built into the roof field by the station manufacturer using the same materials as specified above.
 - d. Metal Facia and Soffits shall be installed on the building by the building manufacturer.
 - e. These materials for the facia and soffit shall be complimentary in color and texture and approved by the Engineer.
 - f. A ridge line, metal air vent system shall be installed as a part of the roof.
 - g. For review by the Engineer, the roof system shall be designed and stamped by a Registered Professional Engineer in the State of Kentucky and provided with the equipment submittals.
- 7. Building Substructure:
 - a. The base/floor system substructure shall be made up of steel plate and standard structural steel shapes of the sizes and weights sufficient to bear the loading placed on the base by shipping and operation.
 - b. The substructure shall be designed to support the building live and dead loads plus the burden imposed by loading, transporting and unloading of this equipment.
 - c. All steel plates used in the substructure shall meet or exceed the requirements of ASTM-A36.
 - d. The structural shapes (channels and angles) shall be of the thickness/weight as shown on the plans for this item and shall meet or exceed the requirements for ASTM A-36.
 - e. The structural rectangular or square tubing shall be of the wall gauge as shown on the plans for this item and shall meet or exceed the requirements for ASTM A-500 Grade B.
 - f. On the substructure on the floor plate, indented approximately 6"/8", there shall be welded a 1-1/2" x 2" x 1/8" steel angle iron with drilled holes. This angle steel piece shall be the bracket through which the building is attached to the base substructure.
- 8. Floor drain(s):
 - a. The station shall have floor drains as shown on the drawing.
- 9. Piping Floor Penetrations:
 - a. Where suction and discharge piping, or any other pressure piping, passes through the station floor plate and base sub-structure, that area of the floor shall be provided with a grout sleeve made up of steel pipe of 9" height and of sufficient annular diameter to pass a full size pipe flange for the pipe size shown.
 - b. The steel sleeve shall be welded into the floor plate with a 1" projection above the floor in the station.

2.2 PUMPS AND MOTORS

A. Primary Pump(s) and Operating Conditions

- 1. Type: Close coupled, horizontal, end suction centrifugal pump.
- 2. Manufacturer: Cornell 2.5WH or approved equal.
- 3. Design condition: 350 gpm at 147 feet TDH with minimum pump efficiency of 79%.
- 4. Secondary condition: 450 GPM at 109 feet TDH with minimum pump efficiency of 68%.
- 5. Shutoff condition: 0 gpm at 169 feet TDH.

6. Maximum speed: 3600 RPM.
7. Nameplate driver horsepower: 20.
8. Drive type: Variable speed drive.
9. Drive configuration: Direct.
10. Net positive suction head required (NPSHR): 30.
11. Suction Pressure: 40 to 60 psi.
12. Discharge Pressure: 110 to 130 psi.

B. Pump Requirements.

1. The pumps shall be NSF 61 certified.
2. The pumps shall be of close grain cast iron construction with bronze or stainless steel impeller.
3. The pumps shall be Volute style with the pump casing bolted to adapter, with recessed lock fit to insure alignment.
4. No stud or bolt holes are tapped through casing to liquid ways.
5. Tapping openings provided for priming, venting, draining and suction and discharge gauge connections.
6. Piping connections are to be as shown on the pump data sheets.
7. Impellers are to be single suction type, cast in one piece.
8. All impellers are to be statically balanced to insure smooth operation, also hydraulically balanced except in some small sizes where end thrust is but a minor factor.
9. Wearing rings shall be renewable, be set on both the impeller and body and be set maintain proper running clearance with impeller hubs to minimize leakage between the suction and discharge.
10. Shaft sleeves shall be shouldered onto the shaft near impeller to cover the full length of shaft from impeller hub to motor end bracket by being in compression over the shaft protecting shaft from contact with liquid.
11. The stuffing box shall be cast integral with the pump casing.
12. The stuffing box shall contain a single face type mechanical seal.
13. The seal shall have a carbon rotating head against a Ni Resist stationary face and be complete with a Buna N boot with stainless steel spring and spring retainer.
14. The motor adaptor shall maintain a rigid, bolted, registered assembly between motor and the casing by a machined lock between adapter and motor end bracket keeping the adapter and casing in permanent alignment with motor and motor shaft.
15. Motor configuration shall be as a close-coupled assembled as an integral part of the complete units.
16. The extended motor shaft carries the impeller and shaft sleeve.
17. Motor bearings are ball bearing type, designed to carry all radial and thrust loads, and are installed in sealed housings which retain lubricant and exclude dirt and moisture.

C. Vibration Isolation Pads

1. The pump/motor assembly shall be mounted to a fabricated steel base built specifically for the pump/motor to be mounted.
2. Each mounting or attachment point shall be complete with a vibration isolation pad.
3. The pad will be in two (2) parts, a 1/4" base layer followed by a 5/8" upper layer and be a nominal 2" x 2" square size for pump/motor combinations weighing up to 1500 pounds.

D. Support Stands

1. The pump support stands shall be structural steel C-channel, standard weight or steel plate bent to form a channel.
2. The bent steel plate shall be of sufficient thickness to support the pump and motor.

3. A plate or channel shall be welded between the pump supports to form an "H" configuration for rigidity.
4. The base of the legs shall be continuously welded to the steel floor.

E. Motor Configuration

1. The pump driver shall be a NEMA Design B, three phase, alternating current, (squirrel cage) induction motor, continuous duty rated, with motor insulation as Class F for Class B Heat Rise.
2. Motor efficiencies shall be Premium Efficient as stated in NEMA MG 1, 2011 Part 12, Table 12-12 for the motor enclosure, open or closed.
3. Motor Service factor shall be 1.15 on the nameplate, reduced to 1.0 when used with variable frequency drives per NEMA MG 1 – 2011, Part 31.3.7.
4. The motor enclosure shall be Open Drip Proof (ODP).
5. Motors of 600 volts or less shall meet the requirements of NEMA MG 1 2011 Part 31.4.4.2 for ability to sustain voltage spikes when used with variable frequency drives under usual conditions.
6. Motors are designed and manufactured for use with variable frequency drives – inverter duty rated.

F. Spare Parts

1. Include each of the following manufacturer's spare parts pre-packaged kits where applicable according to proposed pump style. Include one set/kit for a single pump only:
 - a. Oil Change: Provide one complete pump and motor lubrication change kit (if applicable). Oils and lubricants shall be synthetics by Mobil oil or approved equivalents per pump/motor manufacturer.
 - 1) Provide OS&Y lubricant.
 - b. Paint Touch-Up Kit: Include a touch-up kit for each coating system for repair of any scratches or abrasions that have occurred during shipment or installation.
2. Medium and Large Pump (≥ 4 HP) - Rebuild Kits (per pump manufacturer for most routine kit(s) available):
 - a. Impeller Repair Kit: include impeller, casing ring, washers and gaskets.
 - b. Bearing Repair Kit: include inboard and outboard bearings, retainers, locknut, seals and gaskets.

2.3 PIPING

A. Piping Transmission

1. Piping shall conform to AWWA Standard C-200.
2. Piping larger than two (2) inch shall be steel and conform to material specification ASTM A-53(CW) for nominal pipe size four (4) inch and smaller and ASTM A-53(ERW) Grade B for nominal pipe size five (5) inches and larger.
3. Steel butt-welding fittings shall conform to material specification ASTM A-234 Grade WPB and to the dimensions and tolerances of ANSI Standards B16.9 and B16.28 respectively.
4. Forged steel flanges shall conform to material specification ASTM A-105 Class 60 and/or ASTM A-181 for carbon steel forgings and to the dimensions and tolerances of ANSI Standards B16.5 as amended in 1992 for Class 150 and Class 300 flanges.
5. The piping sizes shall be as shown on the drawing.
 - a. Size 10 inch and below Schedule 40
 - b. Size 12 inch thru 20 inch Standard weight (.375" wall)
 - c. Size 24 inch and above - Standard weight (.500" wall)

B. Pipe Welding

1. Welders:

- a. All pipe welds shall be performed by certified welders employed by the pump station manufacturer.
 - b. The pump station manufacturer shall provide copies of the welding certificates of the employees who are to perform the pipe welds.
 - c. Shop welders shall be certified in accordance with ASME BPVC Section IX or AWS D1.1.
 - d. Certification shall be done by an independent testing laboratory giving certification for the weld positions for which the tests were performed.
2. Welding Techniques:
- a. Pipe welds shall be performed by metal added, inert gas shielded arc welding (MIG) techniques wherein the weld heat settings, the wire feed speed and the traverse speed of the work below the welding are numerically set to assure proper weld fusion and penetration and repeatable welds.
 - b. In all cases, short circuit transfer, spray transfer or pulse-arc transfer modes of the gas metal arc welding process shall be used.
 - c. When utilizing the short circuit mode, shielding gas consisting of 50% carbon dioxide and 50% argon gas shall be used.
 - d. When utilizing the spray or pulse-arc transfer modes, a shielding gas consisting of 5% carbon dioxide and 95% argon shall be used.
 - e. In all cases, welding wire with a minimum tensile strength of 70,000 psi shall be employed.
 - f. All flange welds and butt welds of equal size pipe shall be a single continuous nonstop weld around the complete circumference of the pipe.
 - g. Whenever possible, vertical up weld passes will be applied to all pipe welds.
 - h. No vertical down weld passes will be allowed.
 - i. Completed pipe welded assemblies shall create no internal obstruction, restriction or create any unintended sources of water deflection.
 - j. Piping of six (6) inch diameter and larger shall require a minimum of two (2) weld passes to complete each weld.
 - k. The first pass, or root pass, shall be applied at the bottom of the bevel cut using the short circuit transfer welding mode, and the second pass, or cap pass, shall be applied over the root pass using the spray or pulse arc transfer welding modes to insure that at a minimum the total weld thickness shall be equal to thinnest of the two pieces being welded together.
 - l. The pipe shall be sand blasted, as specified elsewhere, before pipe weld and after pipe weld, before fusion bonded epoxy is applied.
3. Welding Standoffs:
- a. No welding shall be performed on fusion bonded coated piping after the coating process has been performed.
 - b. Where any piping is to be welded after the application of fusion bonded epoxy coating to the inside of the pipe, at the point of the weld, a weld standoff must be welded to the pipe prior to the coating.
 - c. The weld shall be made to the standoff and not onto the pipe.
- C. Pipe Surface Preparation:
- 1. All piping inside and outside surfaces shall be prepared by grit blasting, or other abrasive blasting, prior to any welds taking place to minimum SP-6 finish.
- D. Pipe Cutting:
- 1. Piping of 4" diameter and smaller may be cut by saw.
 - 2. Piping of 6" diameter and larger shall be bevel cut, and Oxyfuel or Plasma-arc cutting techniques shall be used to assure and facilitate bevel pipe cuts.

E. Saddle Cuts and Welds:

1. Saddle cuts in pipe made in preparation for a saddle weld of a pipe at an angle to a pipe shall be made with numerically controlled, plasma cutting machines.
2. Saddle end cuts to pipes to make a saddle mating piece shall be done with the same numerically controlled plasma cutting equipment.
3. When the two saddle cut pieces are mated and welded with the MIG process, the internal finished weld shall be smooth and free of inclusions, crevices and other corrosion sites.

F. Wall Penetration Coating Protection Sleeve:

1. Where a fusion bonded epoxy interior coated pipe passes through the steel tank shell or a steel wall section, prior to fusion bonded coating of that pipe, a pipe sleeve shall be welded over the pipe in the area where the pipe passes through the steel sheet.
2. The sleeve shall be one-half (1/2") inch thickness and fit closely over the transmission pipe.
3. The sleeve shall be seal welded to the transmission pipe at each end with a full and continuous fillet weld.
4. Following the welding of the sleeve to the transmission piping, the sleeve welds and the sleeve shall be grit blasted to an SP-6 finish so the pipe is prepared for fusion bonded epoxy coating by the process specified elsewhere in these documents.

G. Pipe Supports:

1. Pipe supports by minimum sizing for:
 - a. 8" and smaller piping shall be 2" x 3" x 3/16" wall rectangular tubing;
 - b. 10" and larger piping shall be 3" x 4" x 1/4" wall rectangular tubing;
 - c. 6" and larger piping shall be provided with "kick" bracing projecting fully from the underside of the pipe to the floor at an angle of no less than 15° from vertical out at a right angle to the run of the pipe being supported. These "kick" braces shall be in addition to the vertical pipe supports called out above.
2. Pipe supports are to be fully welded at both end points to the pipe and steel floor where required.
3. Where components are to be supported and may require disassembly at some time, the supports for these components shall be welded at the bottom and bolted at the top by use of a bolt yoke welded to the top of the support and bolted into the flange connection picking up at least three bolts.

H. Riser Pipe Vertical Supports:

1. All of the inlet and outlet vertical riser pipes shall be provided each with, two (2) structural steel, angle pipe support welded to the weldment plates on the vertical riser pipe to down to the floor.
2. These supports shall be opposed by at least 120 degrees around the pipe.
3. The minimum member size for these supports shall be 3" x 4" x 1/4" tubular steel.

I. Fusion Bonded Epoxy Internal Pipe Coating:

1. The internal surfaces of piping to be fusion bonded coated shall be grit blasted to an SP-10 finish with the finish profile required by the coating material manufacturer.
2. The internal, wetted surfaces of the steel transmission piping shall have applied to it a Fusion Bonded Epoxy Coating on the interior pipe surface.
3. The coating shall be applied and meet the testing requirements of Table 1 and Table 2 with the exception of Table 2 section 7 per AWWA C-213.
4. The powder coating product shall be National Sanitation Foundation (NSF) Standard 61 certified material.
5. Prior to shipment of the station, the station manufacturer shall provide in writing to the Engineer certification that the fusion bonded epoxy coating has been applied to all internal

surfaces of the steel piping using the proper method. Certification shall show under the station manufacturer's letterhead:

- a. Date of application;
- b. Material manufacturer and product designation including a product data sheet for the coating;
- c. Applier of the fusion bonded coating, name, address and phone number;
- d. Notarized signature of an officer of the station manufacturing company stating the fusion bonded epoxy coating was applied to AWWA Standard C213-91 or the latest revision.

2.4 PIPING CONNECTIONS AND TAPS

A. Service Connections on Internal Piping

1. All plumbed devices within the station eventually requiring service, such as meters, control valves, pumps and like equipment, shall be easily removed from the piping by the presence of appropriately placed and sufficient quantity of adaptors and couplings as shown on the drawings; no less than the quantity of couplings and adaptors shown shall be allowed.

B. Restraining Points

1. The main inlet and outlet piping to the station shall each be provided with two (2)/four (4) restraining points as welded on "eyes" or similar device welded to the underside of the base structure framing as shown to facilitate the attachment of joint restraint tie rods or other device to be used in retarding any pipe movement at the connections.

C. Compression Couplings

1. The station piping shall include a variety of compression type, flexible coupling to prevent binding and facilitate removal of associated equipment.
2. These couplings are to be where shown on the plans.
3. In lieu of a compression coupling, a flanged coupling adapter (FCA) may be used.
4. Grooved fittings may not be used under any circumstance.
5. All compression couplings or flanged coupling adapters (FCA), and flexible connectors/expansion joints shall include a minimum of two (2) zinc coated steel threaded rods across the joint with appropriate bolted restraining points.

D. Elastomer Pipe Connector

1. The inlet side of each booster pump shall include an elastomer connector to help isolate vibration and noise in the piping system.
2. The elastomer connector shall be of single sphere design, constructed of neoprene and nylon with bias-ply tire reinforcing cord to provide a 225 psi working pressure rating to a minimum of 120 degrees F.
3. The elastomer connector shall pass through the plate steel flanges designed to grip the connector so the connector seals without gaskets when the flange bolts are drawn up.
4. A control joint limiting pipe connector movement shall be supplied with each pipe connector.

E. Line Pressure Gauges

1. Pressure gauges shall minimally be provided on the suction header and the discharge header.
2. Pressure gauges shall be provided at each pump for both suction and discharge pressure.
3. Combination pressure gauges shall have a built-in pressure snubber and have 4 1/2" minimum diameter faces and turret style case, black fiberglass-reinforced thermoplastic with a clear acrylic window with Buna-N gasket.
4. The movement shall be rotary; the bourdon tube shall be copper alloy C-type.
5. The gauge shall have a 1/4" MNPT lower mount process connection and contain a 0.6mm copper alloy restrictor.

6. Combination pressure gauge range and scale graduations shall be in psi and feet of water as follows:
7. Gauge ranges shall be established by the Engineer for each of the suction and discharge gauges for each pump station.
8. All gauges will be panel mounted off the pipeline and be connected to their respective sensing point.
9. The gauge trim tubing shall be complete with both isolating and vent valves and the tubing shall be so arranged as to easily vent air and facilitate gauge removal.
10. Gauges mounted directly to the pipeline or at the sensing point will not be accepted.
11. Gauge ranges, markings and gauge location shall be identified in the submittal documents.

F. Static and Sensing Lines

1. All gauge, switch and transmitter sensing lines shall be minimum 1/4" OD stainless steel tubing run from the sensing point and a ball valve to the point of device mounting.
2. The pilot tubing shall be run in a workmanlike manner with elastomeric/stainless steel mounting straps to securely hold the tubing to be free of stress and vibration.
3. The alignment and organization of the sensing lines shall be continuously rising.

G. Sample Tap

1. A single, right angle outlet, smooth nose, brass sample tap shall be affixed to the manual vent ball valve for the low suction lockout and suction pressure gauge assembly.

H. Hose Bib

1. There shall be provided a standard hose bibb with valve and vacuum breaker on the suction and discharge piping.
2. The hose bibb connection shall be through a pressure regulator if the header pressure would exceed 60 psi.

2.5 VALVES

A. Ball Valves

1. The ball valves will be 2-piece, full-port design with blow-out proof stem.
2. Seats, packing and seal shall be PTFE.
3. Ball valves shall be provided with an adjustable stem packing nut.
4. The body and retainer shall be lead free brass (DZR).
5. The ball shall be lead free brass (DZR), chrome plated for sizes 1/4"-1" and 316SS for sizes 1-1/4"-4".
6. The handle shall have a distinctive white "lead free" handle grip and blue "lead free" hanging tag.
7. The valves will be NPTxNPT threaded pattern.
8. Maximum working pressure shall be 600 psi up to 2" and 400 PSI for sizes 2-1/2" to 4".

B. Butterfly Valves

1. Valve body shall be one-piece wafer or lug design.
2. Flange locating holes shall be provided on wafer bodies to allow for quick and precise alignment during valve installation.
3. Flange hole drilling per international flange standard as specified.
4. A non-corrosive bushing and a self-adjusting stem seal shall be provided.
5. No field adjustment shall be necessary to maintain optimum field performance.
6. The disc edge and hub on metal discs shall be spherically machined and hand polished for torque and maximum sealing capability.
7. Disc shall be Nylon 11 coated ductile iron.

8. The stem shall be one-piece design.
9. Disc to stem connection shall be an internal double "D" design with no possible leak paths in the disc-to-stem connection.
10. External disc-to-stem connections such as disc screws or pins are not allowed.
11. Stem shall be mechanically retained in the body neck and no part of the stem shall be exposed to the line media.
12. The seat shall be tongue-and-groove seat with a primary hub seal and a molded flange O-ring for weld-neck and slip-on flanges.
13. The seat shall totally encapsulate the body isolating it from the line media and no flange gaskets shall be required.
14. The valve shall be rated for bubble-tight shut-off at pressures of 175 PSI for 2"-12" and 150 PSI for 14"-20".

C. Manual Valve Actuators

1. Manually operated butterfly valves size 6" and smaller shall be equipped with lever style operators capable of withstanding 450 ft. lbs. of input torque and mounted to the valve trunnion with 4 bolts.
2. Manually operated butterfly valves size 8" and larger shall be equipped with travelling nut style handwheel operators capable of withstanding 450 ft. lbs. of input torque and mounted to the valve trunnion with 4 bolts.

D. Silent Check Valves – Wafer Style

1. Silent check valves shall be wafer style, non slam and made to set between ANSI Class 125 flanges.
2. Sizes shall be as shown. (2" – 10")
3. The body of the check valve shall be cast iron.
4. The plug and seat shall be bronze and conform to ASTM Designation B 584.
5. The seat shall contain a Buna-N seal to provide zero leakage.
6. The seal design shall provide for both a metal to metal low and high pressure without over-loading or damaging the Buna-N seal.
7. The guide bushings shall be bronze copper alloy and conform to ASTM Designation B-584.
8. The valve spring and seat retainers shall be stainless steel and conform to ASTM Designation A 313.
9. The valve plug shall be guided at both ends by a center shaft integral with the valve plug. Alignment of the center shaft shall be provided by guide bushings.
10. Silent Check Valve manufacturer:
 - a. Dezurik
 - b. Or approved equal.

E. Gate Valve

1. The gate valve as shown shall be a full ported gate valve meeting the requirements of AWWA C-515.
2. The body, bonnet, wedge and seal plate shall be ductile iron in accordance with ASTM A536.
3. The wedge shall be totally encapsulated in rubber.
4. The rubber coating shall be permanently bonded to the ductile iron wedge casting and shall meet ASTM D429 tests for rubber to metal bonding.
5. No paint shall be allowed in the wedge and the wedge must not be hollow.
6. All gaskets shall be O-ring seals.
7. All fasteners are to be 304 stainless steel.

8. The body, bonnet and seal plate shall be epoxy coated in accordance with ANSI/AWWA C550 certified to NSF 61.
9. The coating shall be on the interior and exterior of the valve.
10. The valves are to be non-rising stem with handwheel operator, opening left.
11. The valve body shall be flanged and drilled to ANSI B16.1, Class 125.
12. Valve maximum working pressure rating shall be 250 psi.
13. Valve manufacturer:
 - a. Kennedy Valve
 - b. Mueller
 - c. Or approved equal.

F. Hydraulic Actuated Surge Relieve Control Valves

1. The valve configuration as shown shall be hydraulically operated, single diaphragm actuated.
2. The valve shall consist of three major components: the body with seat installed, the cover with bearing installed, and the diaphragm assembly.
3. The diaphragm assembly shall be the only moving part and shall form a sealed chamber in the upper portion of the valve, separating operating pressure from line pressure.
4. Packing glands and/or stuffing boxes are not permitted and there shall be no pistons operating the main valve or pilot controls.
5. Valve body and cover shall be epoxy coated.
6. The stainless steel seat with integral bearing shall be of the solid, one piece design.
7. The diaphragm assembly shall contain a non-magnetic stainless steel stem of sufficient diameter to withstand high hydraulic pressures.
8. The stem shall be fully guided through its complete stroke by a removable bearing in the valve cover and an integral bearing in the valve seat. No center guides shall be permitted.
9. The stem shall be drilled and tapped in the cover end to receive and affix such accessories as may be deemed necessary.
10. The flexible, non-wicking, FDA approved diaphragm shall consist of nylon fabric bonded with synthetic rubber compatible with the operating fluid.
11. The diaphragm shall be fully supported in the valve body and cover by machined surfaces which support no less than one-half of the total surface area of the diaphragm in either the fully open or fully closed position.
12. The pilot control system shall include CK2 isolation valves.
13. The pilot system shall include a closing speed control on all valves.
14. Pilot controlled sensing shall be upstream of the pilot system strainer so accurate control may be maintained if the strainer is partially blocked.
15. The pressure relief pilot shall be a direct-acting, adjustable, spring-loaded, diaphragm valve designed to permit flow when controlling pressure exceeds in the adjustable spring setting.
16. The pilot control is normally held closed by the force of the compression on the spring above the diaphragm and it opens when the pressure acting on the underside of the diaphragm exceeds the spring setting.
17. The pressure relief valve shall be supplied with the Dura-Kleen® stem (KD option).
18. The valve shall be equipped with One (1) body mounted limit switch with adjustable cams on the valve stem rod.
19. The limit switches shall be 120 VAC, 24 VAC powered back through the Station controls as so noted elsewhere in these specifications.
20. The Control Valve shall be a Cla-Val Model 50-01.
 - a. Or approved equal.

2.6 MISCELLANEOUS APPURTENANCES

A. Magnetic Flow Meter

1. The magnetic flow meter will maintain an accuracy of $\pm 0.5\%$ of flow rate or better when mounted as close as one pipe diameter from the flange of the magmeter when located next to elbows in line sizes up to 18".
2. It will also have no downstream piping requirements for maintaining its published accuracy specification.
3. The meter shall have a standard certified flow accuracy of 0.2% of rate or better.
4. There may be some slight deviation with no more than an additional $\pm 0.5\%$ of Reading permitted.
5. Each flow meter will be flow lab calibrated in the manufacturer's flow lab.
6. The manufacturer will flow lab calibrate all meters twice at 0%, 50% and 100% of flow for a total of 6 flow point calibrations.
7. The dual flow calibration technique will confirm the results of the first flow test and ensure that the meter will exhibit a typical installed accuracy of $\pm 0.2\%$ or better of actual flow rate.
8. The electrodes shall be 316L stainless steel or Hastelloy C, electrolytic polished with non-stick self-cleaning finish.
9. Flanges will be carbon steel as standard up to and including 18".
10. The detectors neck (connection between coils and wiring plate) shall be epoxy sealed to prevent moisture or water from entering the body of the detector.
11. All sensing tubes (regardless of size) must be stamped with the original flow lab calibration factor to allow "dry calibration" and interchangeability between all flow converters and sensing tubes to original accuracy.
12. All meters must be IP67 and NEMA 4X watertight as standard or optionally, IP68 and NEMA6P and submersible to 15m in water.
13. The meter shall have its own "Built-in" field re-verification tool – which can re-verify and recalibrate the converter to the original flow lab calibration without the need of other devices.
14. The converter shall have non invasive 3 button infrared display that configures using a self prompting menu without exposing the converter internals to the surrounding atmosphere.
15. The meter shall have a full function dot-matrix 128 X 128 analog/digital LCD display backlit for night viewing that is electrically 360 degrees rotatable in 90 degree increments using the meter's software.
16. The converter housing must be NEMA 4X fireproof and made of corrosion resistance anodized aluminum with Acrylic resin coating.
17. The meter shall be capable of switching between 4 different ranges and forward/reverse 2-range switching.
18. The meter shall be capable of bi-directional flow without requiring any re-zeroing.
19. The electronic circuit boards will be conformal coated for protection from moisture.
20. All electronic circuit boards will use Surface Mount Technology to provide resistance to vibration.
21. The meter shall incorporate high input impedance circuitry and have an input impedance of 50 meg ohm or greater thus negating the need for external electrode cleaning devices and to eliminate errors caused by changing process conductivity.
22. The meter must be capable of normal operation during abnormal voltage conditions from a minimum of 80 volts during low voltage conditions or a maximum of 264 volts during over voltage conditions.
23. The meter shall have: High, low, empty pipe, rate-of-change, limit alarms, control limit time, self-diagnostics and data checking, over-range flow, under-range flow, over totalize, under totalize, range change, preset output, adjustable low flow cutoff, totalizer preset value reached, reverse flow, and converter failure alarms as standard.

24. Outputs/inputs shall be as follows: one (1) 4-20mA analog with HART, HART (standard) or Modbus RTU +4 ~20mA or PROFIBUS-PA (optional – selected one), two (2) digital outputs (for alarms, batching, and pulse applications), one (1) digital input (20 – 30 Volts dc) for range switching, totalizer control, fixed value outputs, zero adjustment.
 25. The meter shall incorporate separate advanced noise suppression and filtering circuit specially designed for slurry applications.
 26. Auto zeroing, averaging, or dampening type algorithms in lieu of noise filtering circuitry are not acceptable.
 27. A built-in rate limit function shall be available to further eliminate extraneous output dynamics.
 28. The magnetic flowmeter will be approved for cFMus Class I, Div II, Groups B, C, and D.
 29. The meter shall be supplied with a polyurethane rubber liner and be certified by NSF on NSF/ANSI Standard 61, Drinking Water System Components – Health Effects.
 30. The magnetic flowmeter shall be the as manufactured by Krohne, or equal.
- B. Station Exterior Lighting
1. An exterior light shall be provided as located on the drawing.
 2. The light shall be 50 watt LED.
 3. Housing shall be one piece, injection molded, bronze polycarbonate.
 4. A button type photo control shall be provided.
- C. Station Interior Lighting
1. Shall be forty eight (48) inch minimum length LED light fixtures installed within the equipment enclosure.
 2. The light switch shall be of the night glow type and be located conveniently adjacent to the door.
 3. The light switch shall be of the night glow type and be located conveniently adjacent to the door.
- D. Heating / Cooling / Exhaust Unit
1. The unit shall be one-piece, wall-mounted, factory-assembled, pre-charged, prewired, tested and ready-to-operate.
 2. The unit shall have a limited warranty of 5-years on parts and 1-year on compressor. Capacity and EER certified in accordance with ANSI/ARI Standard 390-2003.
 - a. One (1) each exterior wall mounted, hard-wired as shown;
 - b. Enclosed weatherproof casing constructed of 20 gauge galvanized steel, finished with baked-on polyester enamel paint;
 3. One (1) washable filter;
 4. Remote adjustable thermostat;
 5. Refrigerant: 410A (HFC);
 6. Minimum EER Rating: 9.00
 7. Cooling Capacity: 3 Ton
 8. BTUH: 35,400
 9. Heater: 15 kW
- E. Dehumidifiers
1. One (1) each, installed as shown.
 2. Capacity 30 pints per 24 hours.
 3. Compressor rated 115 volts, 60 Hz, 4.3 operating amps.
 4. 106 CFM fan, 2 fan speed.

5. Humidity range 35 to 80% RH, ambient temperature range of 41 to 95 F, Type R410A refrigerant.
6. Washable filter.
7. Condensate piped direct to drain.
8. UL listed rubber cord.

2.7 COATINGS –CORROSION PROTECTION

A. General

1. All interior and exterior surfaces of the exposed steel structure, transmission piping, and fittings shall be gritblasted equal to commercial blast cleaning (SSPC SP6).
2. Following fabrication all exposed surfaces of the station, interior and exterior, shall be coated according to the following requirements.
3. Exterior finish coating colors to be approved by Owner.
4. Exterior exposed skid to have a finish coat to match doors and trim unless otherwise noted by Owner.

B. Weldment Prime Coating:

1. All weldments will be pretreated by hand to provide additional corrosion protection using the same product as the base coat.
2. Following the pretreatment full coating application shall take place.

C. Base Coating:

1. The base coating shall take place immediately after surface preparation.
2. The protective coating shall consist of a two-component, high solids, high build, fast drying epoxy system for protection and finishing of steel and having excellent corrosion resistant properties.
3. The epoxy system shall be self-priming and require no intermediate coatings.

D. Top Coating:

1. Following the base coating application, a full finish coating application shall take place.
2. The protective coating shall consist of a two-component, high solids, high build, fast drying epoxy system for protection and finishing of steel and having excellent corrosion resistant properties.
3. The epoxy system shall be self-priming and require no intermediate coatings.
4. The base and finish coats shall provide a total dry mil thickness of 8.0 mils.

E. Post-Assembly Coating

1. Following assembly and just prior to shipping, there shall take place a thorough cleaning of the floor of the station followed by a rolled on coating of the two part epoxy coating to cover over any scuffing or scaring that might have occurred during assembly.

F. Floor Coating and Corrosion Protection System

1. The exposed surfaces on the interior of the structural steel base shall have a non-skid coating of a two-component, 100% high performance aromatic polyurea spray elastomer system with zero VOC (Volatile Organic Compounds), 100% solid.
2. The coating shall offer outstanding performance and superior elastomeric protection for various substrates.
3. The coating shall be designed as a user-friendly product for moisture insensitive applications because of its pure polyurea chemistry, and offer exceptional adhesion properties for properly prepared substrates.
4. The high performance formulation shall produce an excellent skin formation for chemical resistance and moisture protection.
5. The coating color shall be confirmed by the Owner.

6. Both the Iso "A" Side and Resin "B" Side shall be preconditioned between 70-90°F before application. Iso "A" and Polyol "B" components must be pumped by low-pressure transfer pumps to a suitable high-pressure proportional pumping system.
7. Basic Physical Properties:
 - a. All tests are performed by OCM Test Laboratories.
 - b. ISO 17025 Certified
 - c. American Association for Laboratory Accreditation (A2LA)
8. The chemical resistance testing for the coating shall be per ASTM D543 for immersion in fluids methods.
9. Additional product certifications shall include USFDA Coatings for Incidental Food Contact Applications Certified by Keller and Heckman LLP and MIL-STD-810F.

2.8 ELECTRICAL AND CONTROLS

A. Electrical design, assembly & testing

1. The electrical apparatus and control panel design, assembly, and installation, and the integration of component parts will be the responsibility of the manufacturer of record for this booster pumping equipment.
2. That manufacturer shall maintain at his regular place of business a complete electrical design, assembly and test facility to assure continuity of electrical design with equipment application.
3. Control panels designed, assembled or tested at other than the regular production facilities or by other than the regular production employees of the manufacturer of record for this booster pumping equipment will not be approved.

B. Conformance to Electrical Standards

1. The manufacturer of electrical control panels and their mounting and installation shall be done in strict accordance with the requirements of UL Standard 508A and the National Electrical Code (NEC), NFPA 70 latest revision so as to afford a measure of security as to the ability of the eventual owner to safely operate the equipment.
2. No exceptions to the requirements of these codes and standards will be allowed; failure to meet these requirements will be cause to remove the equipment and correct the violation.

C. UL Listing

1. All service entrance, power distribution, control and starting equipment panels shall be constructed and installed in strict accordance with Underwriter's Laboratories (UL) Standard 508A "Industrial Control Equipment."
2. The UL label shall also include an SE "Service Entrance" rating stating that the main distribution panel is suitable for use as service entrance equipment.
3. The panels shall be shop inspected by UL, or constructed in a UL recognized facility.
4. All panels shall bear a serialized UL label indicating acceptance under Standard 508A and under Enclosed Industrial Control Panel or Service Equipment Panel.
5. A photocopy of the UL labels for this specific project shall be transmitted to both the project engineer and the contractor for installation within their permanent project files, prior to shipment of the equipment covered under these specifications.

D. ETL Listing

1. All control panels shall be E.T.L. Listed by Interek Testing Services (ITS) under the Industrial Control Panel (ICP) Category.
2. Each completed control panel shall bear an ETL listing label stating that the panel conforms to UL STD 508A and is certified to CAN/CSA STD C22.2 NO. 14.
3. The listing label shall include the station manufacturer's name, address and telephone number.

4. The station manufacturer shall have quarterly inspections performed by ETL at the manufacturer's facility to ensure that the products being listed comply with the report and procedural guide for that product.
- E. Equipment Grounding
1. Each electrical equipment item in the station shall be properly grounded per Section 250 of the National Electrical Code.
 2. Items to be grounded include, but are not limited to, pump motor frames, control panel, transformer, convenience receptacles, dedicated receptacle for heater, air conditioner, dehumidifier, lights, light switch, exhaust fans and pressure switches.
 3. All ground wires from installed equipment shall be in conduit and shall lead back to the control panel to a copper ground buss specific for grounding purposes and so labeled.
 4. The ground buss shall be complete with a lug large enough to accept the installing electrician's bare copper earth ground wire.
 5. The bus shall serve as a bond between the earth ground and the equipment ground wires.
- F. Panel Mounting Hardware
1. Metal framing channel and hangers shall be used exclusively for mounting of electrical panels and electrical components except for those specifically designated otherwise.
 2. When mounting panels in buildings with $\frac{3}{4}$ " plywood interior sheathing, certain panels and components may be mounted by screwing these devices into the wall.
 3. The maximum weight of a panel mounted with four lag screws cannot exceed 250#.
 4. The lag screws must either be $\frac{5}{16}$ " or $\frac{3}{8}$ " diameter and be fully threaded.
- G. Electrical Service
1. The electrical service provided for this station will be 480 volt, 3 phase, 60 Hertz, 4 wire.
- H. Electrical Distribution Panel
1. The distribution panel shall be a single section, bolt-on panelboard, bottom feed, surface mount, SE rated, NEMA 1 enclosure for three phase, three wire, 480 VAC Delta power and with aluminum bus. Circuit Breakers are rated for 42 KAIC.
 2. The main circuit breaker shall be rated for 600 amp service.
- I. Lighting Panel
1. All secondary circuit breakers shall be incorporated into one (1), separate NEMA 1 circuit breaker panel.
- J. Electrical Apparatus – Control Panel
1. All circuit breakers, motor starters, time delay relays and control relays shall be incorporated into one (1) NEMA 1 control panel.
- K. Telemetry Control Interface Panel
1. The telemetry panel, including remote terminal unit (RTU) hardware and software, PLC and communication equipment shall be fabricated and installed by Sewell Electronics or approved equal. The bill of materials included in the telemetry panel/RTU are provided in Appendix C.
 2. The pump station manufacturer shall provide wall mounting space telemetry/RTU panel.
 3. During shop drawing review the pump station manufacturer and Sewell Electronics (or an approved equal) shall coordinate conduit locations, control, and power wiring connections.
- L. Alarms Condition and Outputs
- M. Pump Motor Run Time Meter
1. The control panel shall contain one running time meter supplied for each pump to show the cumulative number of hours of operation.

2. The meter shall be enclosed in a dust and moisture proof molded plastic case, suitable for flush mounting on the main control panel.
3. The meter dial shall register in hours and tenths of hours up to 99999.9 hours before repeating.
4. The meter shall be suitable for operation from a 115 volt, 60 cycle supply.

N. Electrical Phase Monitor

1. A phase monitor shall be supplied to protect three-phase equipment against phase loss, undervoltage and phase reversal conditions.
2. When a fault is sensed, the monitor output relay opens within two seconds or less to turn the equipment off and/or cause an audio or visual alarm. Both Delta and Wye systems may be monitored.
3. The monitor shall have an automatic reset and shall also include an adjustable voltage delay.
4. The monitor shall have an indicator LED (glows when all conditions are normal and shall monitor phase sequence: ABC operate (will not operate CBA)).
5. The phase monitor shall be UL approved and CSA certified.

O. Surge Protections Device

1. See section 26 43 13.

P. Electrical Conduit and Wiring

1. See corresponding Div. 26 sections listed in paragraph 1.1.H.

Q. Gauge Pressure Transmitters

1. Pressure transmitters shall be supplied to measure pump station suction and discharge pressure.
2. The transmitters shall sense gauge pressure and transmit a 4-20 mA dc signal.
3. The instruments shall measure pressure of a predetermined span.
4. Range is to be fully adjustable throughout using allowable span and range limits.
5. The accuracy shall be $\pm 0.20\%$ of span.
6. Each transmitter shall provide an analog output and include a standard LCD with pushbuttons to provide Intelligent transmitter configuration directly from the on-board pushbuttons.
7. The two-line digital indicator shall display the measurement in any selected units.
8. The pushbuttons shall provide calibration of zero and span, setting of linear output, forward or reverse direction, external zero enable or disable, damping, failsafe action and local display including upper and lower range value selection.
9. All process-wetted parts of each instrument shall be Type 316L stainless steel.
10. The transmitter shall be protected by a gasketed, weatherproof NEMA 4X enclosure.
11. The transmitter shall be approved for use in hazardous locations (Nonincendive for Class 1 and Class II, Division 2 locations; intrinsically safe or explosion-proof for Class 1 and Class II, Division 1 locations).
12. The transmitter shall have 1/2 inch NPT female threaded tapping ports.
13. Gauge Pressure Transmitter manufacturer:
 - a. Rosemount 2088G2S22A1M7B4S5.
 - b. Or approved equivalent.

R. Electrical Devices

1. Multi-position switches including Hand Off-Automatic switches shall be oil tight, 3 position maintained and be located on the main control panel door.
2. Indicating lights shall be oil tight, with a full voltage pilot light.

3. Nameplates shall be furnished on all panel front mounted switches and lights.
4. Switches, lights and pushbuttons shall be Schneider Electric, Series XB, 22 mm, Die Cast Chrome plated devices.
5. Pilot lights shall be with protected LED's for 120 Vac operation as XB4BVG, pushbuttons shall be non-illuminated, momentary contact, extended lens as ZB4BL and the switches shall be 2 position maintained, 2 position right-to-left, 3 position maintained, 3 position momentary-to-center, 3 position momentary from left to center, and 3 position momentary from right to center with standard black lever as ZB4BD.
6. Switches
 - a. Pump #1 Hand-Off-Auto, 3-position;
 - b. Pump #2 Hand-Off-Auto, 3-position;
 - c. Pump #1 Telemetry-Test, 2-position;
 - d. Pump #2 Telemetry-Test, 2-position;
7. Lights
 - a. Red – Low Suction Pressure;
 - b. Red – High Discharge Pressure;
 - c. Green – Pump #1 in Operation;
 - d. Green – Pump #2 in Operation;
 - e. Red – Pump #1 Failure;
 - f. Red – Pump #2 Failure;
8. The solid state time delay relay shall have an adjustable time range of 10 seconds to 10 minutes. The relays shall be constructed to use a DIN rail mount socket so that the relays can be replaced without disturbing the wiring. The relay shall be complete with LED indicators for output and power.
9. The control panel door shall be complete on the interior with a stick-on transparency containing an "as-built" reproduction of the electrical control panel schematic.
10. The wiring diagram shall be a corrected "as built" copy & contain individual wire numbers, circuit breaker numbers, switch designation & control function explanations.

2.9 SOURCE QUALITY CONTROL

A. Testing:

1. All components of pump station shall be given an operational test at factory to check for excessive vibration, for leaks in piping or seals, and for correct operation of automatic control system and auxiliary equipment.
 - a. Correct all deficiencies.
2. Couple pump suction and discharge lines to a reservoir and have the pumps recirculate water for at least 1 HR under simulated service conditions.
3. Adjust automatic control to start and stop pumps at approximate levels required by job conditions.

2.10 MAINTENANCE MATERIALS

- A. See individual equipment Specification Sections.
- B. Touch up kit for coating field welds and for repair of scratches.

PART 3 - EXECUTION

3.1 FABRICATION AND ASSEMBLY

- A. Prior to assembly, all station components shall be inspected for quality and tested for proper function and freedom from defects.
- B. Fabricate, install, construct and assemble all components, equipment and accessories according to manufacturers' recommendations, applicable standards and these specifications.

- C. Assembly and Alignment Verification
 - 1. Verify flow direction on valves and piping prior to installation
 - 2. Verify station is set level and plumb
 - 3. Verify water main inlet and outlet piping are level
 - 4. Verify lay lengths of fittings and valves
 - 5. Verify flange bolt patterns, dimensions and clearances
- D. Seal all conduits between classified and unclassified areas in accordance with NFPA 70.
- E. Pipe condensate from dehumidifier to sump with stainless steel piping.
- F. Perform all welding in accordance with AWS D1.1.
- G. Use Series E70 electrodes conforming to AWS A5.1/A5.1M for all welding.

3.2 PIPE, VALVES AND FITTINGS INSTALLATION

- A. Install valves and fittings in such a manner that does not damage or endanger workers or the materials.
- B. Install such that no stresses are transmitted from the existing water main piping to the appurtenance body, bolts, or flanges.
- C. Adequately support all valves and fittings during assembly. Temporary concrete blocking at each valve and fitting may be utilized.
- D. Install gaskets at each fitting. If necessary, a small amount of glue may be used to ensure gasket stays in place during fit-up and assembly
- E. Flange faces shall bear uniformly on gaskets. No pinched, misaligned, split or otherwise defective gaskets will be accepted.
- F. Flange bolts and fittings are not to be used to 'pull up' or compensate for misaligned or inaccurately installed pipeline flanges.
- G. Flanged joints shall be progressively tightened in a crisscross pattern and made watertight.
- H. Tension in flange bolts shall not exceed manufacturer's recommendations.
- I. Impact wrenches shall not be used to tighten flange bolts.
- J. All pipe welds shall be by certified welders only.
- K. Prepare weld surfaces prior to welding and after welding to achieve desired surface preparation and finish.
- L. Weld six (6) restraining points on each inlet/outlet pipe to the station for attachment of joint restraint tie rods. The restraining points shall be welded fully along its length on both sides, and the back plate of the restraining points may need to be trimmed to fit the pipe OD. The pipe coating shall be restored. On each inlet/outlet pipe, install six (6) joint restraint rods between the next mechanical joint and the station piping for restraint of the transition coupling. The joint restraint rods shall be $\frac{3}{4}$ " diameter rods with nuts, hot-dipped galvanized and coated or stainless steel.
- M. Install pressure gauges, automatic combination air release valve and threaded lead-free brass/bronze piping and fittings.
- N. Station Penetrations – All penetrations in the walls, floor or lid of the station shall be water and weather tight. Contractor shall be responsible for any leakage and damage caused by leakage during construction.
- O. Air Release – mount an automatic air release valve (AAV) on discharge pipe and suction pipe and each pressure station. Use isolation ball valves and tee assembly with hose bibs for pipeline AAV. Use isolation valve for pressure station AAV.
- P. Pressure Instrumentation

1. All gauges, pressure switches and pressure transmitters shall be mounted from the pipeline and be connected with tubing (stainless steel) to their respective sensing point.
2. The gauge trim tubing shall be complete with brass (copper and steel pipe) or stainless steel ball valves for isolation and venting.
3. The tubing and valves shall be arranged to easily vent air and to facilitate instrument removal and calibration.
4. A sketch of the sub-panel detail for pressure instrumentation shall be included with the submittal.

3.3 DRAIN AND SUMP PIPING

A. System

1. Supply and Install all parts for a complete sump system.
2. Drain system shall be day-lighted outside of booster pump station.
3. System shall include a mechanism to prevent rodents and insects entry into the station.
4. Adjust for suitable operation within chamber constraints

3.4 ELECTRICAL AND TELEMETRY

A. Installations shall follow NEC, NESC, and NFPA.

B. Telemetry & Control Panel

1. Controls/PLC programming will be by the Station Manufacturer.

C. Panel and Equipment Identification

1. Panel Identification
 - a. Each panelboard, safety switch, junction box and enclosure containing energized conductors shall have an OSHA-approved Voltage Designation Sign affixed.
2. Legend Plates
 - a. Equipment, breakers, pushbuttons, etc. shall be clearly marked as to their function and use.
3. Panelboard Directory
4. Provide a clearly legible, typewritten directory in the electrical panel, indicating the area, piece of equipment, etc., controlled by each breaker.
5. The directory shall be inserted into a plastic card holder in the panel.

3.5 DISINFECTION

- A. The Manufacturer shall coordinate with the Owner for disinfection in accordance with manufacturer's recommendations and AWWA.

3.6 FACTORY TESTING

A. Pressure Testing

1. When the station piping is completed, the station piping system, including pumps, piping, fittings, and all valves that make up the entire station piping, shall be first tested with high pressure air to test for leaks.
2. After final assembly of the pumps, piping and valves, the entire system shall be hydrostatically tested at a pressure of 200 psi. Verify with manufacturers working pressures of all components and fittings can accept pressure testing to 200 psi prior to starting test.
3. The test pressure shall be applied for a minimum of 20 minutes, during which time all joints, connections and weld seams shall be checked for leaking.
4. Any deficiencies found during the hydrostatic test shall be repaired, and the system shall be retested.

5. The results of this testing shall be transmitted in writing to the Engineer prior to shipment of the station and shall note test pressure, time at full pressure and be signed by the Quality Control Manager or test technician.

B. Operational Testing

1. Pumps shall be tested, to insure compliance with its published head-capacity curve and insure full pumping capability. The manufacturer shall provide a factory certified performance test on each pump in accordance with the Hydraulic Institute..
2. Final test results shall be supplied to the Owner's Project Manager prior to shipment of the station. The tests shall be dated and signed by the Station Manufacturer.

3.7 FACILITY PERFORMANCE AND START-UP

- A. The manufacturer shall provide the services of a factory-trained technical representative for a minimum period of two days (minimum of 16 hours of on-site availability) to assist the Contractor and Owner with the initial start-up of each station.
- B. Field start-up of the new station shall be coordinated with the Engineer and typically includes the following:
- C. Contractor shall provide means (hoses, corps/taps, etc) for field testing and adjustment of the mechanical valve features in the station.
- D. Opening/closing of the pressure plane boundary valves (by Owner)
- E. It shall be the responsibility of the Contractor to inform all parties of this initial start-up, and to ensure their attendance.
- F. The manufacturer's representative shall instruct all personnel attending the start-up in the correct and required operation, maintenance and service procedures for the water booster station.
- G. Owner shall have Electrical subcontractor on-site during this start-up.
- H. The start-up technician shall prepare a start-up service report.

END OF SECTION

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SECTION 33 16 50
REHABILITATION OF WATER STORAGE TANKS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Tank rehabilitation requirements for the existing Garrett and Payneville tanks.
- B. Related Requirements: Include, but are not necessarily limited to:
 - 1. Section 09 90 20 – Surface Preparation and Coating for Tank Projects.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Only one tank can be taken out of service at a time. The Contractor shall coordinate with the Owner's operations to shut down the tank.
 - 2. Existing utility antennas are located on both tanks. Coordination may be required with these utilities to have them relocate and replace their equipment.
- B. Sequencing and Scheduling:
 - 1. Cleaning, blasting, and coating operations for the tanks are only allowed between April 1 and November 1.

1.3 SUBMITTALS

- A. Action Submittals: Submit the following:
 - 1. Shop Drawings:
 - a. Antenna corral.
 - b. Roof vent.
 - c. Exterior safety cable.
 - d. Gaskets, bolts, and nuts for manway access hatches.
 - e. Grout for base plate.

PART 2 - GROUT FOR PIPE SUPPORT.TANK IMPROVEMENTS

2.1 GARRETT TANK

- A. Interior Improvements:
 - 1. Cleaning and Coating:
 - a. See Specification 09 96 00 – High Performance Industrial Coatings.
 - 2. Seam Repair:
 - a. Caulk all seams above waterline with Sika Flex 1a, or equal.
- B. Exterior Improvements:
 - 1. Cleaning and Coating:
 - a. See Specification 09 96 00 – High Performance Industrial Coatings.
 - 2. Miscellaneous Items:
 - a. Install antenna corral.
 - b. Remove all non-operational cables and antennas.
 - c. Replace roof vent.
 - d. Install additional drain holes to balcony floor.
 - e. Replace exterior safety cable.

- f. Replace gaskets, bolts, and nuts for manway access hatches.
 - 1) Two locations: riser pipe and balcony around tank bowl.
 - g. Repair grout at base plate on leg columns.
 - h. Add grout to support overflow pipe.
 - 1) Size: approximately 6-inch x 12-inch.
 - i. Install new logo on tank bowl.
 - j. Remove target for level indicator.
- C. Supplemental Improvements
 - 1. Replace individual ladder rungs on the interior bowl ladder.
 - 2. Replace the interior bowl ladder.
 - 3. Install new support cables for inlet pipe in the bowl.
 - 4. Complete welding repairs.
 - 5. Complete pit welding repairs.
 - 6. Apply pit filler Tnemec 215.
 - 7. Install 4-inch x 4-inch welding plates.
- D. Work By Others:
 - a. Temporarily relocate antennas on tank.
 - b. Install all new antennas and attach to the antenna roof corral.

2.2 PAYNEVILLE TANK

- A. Interior Improvements:
 - 1. Cleaning and Coating:
 - a. See Specification 09 96 00 – High Performance Industrial Coatings.
 - 2. Seam Repair:
 - a. Caulk all seams above waterline with Sika Flex 1a, or equal.
 - 3. Inlet pipe within riser
 - a. Material: flanged standard weight steel.
 - b. See Contract Drawings for detail.
- B. Exterior Improvements:
 - 1. Cleaning and Coating:
 - a. See Specification 09 96 00 – High Performance Industrial Coatings.
 - 2. Miscellaneous Items:
 - a. Install antenna corral.
 - b. Remove all non-operational cables and antennas.
 - c. Replace roof vent.
 - d. Install additional drain holes to balcony floor.
 - e. Replace exterior safety cable.
 - f. Replace gaskets, bolts, and nuts for manway access hatches.
 - 1) Two locations: riser pipe and balcony around tank bowl.
 - g. Fill in hole at the base of the tank riser pipe.
 - h. Install new logo on tank bowl.
 - i. Remove target for level indicator.
- C. Supplemental Improvements
 - 1. Replace individual ladder rungs on the interior bowl ladder.
 - 2. Replace the interior bowl ladder.

3. Install new support cables for inlet pipe in the bowl.
4. Complete welding repairs.
5. Complete pit welding repairs.
6. Apply pit filler Tnemec 215.
7. Install 4-inch x 4-inch welding plates.

D. Work By Others:

- a. Temporarily relocate antennas on tank.
- b. Install all new antennas and attach to the antenna roof corral.

PART 3 - EXECUTION

3.1 MEADE COUNTY WATER DISTRICT LOGO

- A. Contractor shall coordinate with Owner on location, size, and orientation of the logo on the existing tank. Logo should be painted after all coatings have been installed.

3.2 INSPECTION

- A. Contractor shall utilize a NACE certified inspector to be present for the entirety of the tank rehabilitation process.

END OF SECTION

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DIVISION 40

PROCESS INTERCONNECTIONS



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SECTION 40 05 01
COMMON WORK RESULTS FOR PROCESS PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Common work results for buried and exposed process piping, including:
 - a. Pipe saddles (for gage installation).
 - b. Water for testing and disinfection.
 - c. General procedures for installing buried piping.
 - d. General procedures for installing non-buried piping.
 - e. Connections to existing piping
 - f. Field testing of piping.
 - g. Cleaning of piping.
 - h. Disinfecting and water quality testing of piping.
 - i. Piping System Schedules.

B. Related Requirements: Sections include, but are not necessarily limited to:

1. Section 09 96 00 - High Performance Industrial Coatings.
2. Section 10 14 00 - Identification Devices.
3. Section 31 23 33 - Trenching and Backfilling.
4. Section 40 05 51 - Common Requirements for Process and Utility Valves.

1.2 REFERENCES

A. Reference Standards:

1. American Iron and Steel Institute (AISI).
2. American Public Health Association (APHA), American Waterworks Association (AWWA), Water Environment Federation (WEF):
 - a. APHA/AWWA/WEF - Standard Methods for Examination of Water and Wastewater.
3. American Society of Mechanical Engineers (ASME):
 - a. B16.3, Malleable Iron Threaded Fittings.
 - b. B16.5, Pipe Flanges and Flanged Fittings.
 - c. B16.9, Factory-Made Wrought Steel Butt-Welding Fittings.
 - d. B16.22, Wrought Copper and Bronze Solder - Joint Pressure Fittings.
 - e. B16.26, Cast Copper Alloy Fittings for Flared Copper Tubes.
 - f. B36.19, Stainless Steel Pipe.
 - g. B40.100, Pressure Gauges and Gauge Attachments.
4. Association of Materials Protection and Performance (AMPP) (National Association of Corrosion Engineers (NACE)):
 - a. NACE SP0286, Electrical Isolation of Cathodically Protected Pipelines.
5. ASTM International (ASTM):
 - a. A53, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 - b. A126, Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
 - c. A182, Standard Specification for Forged or Rolled Alloy-Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service.

- d. A536, Standard Specification for Ductile Iron Castings.
- e. A778, Standard Specification for Welded, Unannealed Austenitic Stainless Steel Tubular Products.
- f. B88, Standard Specification for Seamless Copper Water Tube.
- 6. American Water Works Association (AWWA):
 - a. B300, Standard for Hypochlorites.
 - b. C208, Standard for Dimensions for Fabricated Steel Water Pipe Fittings.
 - c. C606, Standard for Grooved and Shouldered Joints.
 - d. C651, Standard for Disinfecting Water Mains.
 - e. C655, Field Dechlorination.
 - f. C800, Standard for Underground Service Line Valves and Fittings.
- 7. American Water Works Association/American National Standards Institute (AWWA/ANSI):
 - a. C110/A21.10, Standard for Ductile-Iron and Gray-Iron Fittings.
 - b. C111/A21.11, Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
 - c. C151/A21.51, Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water.
 - d. C153/A21.53, Standard for Ductile-Iron Compact Fittings for Water Service.
 - e. C605, Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings.
 - f. Manual M11, Steel Pipe: A Guide for Design and Installation.
- 8. Underwriters Laboratories, Inc. (UL).

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

- 1. Completion of the Work of this Section and Engineer's acceptance of associated field testing and inspection results is required prior to Contractor requesting inspection for Substantial Completion of the associated Work.

1.4 QUALITY ASSURANCE

A. Qualifications:

- 1. Installer of Piping:
 - a. Installer of piping shall be entity possessing not less than five years of similar, relevant experience to the piping Work required under the Contract and shall have completed not less than five projects installing substantively similar piping materials (including lining) of similar size to that required for the Work. Installer shall be able to document having installed not less than 5,000 linear feet combined total of such projects, excluding piping less than six-inch diameter and smaller.

1.5 SUBMITTALS

A. Action Submittals: Submit the following:

- 1. Product Data:
 - a. Submit manufacturer's published information, including catalog excerpts, specifications, and indication of specific reference standards with which materials comply, for each item specified in this Section, unless such information is furnished as part of a Submittal under another Specifications section. Furnish such information for each size and type of item required.
 - b. Clearly mark on product data Submittals proposed items and clearly indicate, via cross-outs or other method, items not proposed for the Work.

B. Informational Submittals:

- 1. Supplier Instructions:

- a. Instructions for handling, storing, installing, and placing into operation materials specified in this Section.
- 2. Field Quality Control Submittals:
 - a. Results of tests, inspections, and other quality control activities required by the Contract Documents and performed at the Site.
- C. Closeout Submittals: Submit the following:
 - 1. Record Documentation:
 - a. Submit record documents of piping layout Shop Drawings showing and indicating changes made during fabrication and installation, in accordance with Contract Modifications, allowance authorizations (if any), and field conditions encountered.

PART 2 - PRODUCTS

2.1 PIPING SYSTEMS SCHEDULE

- A. Piping system materials, fittings and appurtenances are subject to requirements of specific piping systems schedule at the end of "Part 3 – Execution" of this Section.
- B. Description:
 - 1. Piping Systems Organization and Definition:
 - a. Piping services are grouped into designated systems according to the chemical and physical properties of the fluid or slurry conveyed, system pressure, piping size and materials of construction.
 - b. Comply with the Piping Systems Schedule in "Part 3 – Execution" of this Section.

2.2 COMPONENTS AND ACCESSORIES

- A. Reducers:
 - 1. Furnish appropriate size reducers and reducing fittings to mate pipe to equipment connections.
 - 2. Connection size requirements may change from those shown on Drawings depending on equipment furnished.
- B. Protective Coating and Lining:
 - 1. Include pipe, fittings, and appurtenances where coatings, linings, coating, tests and other items are specified.
 - 2. Piping systems scheduled in the PIPING SYSTEM SCHEDULES Article of this Section that are indicated to receive HPC per Section 09 96 00 shall receive surface preparation and primer applied in the fabrication facility, at the coating applicator's shop, or other off-site location acceptable to the Engineer. Intermediate and topcoats are to be field applied unless noted otherwise.
- C. Underground Warning Tape:
 - 1. See Section 10 14 00 - Identification Devices.
- D. Sacrificial Anode Cathodic Protection:
 - 1. 3 pound magnesium sacrificial anodes, prepackaged in a cloth bag containing 75% hydrated gypsum, 20% bentonite and 5% anhydrous sodium sulphate.
 - 2. TW 600 V or an HMWPE insulated copper lead attached to the anode.
- E. Valves:
 - 1. See schematics and details for definition of manual valves used in each system under 4 inches in size.
 - a. See Drawings for valve types 4 inches and above and for automatic valves used in each system.

2. See Section 40 05 51 - Common Requirements for Process and Utility Valves.

2.3 WATER

A. Water for Testing and Disinfection:

1. Comply with reference standards indicated for required types of testing in this Section's "Field Quality Control" Article, for associated types of pipe, unless otherwise required in the Contract Documents.
2. Sources - General:
 - a. Where piping to be tested is also required to be disinfected, water for testing and disinfection shall be potable water in accordance with Laws and Regulations.
 - b. Where piping to be tested, does not require disinfection, unless otherwise required, water for testing may be potable water or non-potable water.
 - 1) Non-potable water, when used, shall be one of the following: fresh (without brine) surface water, groundwater (where available in sufficient quantity), treated final effluent from a wastewater treatment facility or water reclamation facility, or other, from source acceptable to Engineer (following Engineer's consultation with Owner or facility manager as applicable). Such water shall be of reasonable quality, free of debris and noticeable biological growth and materials. Water used for testing shall not contain Constituents of Concern in quantity that results in Hazardous Environmental Condition, permanent contamination of the piping tested, or effect detrimental to the Work and operation and maintenance of the facility.
3. Project-Specific Water Source(s):
 - a. The following may be used as source of water for testing and disinfection:
 - 1) Owner's existing water system. Rate of water withdrawal shall not exceed a rate considered acceptable by the Owner and does not hinder the normal operation of the utility.
 - b. Do not use water source not acceptable to Engineer (following Engineer's consultation with Owner or facility manager, as applicable).
4. Limitations on Water Conveyance Rates:
 - a. In addition to limitation(s), if any, on rate of water withdrawal from source, indicated above, maximum rates of water conveyance through temporary equipment and materials shall:
 - 1) Not result in filling of piping with flow velocity greater than one foot per second.
 - 2) Not cause damage or erosion at point of discharge. Provide appropriate energy-dissipating materials as necessary.
 - 3) Not cause temporary equipment and materials used for conveyance to exhibit undue strain or movement during operation.
5. Temporary Equipment and Materials for Conveyance of Water for Testing and Disinfection:
 - a. Provide, operate, and maintain temporary equipment and materials necessary for conveying water used for testing [and disinfection], including conveyance to piping and discharge from piping.
 - b. Sizes, capacity, and materials of temporary equipment shall be suitable for the intended purpose and Contractor's means, methods, procedures, techniques, and sequences of construction.
 - c. Provide temporary piping, couplings, valves, pumps, and appurtenances necessary.

PART 3 - EXECUTION

3.1 BURIED PIPING INSTALLATION

- A. Unless otherwise shown on the Drawings, provide a minimum of 42 inches earth cover over exterior buried piping systems and appurtenances conveying water, fluids, or solutions subject to freezing.

- B. When entering or leaving structures with buried mechanical joint piping, install joint within 2 feet of point where pipe enters or leaves structure.
 - 1. Install second joint not more than 6 feet nor less than 4 feet from first joint.
- C. Install expansion devices as necessary to allow expansion and contraction movement.
- D. Laying Pipe In Trench:
 - 1. Perform excavation and backfilling in accordance with Section 31 23 33 - Trenching and Backfilling.
 - 2. Clean each pipe length thoroughly and inspect for compliance to specifications.
 - 3. Grade trench bottom and excavate for pipe bell and lay pipe on trench bottom.
 - 4. Install gasket or joint material according to manufacturer's directions after joints have been thoroughly cleaned and examined.
 - 5. Except for first two joints, before making final connections of joints, install two full sections of pipe with earth tamped alongside of pipe or final with bedding material placed.
 - 6. Lay pipe in only suitable weather with good trench conditions.
 - a. Never lay pipe in water except where approved by Engineer.
 - 7. Seal open end of line with watertight plug if pipe laying stopped.
 - 8. Remove water in trench before removal of plug.
- E. Lining Up Push-On Joint Piping:
 - 1. Lay piping on route lines shown on Drawings.
 - 2. Deflect from straight alignments or grades by vertical or horizontal curves or offsets.
 - 3. Observe maximum deflection values stated in manufacturer's written literature.
 - 4. Provide special bends when specified or where required alignment exceeds allowable deflections stipulated.
 - 5. Install shorter lengths of pipe in such length and number that angular deflection of any joint, as represented by specified maximum deflection, is not exceeded.
- F. Anchorage and Blocking:
 - 1. Provide reaction blocking, anchors, joint harnesses, or other acceptable means for preventing movement of piping caused by forces in or on buried piping tees, wye branches, plugs, or bends.
 - 2. Place concrete blocking so that it extends from fitting into solid undisturbed earth wall.
 - a. Concrete blocks shall not cover pipe joints.
 - 3. Provide bearing area of concrete in accordance with drawing detail.
- G. Install underground hazard warning tape per Section 10 14 00 - Identification Devices.

3.2 CONNECTIONS WITH EXISTING PIPING

- A. Where connection between new work and existing work is made, use suitable and proper fittings to suit conditions encountered.
- B. Perform connections with existing piping at time and under conditions which will least interfere with service to customers affected by such operation.
- C. Undertake connections in fashion which will disturb system as little as possible.
- D. Provide suitable equipment and facilities to dewater, drain, and dispose of liquid removed without damage to adjacent property.
- E. Where connections to existing systems necessitate employment of past installation methods not currently part of trade practice, utilize necessary special piping components.
- F. Where connection involves potable water systems, provide disinfection methods as prescribed in this Section.

- G. Once tie-in to each existing system is initiated, continue work continuously until tie-in is made and tested.

3.3 CATHODIC PROTECTION

- A. Isolate, dielectrically, all piping from all other metals including reinforcing bars in concrete slabs, other pipe lines, and miscellaneous metal.
- B. Provide connections from wire or cable by Thermit Cadwelding accomplished by operators experienced in this process.
- C. Install cabling with loop and overhead knot around each pipe and slack equal to at least 50 percent of straight line length.
- D. After cadwelding, coat exposed metallic surfaces with hot applied tape.

3.4 FIELD QUALITY CONTROL

- A. Field Testing of Piping - General:
 - 1. Test at the Site, following piping installation, all piping, except as expressly indicated otherwise elsewhere in the Contract Documents.
 - 2. When authorities having jurisdiction require that their delegate or representative witness field testing of piping, advise Engineer in writing and authorities having jurisdiction not less than 48 hours prior to the associated testing.
 - 3. Perform testing of piping in presence of Engineer or Owner's Site Representative.
 - 4. Temporarily remove or protect piping-mounted devices, and devices installed on, in, or inline with piping and piping system appurtenances, such as manholes or chambers subjected to piping system testing, that could be damaged by testing. Upon successful completion of field testing of piping, reinstall devices temporarily removed and remove temporary protections provided for such devices, and verify such devices are in proper operating condition.
 - 5. Provide construction equipment and machinery, apparatus, and services necessary, required, or both, for field testing of piping, including:
 - a. Test pumps, compressors, hoses, temporary piping, calibrated monitoring and indicating devices, meters, test containers, valves, fittings, and temporary pumping systems required to maintain facility and system operations.
 - b. Temporary bulkheads, bracing, blocking, and thrust restraints.
 - 6. Provide pressurized air when air testing is required and gases when gases are required.
 - 7. Unless otherwise indicated, Owner will provide water for hydrostatic testing of piping. Contractor shall provide means to convey water for hydrostatic testing into piping being tested.
 - 8. Remedy observed and apparent leaks and remedy piping failing to comply with required acceptance criteria. Retest after implementing remedies until acceptable test results are obtained.
 - 9. Testing Schedules:
 - a. Type of testing required, and test pressure (when applicable), are indicated in piping schedules in the Contract Documents, including this Section.
 - b. Unless otherwise indicated, required test pressures are at lowest elevation of piping segment being tested.
 - c. For piping not indicated in piping schedules in the Contract Documents:
 - 1) Hydrostatically test piping that will convey liquid at pressure greater than five psig.
 - 2)
 - 3) Water quality testing (including bacteriological testing) of piping that will convey potable water or water that will be treated to become potable is required promptly following disinfection of such piping.
 - d. Test Pressure:

- 1) Where piping is required to be field tested under pressure, provide test pressure in accordance with piping schedules included in the Contract Documents.
 - 2) If test pressure is not indicated in piping schedule in the Contract Documents, or if test is required for piping not indicated in piping schedule in the Contract Documents, obtain interpretation or clarification from Engineer before proceeding. Test pressure will be determined by Engineer based on maximum anticipated sustained operating pressure and methods described in AWWA manual or reference standard applicable to such piping system.
10. Scheduling and Sequencing of Field Testing of Piping:
- a. Test exposed, non-insulated piping, and obtain Engineer's acceptance of results, as condition precedent to requesting Substantial Completion of such piping..
 - b. Test buried piping after backfilling.
11. Instrumentation Used for Field Testing of Piping:
- a. Perform field testing of piping systems that will operate under pressure or vacuum using calibrated pressure or vacuum measuring equipment, as applicable, and calibrated volumetric measuring equipment. Such calibrations shall have been issued not more than 12 months prior to the testing for which they are used.
 - b. Required value of parameter to be measured shall be in upper half of range of the associated item of pressure-, vacuum-, volume-measurement, and other measuring instrumentation used in field testing of piping.
- B. Hydrostatic Testing of Piping:
1. Preparation for Testing:
 - a. For thermoplastic pipe and fiberglass pipe, comply with procedures in Sections 7, 8, 9.1, and 9.2 of AWWA C605, and the Contract Documents.
 - b. For polyethylene pipe, comply with procedures in ASTM F2164, and the Contract Documents. Test duration, including time to pressurize, time for initial expansion, time at test pressure, and time to depressurize, shall not exceed eight hours. If re-testing of a test section or pipeline is required, not less than eight hours shall elapse between tests.
 - c. For steel pipe, comply with procedures in AWWA Manual M11, and the Contract Documents. Wetting period is not required for pipe without cement-lining.
 - d. For other piping, comply with procedures in AWWA Manual M9, and the Contract Documents, except minimum wetting period required immediately prior to testing for asbestos cement pipe shall be 24 hours rather than 48 hours prescribed for concrete pipe. Wetting period is not required for pipe without cement mortar- or concrete-lining.
 - e. Prior to testing, provide adequate thrust restraint and verify joints are properly installed.
 2. Test Procedure:
 - a. Fill piping slowly to minimize air entrapment and surge pressures. Fill rate shall not exceed one foot of pipe length per second in pipe being tested.
 - b. Expel air from piping as necessary. Obtain Engineer's approval prior to tapping pipe for expelling air.
 - c. Examine exposed joints and valves and remedy to eliminate visible or otherwise apparent leakage.
 - d. After required wetting period (if any), add water as necessary to pressurize piping to required test pressure. Maintain test pressure for stabilization period of ten minutes before beginning testing.
 - e. Polyethylene Pipe: After filling piping, gradually pressurize pipe to test pressure and maintain required test pressure for three hours for pipe to expand. During expansion, add water to maintain required test pressure. Begin timed test period after expansion period and complying with other requirements.
 - f. Timed test period shall not begin until after piping is filled, exposed to required wetting period (if any), air is expelled, and pressure stabilized.

- g. Timed Test Period: After stabilization period, maintain test pressure for not less than two hours. During timed testing period, add water as necessary to maintain pressure within five psig of required test pressure. Test pressure shall remain steady for one hour, indicating no leakage.
- h. Pump from test container to maintain test pressure. Measure volume of water pumped from test container and record on test report. Record pressure at test pump at 15-minute intervals for duration of test.
- 3. Allowable Leakage Rates: Leakage is defined as the quantity of water supplied to pipe segment being tested to maintain pressure within five psig of test pressure during timed test period. Allowable leakage rates for piping are:
 - a. No Leakage: Pipe with flanged, welded, fused, threaded, soldered, or brazed joints.
 - b. Rates based on formula or table in AWWA Manual M41:
 - 1) Metal and fiberglass pipe joined with rubber gaskets as sealing members, including the following joint types:
 - a) Bell and spigot and push-on joints.
 - b) Mechanical joints.
 - c) Bolted sleeve type couplings.
 - d) Grooved or shouldered couplings.
 - c. Rates based on formula or table in AWWA C605:
 - 1) Plastic pipe joined with O-ring gasket sealing members.
- 4. Record date, time, and location of each test, indicating piping segment tested, general description of apparatus used, pressure and leakage measurements obtained, remarks concerning conditions encountered during testing of each pipe segment, whether each pipe segment successfully passed the test, and names and employers of individuals performing and witnessing such testing. Furnish such results as Submittal.

3.5 CLEANING

A. Cleaning of Piping:

- 1. Cleaning of Piping – General:
 - a. Clean interior of piping systems thoroughly before installing.
 - b. Before jointing piping, thoroughly clean and wipe joint contact surfaces and properly dress and make joints.
 - c. For piping requiring disinfection that has not been kept clean during storage and handling, swab interior of each section and contact surfaces of joints, before installation, with five percent sodium hypochlorite solution.
 - d. Maintain pipe in clean condition during installation.
 - e. Cap or plug openings in pipe at end of each workday. Prevent entry of dirt, dust, particulates, water, humans, animals, and insects.
 - f. Following installation, piping 24-inch diameter and larger shall be inspected from inside and debris, dirt, and foreign matter removed.
 - g. Following installation, thoroughly clean all piping, including flushing with water, dry air, or inert gas as required, in appropriate manner, prior to placing in service. [Flush chlorine solution and sodium hypochlorite piping with water].

3.6 DISINFECTING AND WATER QUALITY TESTING

A. Applicability and Method:

- 1. This Article applies to piping that will convey potable water.
- 2. Disinfect piping requiring disinfection in accordance with AWWA C651 continuous feed method, unless otherwise required by the Contract Documents.

B. Disinfection Procedure:

1. Provide temporary taps, plugs, valves, drains, pumps, tanks, piping, facilities, and connections necessary to disinfect, dechlorinate, and remove chlorinated water in accordance with the Contract Documents.
2. Disinfect piping immediately before such piping is placed into operation, to prevent piping and appurtenances from becoming contaminated after disinfection.
3. Use solution of water and liquid chlorine, calcium hypochlorite, or sodium hypochlorite for disinfecting piping.
4. Introduce chlorine solution into piping in manner acceptable to Engineer. Introduction via an appropriate injection port or diffuser is preferred.
5. Add potable water to piping with the chlorine solution. Introduce water to piping through backflow prevention device if being introduced via outside source.
6. During disinfecting, exercise valves, hydrants, and similar operable devices in contact with chlorinated water to ensure complete disinfection of operable, wetted components.
7. When tapping piping conveying potable water, whether for water service lateral or other connection, comply with AWWA C651 relative to disinfecting during tapping operations.
8. Comply with AWWA C651 relative to disinfecting connecting piping and appurtenances between newly-disinfected piping and existing (operating) piping that conveys potable water.
9. Dechlorination:
 - a. When Chlorination Water will be Discharged to Potable Water System: Upon completion of disinfection of each piping segment, dechlorinate contents of piping, in accordance with AWWA C655, until chlorine residual equals the residual in local potable water system.
 - b. When the piping's heavily chlorinated water used for disinfection will be discharged into the potable water system and residual of local potable water system is not available, dechlorinate to achieve maximum chlorine residual of 0.50 mg/L, in accordance with AWWA C655.

3.7 LOCATION OF BURIED OBSTACLES

- A. Furnish exact location and description of buried utilities encountered and thrust block placement.
- B. Reference items to definitive reference point locations such as found property corners, entrances to buildings, existing structure lines, fire hydrants and related fixed structures.
- C. Include such information as location, elevation, coverage, supports and additional pertinent information.
- D. Incorporate such information on Record Drawings.

3.8 PIPING SYSTEM SCHEDULES

- A. Piping System 10 – Buried Potable Water Piping:
 1. General:
 - a. Field Tests and Inspections:
 - 1) Hydrostatic testing at 150 psi, or 1.5 times the working pressure, whichever is greater.
 - 2) Disinfecting and water quality testing of piping.
 - 3) Test procedures are indicated in this Section's "Field Quality Control" Article.
 - b. Gaskets and O-rings:
 - 1) O-rings: Neoprene or rubber.
 - 2) Flanged, push-on and mechanical joints (ductile iron): Rubber, AWWA/ANSI C111/A21.11.
 2. System components:
 - a. Pipe size to 3 inches:

- 1) Buried service:
 - a) Material: Copper tubing, Type K.
 - b) Reference: ASTM B88.
 - c) Lining: None.
 - d) Coating: None.
 - e) Fittings: AWWA C800.
 - f) Joints: Flared.
- b. Pipe size 3 inches through 24 inches:
 - 1) Buried service, Ductile Iron:
 - a) Materials: Ductile iron, Class 250.
 - b) Reference: AWWA/ANSI C151/A21.51.
 - c) Lining: Cement.
 - d) Coating: Bituminous.
 - e) Fittings:
 - (1) Either AWWA/ANSI C110/A21.10 ductile or gray iron.
 - (2) Optional: AWWA/ANSI C153/A21.53 ductile iron compact fittings for sizes 3 to 16 inches.
 - f) Joints: Push-on with mechanical (stuffing box type) joints at fittings and valves.
 - 2) Buried service, PVC:
 - a) Materials: PVC, DR 18.
 - b) Reference: AWWA C900.
 - c) Lining: None.
 - d) Coating: None.
 - e) Fittings:
 - (1) Either AWWA/ANSI C110/A21.10 ductile or gray iron.
 - (2) Optional: AWWA/ANSI C153/A21.53 ductile iron compact fittings for sizes 3 to 16 inches.
 - f) Joints: Push-on with mechanical (stuffing box type) joints at fittings and valves.

END OF SECTION

SECTION 40 05 31
PIPE - PLASTIC

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Plastic pipe.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Section 40 05 00 - Pipe and Pipe Fittings - Basic Requirements.

1.2 QUALITY ASSURANCE

- A. See Specification Section 40 05 00.
- B. Referenced Standards:
 - 1. ASTM International (ASTM):
 - a. PVC (polyvinyl chloride) materials:
 - 1) D1784, Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.
 - 2) D1785, Standard Specification for Poly(Vinyl Chloride) PVC Plastic Pipe, Schedules 40, 80 and 120.
 - 3) D2241, Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
 - 4) D2467, Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
 - 5) D3034, Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
 - 6) D3139, Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
 - 7) D3212, Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
 - 8) F593, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
 - 9) F679, Standard Specification for Poly(Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings.
 - 10) F794, Standard Specification for Poly(Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.
 - 11) F949, Standard Specification for Poly(Vinyl Chloride) (PVC) Corrugated Sewer Pipe with a Smooth Interior and Fittings.
 - b. American Water Works Association (AWWA):
 - a. PVC (polyvinyl chloride) materials:
 - 1) C900, Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 60 In.
 - b. Polyethylene (PE) materials:
 - 1) C901, Standard for Polyethylene (PE) Pressure Pipe and Tubing, 1/2 inches through 3 IN, for Water Service.
 - 2. NSF International (NSF).

1.3 SUBMITTALS

- A. See Specification Section 40 05 00.

PART 2 - PRODUCTS

2.1 PRESSURE PIPING (UNDERGROUND)

- A. Materials: Furnish materials in full compliance with following requirements:
 - 1. Sizes 4- through 60-inch diameter: AWWA C900 DR 18 PVC
 - a. Pressure Rating: 235 psi.
 - 2. Joints for polyethylene pipe shall be fusion type in accordance with AWWA C901.
 - 3. Joints for PVC pipe shall be the elastomeric-gasket type with a pressure rating not less than pipe pressure rating meeting performance requirements of ASTM D3139.

PART 3 - EXECUTION

3.1 IDENTIFICATION

- A. Identify each length of pipe clearly at intervals of 5 feet or less.
 - 1. Include manufacturer's name and trademark.
 - 2. Nominal size of pipe, appurtenant information regarding polymer cell classification and critical identifications regarding performance specifications and NSF approvals when applicable.

3.2 PRESSURE PIPING (UNDERGROUND)

- A. Installation:
 - 1. Field threading of PVC pipe will not be permitted.
 - 2. Perform installation procedures, handling, thrust blocking, connections, and other appurtenant operations in full compliance to the manufacturer's printed recommendations and in full observance to plan details when more stringent.

END OF SECTION

SECTION 40 05 51
COMMON REQUIREMENTS FOR PROCESS AND UTILITY VALVES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Valving and valving appurtenances.
- B. Related Sections include but are not necessarily limited to:
 - 1. Section 40 05 00 - Pipe and Pipe Fittings - Basic Requirements.
 - 2. Section 40 05 61 - Gate Valves.
 - 3. Section 40 05 64 - Butterfly Valves.

1.2 REFERENCES

- A. Referenced Standards:
 - 1. American Society of Mechanical Engineers (ASME):
 - a. B1.20.1, Pipe Threads, General Purpose.
 - b. B16.1, Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.
 - c. B16.18, Cast Copper Alloy Solder Joint Pressure Fittings.
 - 2. ASTM International (ASTM):
 - a. A126, Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
 - b. D256, Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics.
 - c. D638, Standard Test Method for Tensile Properties of Plastics.
 - d. D648, Standard Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position.
 - e. D695, Standard Test Method for Compressive Properties of Rigid Plastics.
 - f. D2240, Standard Test Method for Rubber Property-Durometer Hardness.
 - 3. American Water Works Association (AWWA):
 - a. C207, Standard for Steel Pipe Flanges for Waterworks Service - Sizes 4 inches through 144 inches.
 - b. C500, Standard for Metal-Seated Gate Valves for Water Supply Service.
 - c. C504, Standard for Rubber-Seated Butterfly Valves.
 - d. C507, Standard for Ball Valves, 6 inches through 48 inches (150 mm through 1200 mm).
 - e. C509, Standard for Resilient-Seated Gate Valves for Water Supply Service.
 - f. C550, Standard for Protective Coatings for Valves and Hydrants.
 - g. C606, Standard for Grooved and Shouldered Joints.
 - 4. American Water Works Association/American National Standards Institute (AWWA/ANSI):
 - a. C111/A21.11, Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
 - 5. National Electrical Manufacturers Association (NEMA):
 - a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
 - b. MG 1, Motors and Generators.
 - 6. National Fire Protection Association (NFPA):
 - a. 70, National Electrical Code (NEC).

1.3 SUBMITTALS

A. Action Submittals:

1. Shop Drawings:
2. Product technical data including:
 - a. Acknowledgement that products submitted meet requirements of standards referenced.
 - b. Manufacturer's installation instructions.
 - c. Valve pressure and temperature rating.
 - d. Valve material of construction.
 - e. Special linings.
 - f. Valve dimensions and weight.
 - g. Valve flow coefficient.

B. Informational Submittals:

1. Test reports if required in the individual valve specification.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Contract Documents, refer to individual valve Specification Sections for acceptable manufacturers.

2.2 MATERIALS

- A. Refer to individual valve Specification Sections.

2.3 FABRICATION

A. End Connections:

1. Provide the type of end connections for valves as required in the Piping Schedules presented in Section 40 05 00 or as shown on the Drawings.
2. Comply with the following standards:
 - a. Threaded: ASME B1.20.1.
 - b. Flanged: ASME B16.1, Class 125 unless otherwise noted or AWWA C207.
 - c. Bell and spigot or mechanical (gland) type: AWWA/ANSI C111/A21.11.
 - d. Soldered: ASME B16.18.
 - e. Grooved: Rigid joints per Table 5 of AWWA C606.

- B. Refer to individual valve Specification Sections for specifications of each type of valve used on Project.

C. Nuts, Bolts, and Washers:

1. Wetted or internal to be bronze or stainless steel.
 - a. Exposed to be zinc or cadmium plated.
2. Buried:
 - a. T-Bolts for mechanical joints: Per AWWA/ANSI C111/A21.1
 - b. Other bolts and nuts: ASTM A307
 - c. Wax Tape Coatings per AWWA C217
 - d. Exposed: Mechanical galvanized ASTM B695, Class 40.
3. Heads and dimensions per ASME B1.1.
4. Threaded per ASME B1.1.
5. Project ends 1/4 to 1/2 inches beyond nuts.

- D. On Insulated Piping: Provide valves with extended stems to permit proper insulation application without interference from handle.
- E. Epoxy Interior Coating: Provide epoxy interior coating for all ferrous surfaces in accordance with AWWA C550.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Setting Buried Valves:
 - 1. Locate valves installed in pipe trenches where buried pipe indicated on Drawings.
 - 2. Set valves and valve boxes plumb.
 - 3. Place valve boxes directly over valves with top of box being brought to surface of finished grade.
 - 4. Install in closed position.
 - 5. Place valve on firm footing in trench to prevent settling and excessive strain on connection to pipe.
 - 6. After installation, backfill up to top of box for a minimum distance of 4 feet on each side of box.
- C. Support exposed valves and piping adjacent to valves independently to eliminate pipe loads being transferred to valve and valve loads being transferred to the piping.
- D. For grooved coupling valves, install rigid type couplings.
- E. For threaded valves, provide union on one side within 2 feet of valve to allow valve removal.
- F. Install valves accessible for operation, inspection, and maintenance.

END OF SECTION

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SECTION 40 05 61

GATE VALVES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Gate valves.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Section 40 05 51 - Common Requirements for Process and Utility Valves.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. ASTM International (ASTM):
 - a. A126, Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
 - 2. American Water Works Association (AWWA):
 - a. C500, Standard for Metal-Seated Gate Valves for Water Supply Service.
 - b. C504, Standard for Rubber-Seated Butterfly Valves.
 - c. C550, Standard for Protective Epoxy Interior Coatings for Valves and Hydrants.
 - 3. Manufacturers Standardization Society of the Valve and Fittings Industry Inc. (MSS):
 - a. SP-9, Spot Facing for Bronze, Iron and Steel Flanges.
 - b. SP-70, Cast Iron Gate Valves, Flanged and Threaded Ends.
 - c. SP-80, Bronze Gate, Globe, Angle and Check Valves.
 - 4. NSF International (NSF):
 - a. 61, Drinking Water System Components - Health Effects.

1.3 DEFINITIONS

- A. OS&Y: Outside Screw and Yoke.
- B. NRS: Non-rising Stem.
- C. RS: Rising Stem.

1.4 SUBMITTALS

- A. Shop Drawings:
 - 1. See Specification Section 40 05 51.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the manufacturers listed in the applicable Articles below are acceptable.

2.2 VALVES: WATER

- A. Resilient Wedge Gate Valves:
 - 1. Comply with AWWA C515.
 - 2. Materials:
 - a. Stem and stem nut: Bronze.
 - 1) Wetted bronze parts in low zinc bronze.

- 2) Aluminum bronze components: Heat treated per AWWA C504.
 - b. Body, gate: Ductile iron.
 - c. Resilient wedge: Fully encapsulated rubber wedge.
- 3. Design requirements:
 - a. Minimum 200 PSIG working pressure.
 - b. Buried: NRS, O-ring stem seal, 2 inches square operating nut.
 - c. Exposed: OS&Y, stuffing box stem seal, handwheel.
 - d. Counter clockwise open rotation.
 - e. Fusion bonded epoxy coating interior and exterior except stainless steel and bearing surfaces.
 - 1) Comply with AWWA C550.
 - 2) Comply with NSF 61.
 - 3) Wetted bronze parts in low zinc bronze.
 - 4) Aluminum bronze components: Heat treated per AWWA C504.
- 4. Manufacturers:
 - a. Clow.
 - b. Mueller.
 - c. American Flow Control.
 - d. M & H.

2.3 ACCESSORIES

2.4 FABRICATION

A. General:

- 1. Provide valves with clear waterways the full diameter of the valve.

B. Spot valves in accordance with MSS SP-9.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. See Specification Section 40 05 51.
- B. Where larger buried valves utilize smaller bypass valves, provide a second valve box installed over the bypass valve operating nut.
- C. Do not install gate valves inverted or with the stems sloped more than 45 degrees from the upright unless the valve was ordered and manufactured specifically for this orientation.

END OF SECTION

SECTION 40 05 64

BUTTERFLY VALVES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Butterfly valves.
- B. Related Sections include but are not necessarily limited to:
 - 1. Section 40 05 00 - Pipe and Pipe Fittings - Basic Requirements.
 - 2. Section 40 05 51 - Common Requirements for Process and Utility Valves.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. American Society of Mechanical Engineers (ASME):
 - a. B16.5, Pipe Flanges and Flanged Fittings - NPS 1/2 Through NPS 24.
 - 2. ASTM International (ASTM):
 - a. A48, Standard Specification for Gray Iron Castings.
 - b. A126, Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
 - c. A276, Standard Specification for Stainless Steel Bars and Shapes.
 - d. A395, Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures.
 - e. A436, Standard Specification for Austenitic Gray Iron Castings.
 - f. A536, Standard Specification for Ductile Iron Castings.
 - 3. American Water Works Association (AWWA):
 - a. C504, Standard for Rubber-Seated Butterfly Valves.
 - 4. Manufacturers Standardization Society of the Valve and Fittings Industry Inc. (MSS):
 - a. SP-67, Butterfly Valves.

1.3 SUBMITTALS

- A. Shop Drawings:
 - 1. See Specification Section 40 05 51.
 - 2. For valves 8 inches and larger, furnish "Affidavit of Compliance" with Owner in accordance with AWWA C504.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
 - 1. DeZurik.
 - 2. Mueller/Linesal.
 - 3. Pratt a Mueller Water Company.
 - 4. Bray.
 - 5. Or equal.

2.2 HIGH PERFORMANCE BUTTERFLY VALVES

- A. In locations where reliability is critical, for automated valves that modulate for flow control or actuate periodically in intervals less than 2 hours, high performance butterfly valves with an offset disc design shall be used.
- B. Design Requirements:
 - 1. One-piece shaft.
 - 2. Separate shaft seal.
 - 3. Minimum shaft diameter to conform to AWWA C504, Class 150B.
- C. Materials of construction:
 - 1. Disc: 316 stainless steel.
 - 2. Shaft and pins: 17-4PH stainless steel or 316 stainless steel.
 - 3. Seals:
 - a. Water: PTFE.
 - b. Process air and high temperature: Graphite rings.
 - 4. Backing ring: Stainless steel.
 - 5. Bushings/Bearings: TFE/Glass liner with a 316 Stainless steel shell.
 - 6. Seat:
 - a. Two part with encapsulated RTFE or PTFE.
 - b. Seat Retainer: Stainless Steel.
 - c. Or Stainless Steel.
 - 7. End connection: Lugged valves may be used.

2.3 GENERAL USE BUTTERFLY VALVES

- A. For use in all location, except where high performance butterfly valves are required.
- B. Comply only with AWWA C504, as noted in this Specification Section.
- C. Materials:
 - 1. Valve bodies:
 - a. ASTM A126, Class B or ASTM A536 Grade 65-45-12 ductile iron.
 - b. Wafer valves may be constructed of ASTM A48, Class 40 cast iron.
 - 2. Valve shafts:
 - a. One-piece stainless steel, Type 304.
 - b. Pins: 304 stainless steel.
 - c. Bushings/Packing/O-rings: EPDM, RTFE or TFE.
 - d. Bearings: Reinforced TFE or equal.
 - 3. Valve discs:
 - a. Cast iron with welded nickel edge or 304 Stainless Steel disk.
 - 4. Valve seats:
 - a. Water: EPDM or Hycar.
 - b. Compressed air: Teflon, PTFE.
 - c. Process air: Viton, RTFE, rate for 300 degrees F minimum or higher if required by service.
 - 5. Shaft bearing: Bronze, TFE-coated stainless steel or reinforced TFE.
 - 6. Shaft seal in addition to any sealing provided by seat: Suitable synthetic rubber rings or PTFE V-ring suitable for operating conditions.
- D. Design Requirements:

1. Seat type: Resilient.
2. Body type:
 - a. Wafer Lug (laying length may vary from AWWA C504).
 - b. Equip wafer type with fully tapped anchor lugs drilled per ASME B16.5.
3. Direct buried valves:
 - a. All valves: Working pressure rated for 150 psi (Class 150B per AWWA C504).
4. Shaft diameter: One-piece constant diameter.

2.4 ACCESSORIES

- A. Refer to Drawings and/or valve schedule for type of actuators.
 1. Furnish actuator integral with valve.
- B. Refer to Section 40 05 51 for actuator requirements.
- C. Valve Flange Seal Rings:
 1. If Steel Slip-on flanges are being used on the process piping, flange seals will be required for proper installation of valves.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. See Section 40 05 51.

END OF SECTION

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SECTION 40 92 00
BULK WATER FILLING STATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - a. Packaged Bulk Water Filling Station.
- B. Related Requirements: Include, but are not necessarily limited to:
 - 1. Division 03 - Concrete.
 - 2. Division 26 – Electrical
 - 3. Division 33 - Utilities.

1.2 REFERENCES

- A. Reference Standards: Standards referenced in this section include, but are not necessarily limited to, the following:
 - 1. National Electrical Manufacturers Association (NEMA):
 - a. 250, Enclosures for Electrical Equipment.
 - 2. NSF International (NSF):
 - a. NSF/ANSI 61, Drinking Water Components – Health Effects.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Piping Joints:
 - a. Coordinate joints connecting Bulk Water Filling Station to associated yard piping. Provide compatible joints to connect yard piping and bulk water equipment and accessories.

1.4 SUBMITTALS

- A. Action Submittals: Submit the following:
 - 1. Product Data:
 - a. Manufacturer's standard drawings for each bulk water fill station equipment item and accessory of the type and size required. Such drawings shall indicate bulk water fill station equipment and accessories' layout, size, dimensions, type of connections to piping, and materials.
 - b. Payment system: Controls proposed, including control descriptions. Indicate operating parameters and ranges selectable and adjustable by facility personnel. Indicate details of user interfaces.
 - c. Manufacturer's standard published catalog data and specifications for each size and type of bulk water fill station equipment item and accessory required. Indicate third-party reference standards with which materials and equipment comply.
- B. Informational Submittals: Submit the following:
 - 1. Manufacturer's Instructions:
 - a. Manufacturer's written instructions for bulk water fill station handling, storage, installation, and startup.
 - b. Payment system written instructions for setup.
 - 2. Qualifications Statements:
 - a. Provide from each manufacturer, when requested by Engineer.

- C. Closeout Submittals: Submit the following:
 - 1. Operation and Maintenance Data:
 - a. Submit in accordance with Section 01 78 23 - Operation and Maintenance Data.
- D. Maintenance Materials Submittal: Furnish the items indicated below to Owner and submit documentation of delivery to and acceptance by Owner.
 - 1. Spare Parts and Extra Materials:
 - a. One each of any recommended spare parts.

1.5 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. All materials supplied within the bulk water fill station shall be BABAA compliant. If materials are unable to meet these requirements, a waiver must be applied for and reviewed by the Agency.
- B. Qualifications:
 - 1. Manufacturer:
 - a. Manufacturers of bulk water fill station system equipment and accessories required by this Section shall be a business regularly engaged in manufacturing and furnishing bulk water fill system.
 - b. Each manufacturer shall be able to document having furnished not less than 20 bulk water fill station equipment and accessories of type and size equal to or larger than those required for the Work, during the past five (5) years.
 - c. When requested by Engineer, submit qualifications statement indicating manufacturer's record of manufacturing and furnishing bulk water fill station equipment and accessories of the type required, and documentation of compliance with requirements of this Article.
 - d. The control system shall be manufactured in accordance with all local and applicable standards and shall be inspected as an "Industrial Control Assembly" with either UL or CSA label identification.

1.6 WARRANTY

- A. Manufacturer's Special or Extended Warranty:
 - 1. The manufacturer shall guarantee all components furnished as part of the Filling Station shall remain in effect for a period of five (5) years commencing from the date of shipment to the work site for the associated Work.
 - 2. The manufacturer shall provide software updates and phone support services for a period of one (1) year commencing from the date of shipment to the work site for the associated Work.

PART 2 - PRODUCTS

2.1 BULK WATER FILLING STATION

- A. Manufacturers:
 - 1. Subject to compliance with the Contract Documents, provide required quantity of one of the following:
 - a. Flowpoint Environmental Systems.
 - b. Or equal.
- B. Description:
 - 1. Provide, as shown on the Drawings or otherwise indicated in the Contract Documents, a bulk water fill station.
 - 2. Manufacturer shall provide one (1) access terminal hauler interface to allow for users to dispense water from the fill point. The access terminal shall include a keypad and digital

display for users to choose the fill line, enter a specific volume of water to be dispensed, and pay for the dispensed water.

3. In general, the station should provide the following items:
 - a. Access terminal including a keypad and digital display for user to select, dispense, and purchase a specific volume of water.
 - b. Metering devices and control valves.
 - c. Stainless steel piping and required supports.
 - d. Interior and exterior LED lighting.
4. The station shall be constructed and tested as an assembly prior to delivery to the site.

C. Materials and Performance Criteria:

1. External Components:
 - a. Insulated Enclosure:
 - 1) Minimum 1.5" (R11) thick wall and roof panels
 - 2) Lockable handle on exterior of insulated outswing door with panic bar on interior
 - 3) Drip flashing around perimeter
 - 4) Exterior clad with polyurethane Tri-Gray "Faux Stone" panels glued and screwed to the galvanized steel exoskeleton of the enclosure.
 - a) Panels shall be weatherproof with near zero UV degradation.
 - b. External Water Connection:
 - 1) Size: 2-inch
 - 2) End Connection: Female camlock
 - c. Galvanized Overhead Fill Support:
 - 1) Support shall be able to hold 2" fill line a minimum of 180-inches above the ground.
 - 2) The fill support line shall extend halfway into the driving lane.
2. Internal Components:
 - a. Piping:
 - 1) Material: stainless steel 304.
 - 2) Connection: Victaulic Rigid Couplings (Style 107), or equal.
 - 3) Piping shall be secured with adequate supports for station operation.
 - a) Pipe hangers are not acceptable.
 - b. Backflow Preventer:
 - 1) Size: 2-inch
 - 2) Wilkins 375XL reduced pressure principal assembly, or equal.
 - 3) Constructed with no lead components.
 - 4) Include shutoff valves for testing.
 - c. Control Valve and Flowmeter:
 - 1) Size: 2-inch
 - 2) Bermad 910 Series combination flow meter/control valve hydrometer, or equal.
 - a) Opening and closing speed controls.
 - d. Drain Valve:
 - 1) ASCO Normally Open Solenoid Valve, 120 VAC, 1/2", or equal.
 - e. Pressure Gauge:
 - 1) Material: Lead-free brass.
 - 2) Located downstream of backflow preventer.
3. Access Terminal:
 - a. Marine Grade Aluminum Enclosure:

- 1) Grey powder coating, rated NEMA 3R
- 2) External outswing door insulated for severe cold weather installation
- 3) Lockable handle
- b. Access Keypad:
 - 1) Flowpoint Model FP-KTECK-FUAB16 integrated Keypad/HMI, or equal.
 - 2) Secure, robust, and outdoor rated
 - 3) Clear, backlit LCD color display.
 - 4) Visible in all light levels.
 - 5) Integrated stainless steel backlit buttons with LCD screen with screen protector
- c. Programmable Logic Controller (PLC)
 - 1) Allen-Bradley 1769 CompactLogix PLC, or equal.
 - 2) Non-volatile memory
 - 3) Ethernet connection
- d. Customer Interface:
 - 1) Credit Card Acceptor:
 - a) Swipe terminal provided by Monex Group, or equal.
 - b) Credit card transaction terms and monthly costs as per Monex Group, or equal.
 - c) Credit card merchant account is not required.
 - 2) Receipt Printer Terminal:
 - a) Compact thermal printer
 - b) Anti-paper jam system
 - c) Integral auto-cutter
 - d) On demand printed receipt for each transaction
- e. Communication options:
 - 1) Cellular Assembly:
 - a) RV55 Daul LTE Multiband Antenna with bracket, or equal.
 - b) Programmable text alarms for system faults, communication errors, and external sensors:
 - (1) Flood
 - (2) Door/Intrusion
 - (3) Low temperature
 - (4) Power loss
4. Management Software
 - a. Allow a web-enabled PC to seamlessly interface with one or multiple hauler station using an Ethernet connection or Sierra Wireless RV55 series cellular modem connection or equal.
 - b. Software shall be used to configure the:
 - 1) Station's access device.
 - 2) Devices that shall measure volume of water dispensed.
 - c. Software shall monitor the station and automatically upload the hauler's transaction data.
 - d. Data shall be stored into a secure SQL database. The data shall include:
 - 1) Site ID,
 - 2) Station ID,
 - 3) Date and Time of Transaction,
 - 4) Volume, and
 - 5) Rate ID

- e. Software shall be installed on any site owned PC using Windows 10/11 OS with a network card configured to communicate over the Internet with the access station.
- 5. Interface, Billing, and Payment Features:
 - a. The software shall include an overview screen that can display various data views and create reports using built-in sorting tools.
 - b. The software shall have multiple pre-formatted reports that can be printed to a networked printer, email, or exported using common file formats (.pdf, .doc, etc.). At a minimum, the software shall include reports to show activity with daily totals, statements, and usage. Systems that only allow manual file retrieval from the station or manipulation of .csv files are not acceptable.
 - c. User-friendly interface screens shall be included for the facility to enter billing rates, alarm identification, station name, and location. The data shall be used in both the basic and advanced features of the management system.
 - d. Billing:
 - 1) System software must automatically collect all transactions from each access terminal at a user defined interval.
 - 2) System software must allow User to define "Volume Units" for bill generation.
 - 3) System software must allow User to define billing method either by Volume or by Load and by Discountable Rate based on customer.
 - 4) The software shall allow the Owner to define a list of allowed billing rates for dispensed water.
 - 5) The software shall total the dispensed volume and calculate the total cost of the transaction.
 - 6) The Owner shall be able to use the features of this software to substantiate the data recorded for each transaction.

2.2 BULK WATER FILLING STATION OPERATION

- A. The following is a suggested operating sequence for each User interaction with the system:
 - 1. Customer shall choose the hose '1 – UPPER FILL' and press 'ENTER'.
 - 2. User presses 'START' to use credit card.
 - 3. User is prompted to enter how much water they want to dispense.
 - 4. Cost of the water dispensing transaction is displayed.
 - 5. Users are prompted to tap, insert, or swipe credit card.
 - 6. Monex pre-authorizes for water based on the cost.
 - 7. If the transaction is authorized, the system is activated, and water will dispense until the requested volume is dispensed or until the User presses 'STOP'.
 - 8. Requested and totalized dispensed volume will be displayed.
 - 9. If User presses 'STOP' the user's credit card will only be billed for water dispensed based on volume dispensed x \$ rate of water per cubic yard.
 - 10. User can press 'ENTER' to get a printed receipt at any time during the transaction.
- B. The following is a suggested operating sequence for the internal components of the system:
 - 1. Once a volume of water is selected, and the User presses 'START', system controls to open a Flow Control Valve (FCV) to begin the discharge of water.
 - 2. System must measure the volume of water dispensed by receiving input from the flow meter.
 - 3. Once the requested volume of water has been dispensed, the FCV to close.
 - 4. FCV to "close" if there is a no-flow condition for a predetermined time or the access terminal "STOP" button is pressed.
- C. The system shall automatically disable if an alarm condition is triggered. The FCV shall close, and the screen shall display out of order.

2.3 SOURCE QUALITY CONTROL

A. Tests and Inspections:

1. Perform manufacturer's standard shop tests and inspections on materials and equipment furnished.
2. The station and base shall be constructed and tested as an assembly prior to delivery at the site. Defects shall be corrected prior to shipment to the Site.

PART 3 - EXECUTION

3.1 EXAMINATION

- #### **A. Installing the Work constitutes Contractor's approval of underlying work, substrates, and field conditions prevailing at the time of the Work.**

3.2 INSTALLATION

A. Installation – General:

1. Provide bulk water system equipment and accessories at location shown and indicated in the Contract Documents.
2. Install items in accordance with the Contract Documents, manufacturer's written instructions, and Laws and Regulations. Where such requirements conflict, obtain interpretation or clarification from Engineer prior to commencing the associated Work.
3. Water Filling Station Mounting
 - a. Install Station on adequately sized cast-in-place concrete base.
 - 1) Comply with requirements set forth in Division 03 – Concrete.
4. Support pipe manifold so that the weight of the piping is not supported solely by the Station.
5. Before installing, ensure each process equipment item and accessory is clean and free of dirt and debris.

3.3 FIELD QUALITY CONTROL

A. Field Tests and Inspections:

1. Hydrostatically test process piping before installing bulk water system.
2. Verify proper operation of each bulk water system equipment item and accessory.

B. Start-Up:

1. Manufacturer shall provide orientation and training for initial software installation and configuration and administration training and field configuration/testing of the system.

END OF SECTION



DIVISION 43

**PROCESS GAS AND LIQUID HANDLING,
PURIFICATION, AND STORAGE EQUIPMENT**



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SECTION 43 23 22

PUMPING EQUIPMENT - HORIZONTAL END SUCTION CENTRIFUGAL PUMPS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Pumps for the Flaherty pump station modification.
 - 2. Pumps for the Payneville pump station are included in Section 33 14 43 – Packaged Booster Pump Station.
- B. Related Sections include but are not necessarily limited to:
 - 1. Section 26 05 09 – Motors
 - 2. Section 26 05 19 – Low Voltage Electrical Power Conductors
 - 3. Section 26 05 26 – Grounding and Bonding
 - 4. Section 26 05 33 – Raceways and Boxes

1.2 REFERENCES

- A. Referenced Standards:
 - 1. American Bearing Manufacturers Association (ABMA).
 - 2. American Iron and Steel Institute (AISI):
 - a. Steel Products Manual.
 - 3. American National Standards Institute (ANSI).
 - 4. ASTM International (ASTM):
 - a. A48, Standard Specification for Gray Iron Castings.
 - b. B505, Standard Specification for Copper Alloy Continuous Castings.
 - c. B584, Standard Specification for Copper Alloy Sand Castings for General Applications.
 - 5. Hydraulic Institute (HI):
 - a. Standards for Centrifugal, Rotary Pumps.

1.3 SUBMITTALS

- A. Submittals: Submit the following:
 - 1. Shop Drawings shall mainly include the following:
 - a. System design information sheet with description of how proposed equipment satisfies specification requirements.
 - b. Pump. Inlet and outlet piping, check valve and isolation valve dimension drawing drawn to scale.
 - c. Base plans showing anchor bolt locations and base details.
 - d. Pump material and construction drawing.
 - e. Pump curves showing design point.
 - f. Pump operation and maintenance instructions.
 - g. Service and installation instructions.
 - 2. Operation and Maintenance Data:
 - a. Submit in accordance with Section 01 78 23 - Operation and Maintenance Data.

1.4 QUALITY ASSURANCE

- A. Comply with standards referenced in Article 1.2.A
- B. Balance:

1. All rotating parts to be accurately machined.
2. All rotating parts to be dynamically balanced.
3. Avoid resonance at normal operating speed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
1. Horizontal end suction centrifugal pumps:
 - a. Cornell.
 - b. Grundfos
 - c. Patterson.
 - d. Or approved equal.
 2. Mechanical seals (Type 1):
 - a. Chesterton 442.
 - b. Or approved equal

2.2 MATERIALS

- A. Materials:
1. Pump Service – Potable Water:
 - a. Casing: Cast Iron.
 - b. Casing Wear Ring: Bronze ASTM SAE 660.
 - c. Impeller: Bronze ASTM SAE 40 or Silicon Bronze.
 - d. Impeller Wear Ring: Bronze ASTM SAE 660.
 - e. Shaft: Stainless Steel AISI 416.
 - f. Shaft Sleeve: Bronze ASTM SAE 660.
 - g. Bearings: Antifriction.
 - h. Seal Housing: Cast Iron.
 - i. Baseplate: Cast Iron or Fabricated Steel.
 - j. Mechanical Seals” Tungsten carbide vs silicon carbide or carbon vs ceramic

2.3 EQUIPMENT

- A. Pump Performance and Requirements:
1. Type: Horizontal, close-coupled, end suction centrifugal pump.
 2. Manufacturer: Cornell Model 5H or approved equal.
 3. Design condition: 1200 GPM at 237 feet TDH with minimum pump efficiency of 82%.
 4. Secondary condition: 1440 GPM at 220 feet TDH with minimum pump efficiency of 83%.
 5. Shutoff condition: 0 gpm at 265 feet TDH.
 6. Maximum speed: 1800 RPM.
 7. Nameplate driver horsepower: 125.
 8. Drive type: Variable speed drive
 9. Net positive suction head required (NPSHR): 15 feet.
- B. Assure increasing head characteristic from secondary design condition to shutoff condition.
- C. Provide pumps with net positive suction head requirements that are less than the available net positive suction head at design conditions specified.
1. Fabricated pump base, anchorage and connection to skid foundation:

- a. Provide connection and anchorage detailed drawing prepared by licensed structural engineer as called for on Drawings.

2.4 PUMP SUPPORT AND ANCHORAGE

- A. Pumping units to be capable of withstanding all thrust conditions.
- B. Rotating parts of the pumps to operate without excessive end thrust, vibration or noise.
- C. Vibration Isolation Pad
 1. The pump/motor assembly shall be mounted to a fabricated steel base built specifically for the pump/motor to be mounted.
 2. Each mounting or attachment point shall be complete with a vibration isolation pad.
 3. Maximum vibration measured at the top of the motor not to exceed 90% maximum peak to peak amplitude as required by HI standards.
- D. Support Stands
 1. The pump support stands shall be structural steel.
 2. The steel plate shall be sufficient thickness to support the pump and motor.
 3. Provide connection and anchorage scaled drawing prepared by licensed structural engineer.
- E. Finite Element Analysis
 1. Pump manufacturer to perform finite element analysis (FEA) on assembled pumping units to ensure:
 - a. Torsional natural frequencies do not occur between 25% above or below the operating speed of the pumping unit over the entire operating range.
 - b. Any blade resonant frequency to be no closer than 25% of the natural frequency of the installed pumping unit.
 - c. Manufacturer to prepare an FEA of the pump support system. The support system shall be acceptable once the model and measured frequencies are in agreement.

2.5 ACCESSORIES

- A. See Section 43 05 23.
- B. Mechanical Seals:
 1. Balanced.
 2. Carbon rotating face.
 3. Ceramic seat.
 4. EPR type O-rings.
 5. Metal parts 316 stainless steel.

2.6 FABRICATION

- A. Furnishings causing to withstand 175 psig or 200% of maximum working pressure.
- B. Pump Shaft
 1. Heat treated and machines over its entire length.
 2. Provide shaft sleeves with which are sealed with O-ring.
- C. Bearings
 1. Provide anti-friction type bearings rated for ABMA L-10 life of 50,000 hours based on 24 hour continuous operation
 2. Inboard and outboard bearings to be interchangeable.
- D. Utilize oil lubrication.
- E. Impellers:

1. Balance per HI standards.
 2. One piece casting and machined for smooth finish.
 3. Keyed to shaft and held in center of volute.
- F. Provide one-piece cast bearing housing with catch basin reservoir.
- G. Furnish baseplate with drip lip to mount motor and pump.
- H. Casing Rings:
1. Equip pump case with two case rings at each impeller skirt.
 2. Provide pin to lock each ring in place.
- I. Pump rotation to conform with piping arrangement shown on Drawings.
- J. Heavy duty tapered grid-type capable of transmitting the drive torque.
1. Flexible type and sized for continuous operation at full load.
 2. Secure coupling hubs to driver and driven shafts by set screw over the key.
- K. Suction and Discharge:
1. Provide units with ANSI Class 150 LB rated flanged suction and discharge nozzles.
 2. Flange diameters, reducers, and flanged coupling adapters shall of the following diameters:

SERVICE CATEGORY	SUCTION, IN	DISCHARGE, IN
Potable water service	8	5

2.7 SOURCE QUALITY CONTROL

- A. Factory test any pump 100 hp or greater:
1. One pump of each service category.
 2. Measure capacity, power, and efficiency.
 3. Provide certified performance curve.
 4. Submit test procedures and test results.
 5. Witnessed by Engineer and Owner if 500 hp or greater.

2.8 MAINTENANCE MATERIALS

- A. Spare Parts
1. Include each of the following manufacturer's spare parts pre-packaged kits where applicable according to proposed pump style. Include one set/kit for a single pump only:
 - a. Oil Change: Provide one complete pump and motor lubrication change kit (if applicable). Oils and lubricants shall be synthetics by Mobil oil or approved equivalents per pump/motor manufacturer.
 - 1) Provide OS&Y lubricant.
 2. Medium and Large Pump (≥ 4 HP) - Rebuild Kits (per pump manufacturer for most routine kit(s) available):
 - a. Impeller Repair Kit: includes impeller, casing ring, washers and gaskets.
 - b. Bearing Repair Kit: include inboard and outboard bearings, retainers, locknut, seals and gaskets.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. The pump, motor and baseplate shall be installed per ANSI HI specification 1.4.
- B. Pump manufacturers shall provide specific instructions to the installation on how to anchor the pump/motor support stand to the structural steel skid.

END OF SECTION

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APPENDIX A
AGENCY AND PERMIT APPROVALS

KENTUCKY DIVISION OF WATER (KDOW) APPROVAL



Andy Beshear
GOVERNOR

ENERGY AND ENVIRONMENT CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION

300 Sower Boulevard
Frankfort, Kentucky 40601
Phone: (502) 564-2150
Fax: 502-564-4245

Rebecca W. Goodman
SECRETARY

Anthony R. Hatton
COMMISSIONER

August 24, 2024

Brett Pyles
Meade Co Water District
1003 Armory Pl
Brandenburg, KY 40108

RE: 2023 Water System Improvements
Meade County, KY
Meade Co Water District
AI #: 34020, APE20240001
PWSID #: 0820369-24-001

Dear Mr. Pyles:

We have reviewed the plans and specifications for the above referenced project. The plans include the construction of approximately 18,460 LF of 16-inch DI waterline, 4,200 LF of 8-inch PVC waterline, and also include upgrading the Flaherty Pump Station pumps to 1200 gpm at 241 feet TDH, and the installation of a new Paynesville Pump Station capable of 300 gpm at 137 feet TDH. This is to advise that plans and specifications for the above referenced project are APPROVED with respect to sanitary features of design, as of this date with the requirements contained in the attached construction permit.

If you have any questions concerning this project, please contact Cassie Campbell at 502-782-6909.

Sincerely,

Terry Humphries, P.E.
Supervisor, Engineering Section
Water Infrastructure Branch
Division of Water

TH:CC

Enclosures

c: HDR Engineering Inc
Meade County Health Department
Division of Plumbing

Distribution-Major Construction

Meade Co Water District

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GACT0000000067 (2023 Water System Improvements) 18,460 LF of 16-inch DI and 4,200 LF of 8-inch PVC waterline, upgrade Flaherty Pump Station pumps to 1200 gpm at 241 feet TDH, and new Paynesville Pump Station capable of 300 gpm at 137 feet TDH:

Narrative Requirements:

Condition No.	Condition
T-1	Construction of this project shall not result in the water system's inability to supply consistent water service in compliance with 401 KAR 8:010 through 8:600. [401 KAR 8:100 Section 5]
T-2	The public water system shall not implement a change to the approved plans without the prior written approval of the cabinet. [401 KAR 8:100 Section 4(3)]
T-3	A proposed change to the approved plans affecting sanitary features of design shall be submitted to the cabinet for approval in accordance with Section 2 of this administrative regulation. [401 KAR 8:100 Section 4(2)]
T-4	During construction, a set of approved plans and specifications shall be available at the job site. Construction shall be performed in accordance with the approved plans and specifications. [401 KAR 8:100 Section 3(1)]
T-5	Unless construction begins within two (2) years from the date of approval of the final plans and specifications, the approval shall expire. [401 KAR 8:100 Section 3(3)]
T-6	Upon completion of construction, a professional engineer shall certify in writing that the project has been completed in accordance with the approved plans and specifications. [401 KAR 8:100 Section 4(1)]
T-7	The system shall be designed to maintain a minimum pressure of 20 psi at ground level at all points in the distribution system under all conditions of flow. [Recommended Standards for Water Works 8.2.1, Drinking Water General Design Criteria IV.1.a]
T-8	Water lines should be hydraulically capable of a flow velocity of 2.5 ft/s while maintaining a pressure of at least 20 psi. [Drinking Water General Design Criteria IV.1.b]
T-9	The normal working pressure in the distribution system at the service connection shall not be less than 30 psi under peak demand flow conditions. Peak demand is defined as the maximum customer water usage rate, expressed in gallons per minute (gpm), in the pressure zone of interest during a 24 hour (diurnal) time period. [Drinking Water General Design Criteria IV.1.d]
T-10	When static pressure exceeds 150 psi, pressure reducing devices shall be provided on mains or as part of the meter setting on individual service lines in the distribution system. [Drinking Water General Design Criteria IV.1.c]
T-11	The minimum size of water main in the distribution system where fire protection is not to be provided should be a minimum of three (3) inch diameter. Any departure from minimum requirements shall be justified by hydraulic analysis and future water use, and can be considered only in special circumstances. [Recommended Standards for Water Works 8.2.2, Drinking Water General Design Criteria IV.2.b]

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Narrative Requirements:

Condition No.	Condition
T-12	Water mains not designed to carry fire-flows shall not have fire hydrants connected to them. [Recommended Standards for Water Works 8.4.1.b]
T-13	Flushing devices should be sized to provide flows which will give a velocity of at least 2.5 feet per second in the water main being flushed. [Recommended Standards for Water Works 8.2.4.b, Recommended Standards for Water Works 8.4.1.b]
T-14	No flushing device shall be directly connected to any sewer. [Recommended Standards for Water Works 8.2.4.b, Recommended Standards for Water Works 8.4.1.b]
T-15	Pipe shall be constructed to a depth providing a minimum cover of 30 inches to top of pipe. [Drinking Water General Design Criteria IV.3.a]
T-16	Water mains shall be covered with sufficient earth or other insulation to prevent freezing. [Recommended Standards for Water Works 8.7]
T-17	A continuous and uniform bedding shall be provided in the trench for all buried pipe. Backfill material shall be tamped in layers around the pipe and to a sufficient height above the pipe to adequately support and protect the pipe. Stones found in the trench shall be removed for a depth of at least six inches below the bottom of the pipe. [Recommended Standards for Water Works 8.7]
T-18	Water line installation shall incorporate the provisions of the AWWA standards and/or manufacturer's recommended installation procedures. [Recommended Standards for Water Works 8.7]
T-19	All materials used for the rehabilitation of water mains shall meet ANSI/NSF standards. [Recommended Standards for Water Works 8.1]
T-20	Packing and jointing materials used in the joints of pipe shall meet the standards of AWWA and the reviewing authority. [Recommended Standards for Water Works 8.1]
T-21	All tees, bends, plugs and hydrants shall be provided with reaction blocking, tie rods or joints designed to prevent movement. [Recommended Standards for Water Works 8.7]
T-22	All materials including pipe, fittings, valves and fire hydrants shall conform to the latest standards issued by the ASTM, AWWA and ANSI/NSF, where such standards exist, and be acceptable to the Division of Water. [Recommended Standards for Water Works 8.1]
T-23	Water mains which have been used previously for conveying potable water may be reused provided they meet the above standards and have been restored practically to their original condition. [Recommended Standards for Water Works 8.1]

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GACT0000000067 (2023 Water System Improvements) 18,460 LF of 16-inch DI and 4,200 LF of 8-inch PVC waterline, upgrade Flaherty Pump Station pumps to 1200 gpm at 241 feet TDH, and new Paynesville Pump Station capable of 300 gpm at 137 feet TDH:

Narrative Requirements:

Condition No.	Condition
T-24	Manufacturer approved transition joints shall be used between dissimilar piping materials. [Recommended Standards for Water Works 8.1]
T-25	The minimum size of water main which provides for fire protection and serving fire hydrants shall be six-inch diameter. [Recommended Standards for Water Works 8.2, Drinking Water General Design Criteria IV.2.a]
T-26	Pipes and pipe fittings containing more than 8% lead shall not be used. All products shall comply with ANSI/NSF standards. [Recommended Standards for Water Works 8.1]
T-27	Gaskets containing lead shall not be used. Repairs to lead-joint pipe shall be made using alternative methods. [Recommended Standards for Water Works 8.1]
T-28	Pipe materials shall be selected to protect against both internal and external pipe corrosion. [Recommended Standards for Water Works 8.1]
T-29	Dead end mains shall be equipped with a means to provide adequate flushing. [Recommended Standards for Water Works 8.2]
T-30	The hydrant lead shall be a minimum of six inches in diameter. Auxiliary valves shall be installed on all hydrant leads. [Recommended Standards for Water Works 8.4.3]
T-31	A sufficient number of valves shall be provided on water mains to minimize inconvenience and sanitary hazards during repairs. [Recommended Standards for Water Works 8.3]
T-32	Wherever possible, chambers, pits or manholes containing valves, blow-offs, meters, or other such appurtenances to a distribution system, shall not be located in areas subject to flooding or in areas of high groundwater. Such chambers or pits should drain to the ground surface, or to absorption pits underground. The chambers, pits and manholes shall not connect directly to any storm drain or sanitary sewer. Blow-offs shall not connect directly to any storm drain or sanitary sewer. [Recommended Standards for Water Works 8.6]
T-33	At high points in water mains where air can accumulate provisions shall be made to remove the air by means of air relief valves. [Recommended Standards for Water Works 8.5.1]
T-34	Automatic air relief valves shall not be used in situations where flooding of the manhole or chamber may occur. [Recommended Standards for Water Works 8.5.1]

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GACT0000000067 (2023 Water System Improvements) 18,460 LF of 16-inch DI and 4,200 LF of 8-inch PVC waterline, upgrade Flaherty Pump Station pumps to 1200 gpm at 241 feet TDH, and new Paynesville Pump Station capable of 300 gpm at 137 feet TDH:

Narrative Requirements:

Condition No.	Condition
T-35	The open end of an air relief pipe from automatic valves shall be extended to at least one foot above grade and provided with a screened, downward-facing elbow. [Recommended Standards for Water Works 8.5.2.c]
T-36	Discharge piping from air relief valves shall not connect directly to any storm drain, storm sewer, or sanitary sewer. [Recommended Standards for Water Works 8.5.2.d]
T-37	Water pipe shall be constructed with a lateral separation of 10 feet or more from any gravity sanitary or combined sewer measured edge to edge where practical. If not practical a variance may be requested to allow the water pipe to be installed closer to the gravity sanitary or combined sewer provided the water pipe is laid in a separate trench or undisturbed shelf located on one side of the sewer with the bottom of the pipe at least 18 inches above the top of the gravity sanitary or combined sewer pipe. [Drinking Water General Design Criteria IV.3.b]
T-38	Water lines crossing sanitary, combined or storm sewers shall be laid to provide a minimum vertical distance of 18 inches between the outside of the water main and the outside of the sanitary, combined or storm sewer with preference to the water main located above the sanitary, combined or storm sewer. [Drinking Water General Design Criteria IV.3.c]
T-39	At crossings, one full length of water pipe shall be located so both joints will be as far from the sewer as possible. [Recommended Standards for Water Works 8.8.3.b]
T-40	There shall be no connection between the distribution system and any pipes, pumps, hydrants, or tanks whereby unsafe water or other contaminating materials may be discharged or drawn into the system. [Recommended Standards for Water Works 8.10.1]
T-41	Water utilities shall have a cross connection program conforming to 401 KAR 8. [Recommended Standards for Water Works 8.10.1]
T-42	Installed pipe shall be pressure tested and leakage tested in accordance with the appropriate AWWA Standards. [Recommended Standards for Water Works 8.7.6]
T-43	New, cleaned and repaired water mains shall be disinfected in accordance with AWWA Standard C651. The specifications shall include detailed procedures for the adequate flushing, disinfection, and microbiological testing of all water mains. In an emergency or unusual situation, the disinfection procedure shall be discussed with the Division of Water. [Recommended Standards for Water Works 8.7.7]
T-44	A minimum cover of five feet shall be provided over pipe crossing underwater. [Recommended Standards for Water Works 8.9.2]

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Narrative Requirements:

Condition No.	Condition
T-45	Valves shall be provided at both ends of water crossings so that the section can be isolated for testing or repair; the valves shall be easily accessible, and not subject to flooding for pipes crossing underwater. [Recommended Standards for Water Works 8.9.2.b]
T-46	Permanent taps or other provisions to allow insertion of a small meter to determine leakage and obtain water samples on each side of the valve closest to the supply source for pipes crossing. [Recommended Standards for Water Works 8.9.2.c]
T-47	Pumping facilities shall be elevated to a minimum of three feet above the 100-year flood elevation, or three feet above the highest recorded flood elevation, whichever is higher, or protected to such elevations, [Recommended Standards for Water Works 6.1.1.a]
T-48	Pumping facilities shall be readily accessible at all times. [Recommended Standards for Water Works 6.1.1.b]
T-49	Pumping facilities shall be graded around the station so as to lead surface drainage away from the station. [Recommended Standards for Water Works 6.1.1.c]
T-50	Pumping facilities shall be protected to prevent vandalism and entrance by animals or unauthorized persons. [Recommended Standards for Water Works 6.1.1.d]
T-51	Raw and finished pump stations shall have adequate space for the installation of additional units if needed, and for the safe servicing of all equipment. [Recommended Standards for Water Works 6.2.a]
T-52	Raw and finished pump stations shall have floors that slope to a suitable drain. [Recommended Standards for Water Works 6.2.e]
T-53	Raw and finished pump stations shall provide a suitable outlet for drainage from pump glands without discharging onto the floor. [Recommended Standards for Water Works 6.2.f]
T-54	At least two pumping units shall be provided. With any pump out of service, the remaining pump or pumps shall be capable of providing the maximum pumping demand of the system. [Recommended Standards for Water Works 6.3]
T-55	Pumps shall have ample capacity to supply the peak demand against the required distribution system pressure without dangerous overloading, [Recommended Standards for Water Works 6.3.a]
T-56	Pumps shall be driven by prime movers able to meet the maximum horsepower condition of the pumps. [Recommended Standards for Water Works 6.3.b]

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Narrative Requirements:

Condition No.	Condition
T-57	Pumps shall be provided with readily available spare parts and tools. [Recommended Standards for Water Works 6.3.c]
T-58	Pump stations shall have indicating, totalizing, and recording metering of the total water pumped. [Recommended Standards for Water Works 6.6.3]
T-59	Each pump shall have a standard pressure gauge on its discharge line. [Recommended Standards for Water Works 6.6.3.a]
T-60	Each pump shall have a compound gauge on its suction line. [Recommended Standards for Water Works 6.6.3.b]
T-61	Where two or more pumps are installed, provision shall be made for alternation. [Recommended Standards for Water Works 6.6.5]
T-62	Provisions shall be made to prevent energizing the pump motor in the event of a backspin cycle. [Recommended Standards for Water Works 6.6.5]
T-63	Electrical controls shall be located above grade. [Recommended Standards for Water Works 6.6.5]
T-64	Equipment shall be provided or other arrangements made to prevent surge pressures from activating controls which switch on pumps or activate other equipment outside the normal design cycle of operation. [Recommended Standards for Water Works 6.6.5]
T-65	Pump stations shall have a power supply provided from at least two independent sources or a standby or an auxiliary source. [Recommended Standards for Water Works 6.6.6]
T-66	If standby power is provided by onsite generators or engines, the fuel storage and fuel line must be designed to protect the water supply from contamination. [Recommended Standards for Water Works 6.6.6]
T-67	All lubricants which come into contact with the potable water shall be certified for conformance to ANSI/NSF Standard 60. [Recommended Standards for Water Works 6.6.8]
T-68	Booster pumps stations shall have a bypass available. [Recommended Standards for Water Works 6.4.e]
T-69	Each booster pumping station shall contain not less than two pumps with capacities such that peak demand can be satisfied with the largest pump out of service. [Recommended Standards for Water Works 6.4.1]

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GACT0000000067 (2023 Water System Improvements) 18,460 LF of 16-inch DI and 4,200 LF of 8-inch PVC waterline, upgrade Flaherty Pump Station pumps to 1200 gpm at 241 feet TDH, and new Paynesville Pump Station capable of 300 gpm at 137 feet TDH:

Narrative Requirements:

Condition No.	Condition
T-70	All booster pumping stations shall be fitted with a flow rate indicating and totalizer meter. [Recommended Standards for Water Works 6.4.2]
T-71	Inline booster pumps shall be accessible for servicing and repairs. [Recommended Standards for Water Works 6.4.3]
T-72	Each pump must have an isolation valve on the intake and discharge side of the pump to permit satisfactory operation, maintenance and repair of the equipment. [Recommended Standards for Water Works 6.6.1]
T-73	Each pump shall have a positive?acting check valve on the discharge side between the pump and the shut?off valve. [Recommended Standards for Water Works 6.6.1]
T-74	Pump station piping shall be designed so that the friction losses will be minimized, not be subject to contamination, have watertight joints, be protected against surge or water hammer with suitable restraints when necessary, and be such that each pump has an individual suction line or the lines shall be manifolded that they will insure similar hydraulic and operating conditions. [Recommended Standards for Water Works 6.6.2]
T-75	Booster pumps taking suction from storage tanks shall be provided adequate net positive suction head. [Recommended Standards for Water Works 6.4.b]
T-76	Booster pumps shall controlled so that automatic shutoff or low pressure controllers maintain at least 20 psi in the suction line under all operating conditions. [Recommended Standards for Water Works 6.4.c]
T-77	Booster pumps taking suction from ground storage tanks shall be equipped with automatic shutoffs or low pressure controllers. [Recommended Standards for Water Works 6.4.c]
T-78	All automatic pump stations should be provided with automatic signaling apparatus which will report when the station is out of service. [Recommended Standards for Water Works 6.5]
T-79	All remote controlled stations shall be electrically operated and controlled and shall have signaling apparatus of proven performance. [Recommended Standards for Water Works 6.5]
T-80	Raw and finished pump stations shall have a floor elevation of at least six inches above finished grade. [Recommended Standards for Water Works 6.2.c]

**KENTUCKY TRANSPORTATION CABINET (KYTC) PERMIT
APPROVAL**



Andy Beshear
Governor

COMMONWEALTH OF KENTUCKY
TRANSPORTATION CABINET
Department of Highways, District 4 Office
634 East Dixie Highway
Elizabethtown, Kentucky 42701
(270) 766-5066
www.transportation.ky.gov/

Jim Gray
Secretary

March 3, 2025

Meade Co. Water Dist.
Brett Pyles
1003 Armory Place
Brandenburg, Kentucky 40108

Subject: Permit #: 04-2025-00060
Permit Type: Utilities - Water
Approval

Dear Applicant:

Attached is your permit approval and documentation for the subject permit.

Be advised that all work must be done in conformity with permit and application conditions. If you have any questions, please contact the Permits Section at this office.

Sincerely,

Chris Hampton

Chris Hampton
D4 Permits Supervisor

Attachments



An Equal Opportunity Employer M/F/D

NOTICE OF COMPLETION OF ENCROACHMENT PERMIT WORK

PERMITTEE

Name: Meade Co. Water Dist.
Contact Person: Brett Pyles
Address: 1003 Armory Place
City: Brandenburg
State: Kentucky
Zip: 40108
Telephone: (270) 422-5006

PROJECT IDENTIFICATION

Permit Number: 04-2025-00060

I wish to notify the Department of Highways that the above mentioned permit work and any necessary right-of-way restoration have been completed and are ready for final inspection.

Permittee

Please return this form to the address below when work is completed and ready for final inspection.

Please Return to: Permit Engineer
Department of Highways, District 4 Office
634 East Dixie Highway
Elizabethtown, Kentucky 42701
(270) 766-5066
www.transportation.ky.gov/

LOCATION(S)			
Description	County - Route	Latitude	Longitude
	Meade - KY 1238	37.900767	-86.108308
	Meade - KY 1239	37.954288	-86.242005
	Meade - KY 333	37.875210	-86.097415
	Meade - KY 313	37.864792	-86.085971
	Meade - US 60	37.882381	-86.100228
	Meade - KY 144	37.885707	-86.101103



December 9th, 2024

Chris Hampton
District 4 Permit Supervisor
KYTC- District 4
634 East Dixie Avenue
Elizabethtown, KY 42701

Subject: Encroachment Permits for Meade County Water District (MCWD) 2023 Water System Improvements

Dear Mr. Hampton,

To meet near and future water supply demands within their growing service area, including large commercial expansions, MCWD is planning to install new a new 16-inch, and 8-inch PVC water line. These lines will parallel state road right-of-way, and cross both state routes and county-maintained routes.

This permit package specifically covers the following:

- 16" WM encroachment parallel of KY 313
- 8" WM encroachment parallel of KY 313
- Bore and jack at KY 313
- Bore and jack at US 60
- 16" WM encroachment parallel of KY 1238
- Bore and jack at KY 1238
- Bore and jack at KY 333
- Bore and jack at KY 144 (Brandenburg Rd)
- New access at KY 144 (Payneville Rd)
- Control valve site at KY 1239

Installations are proposed at the back of the right-of-way at a minimum cover depth of 42-inches. All proposed road crossings will be done with bore and jack installation and include a 24" steel casing pipe.

Attached are plans and permits for all the state roads involved for your review.

Kari Horn, PE



APPLICATION FOR ENCROACHMENT PERMIT

KYTC KEPT #: 04202500060

SECTION 1: APPLICANT CONTACT INFORMATION

APPLICANT Meade County Water District	ADDRESS 1003 Armory Place		
EMAIL bpyles@meadecountywater.com	CITY Brandenburg	STATE KY	ZIP 40108
CONTACT NAME 1 Brett Pyles	EMAIL bpyles@meadecountywater.com	PHONE # 270-422-5006	
		CELL #	
CONTACT NAME 2 (if applicable) Kari Horn	EMAIL kari.horn@hdrinc.com	PHONE # 502-909-3264	
		CELL #	

SECTION 2: PROPOSED WORK LOCATION

ADDRESS KY 313	CITY Ekron	STATE Kentucky	ZIP 40117
COUNTY Meade	ROUTE # KY 313	MILE POINT 8.5	LONGITUDE (X) 37.900777
			LATITUDE (Y) -86.108187

ADDITIONAL LOCATION INFORMATION:

FOR KYTC USE ONLY

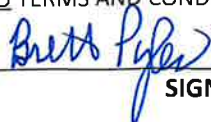
PERMIT TYPE: ☐ Air Right ☐ Entrance ☒ Utilities ☐ Vegetation Removal ☐ Other: _____

ACCESS: ☐ Full ☐ Partial ☒ by Permit **LOCATION:** ☐ Left ☒ Right ☐ Crossing

SECTION 3: GENERAL DESCRIPTION OF WORK

Installation of a 16" WM (material TBD-PVC or DI), with related appurtenances, within easement parallel of Joe Prather HWY (KY-313) and also within existing KYTC ROW (C01-C10). In addition to the parallel encroachment of KY 133, there will be a 160 LF bore and jack at the intersection of KY 313 and KY 1238. All casing pipe will be 24" Steel (C11). A second alignment, Line B, an 8" PVC WM, will be installed on the east side of KY 313 within easement and existing ROW. (C14-C16) Installation will occur at a minimum depth of 42". All disturbed areas shall be seeded and restored to KYTC Standard Specifications.

THE UNDERSIGNED APPLICANT(s), being duly authorized representative(s) or owner(s), DO AGREE TO ALL ORIGINAL UNEDITED TERMS AND CONDITIONS ON THE TC 99-1A, pages 1-4.



SIGNATURE

11-18-24

DATE

This is not a permit unless and until the applicant(s) receives an approved TC 99-1B from KYTC. This application shall become void if not approved by the cancellation date. The cancellation date shall be a minimum of one year from the date the applicant submits their application.

APPLICATION FOR ENCROACHMENT PERMIT

KYTC KEPT #: 04202500060

SECTION 1: APPLICANT CONTACT INFORMATION

APPLICANT Meade County Water District	ADDRESS 1003 Armory Place		
EMAIL bpyles@meadecountywater.com	CITY Brandenburg	STATE KY	ZIP 40108
CONTACT NAME 1 Brett Pyles	EMAIL bpyles@meadecountywater.com	PHONE # 270-422-5006	
		CELL #	
CONTACT NAME 2 (if applicable) Kari Horn	EMAIL kari.horn@hdrinc.com	PHONE # 502-909-3264	
		CELL #	

SECTION 2: PROPOSED WORK LOCATION

ADDRESS US 60	CITY Ekron	STATE Kentucky	ZIP 40117
COUNTY Meade	ROUTE # US 60	MILE POINT 7.9	LONGITUDE (X) 37.882372
			LATITUDE (Y) -86.100228

ADDITIONAL LOCATION INFORMATION:

FOR KYTC USE ONLY

PERMIT TYPE: ☐ Air Right ☐ Entrance ☒ Utilities ☐ Vegetation Removal ☐ Other: _____

ACCESS: ☐ Full ☐ Partial ☒ by Permit **LOCATION:** ☐ Left ☐ Right ☒ Crossing

SECTION 3: GENERAL DESCRIPTION OF WORK

There will be a 170 LF bore and jack at US 60. All casing pipe will be 24" Steel (see sheet C04). Installation will occur at a minimum depth of 42". All disturbed areas shall be seeded and restored to KYTC Standard Specifications.

THE UNDERSIGNED APPLICANT(s), being duly authorized representative(s) or owner(s), DO AGREE TO ALL ORIGINAL UNEDITED TERMS AND CONDITIONS ON THE TC 99-1A, pages 1-4.

Brett Pyles

SIGNATURE

11-12-24

DATE

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APPLICATION FOR ENCROACHMENT PERMIT

KYTC KEPT #: 04202500060

SECTION 1: APPLICANT CONTACT INFORMATION

APPLICANT Meade County Water District	ADDRESS 1003 Armory Place		
EMAIL bpyles@meadecountywater.com	CITY Brandenburg	STATE KY	ZIP 40108
CONTACT NAME 1 Brett Pyles	EMAIL bpyles@meadecountywater.com	PHONE # 270-422-5006	
		CELL #	
CONTACT NAME 2 (if applicable) Kari Horn	EMAIL kari.horn@hdrinc.com	PHONE # 502-909-3264	
		CELL #	

SECTION 2: PROPOSED WORK LOCATION

ADDRESS KY 1238	CITY Ekron	STATE Kentucky	ZIP 40117
COUNTY Meade	ROUTE # KY 1238	MILE POINT 8.35	LONGITUDE (X) 37.900777
			LATITUDE (Y) -86.108187

ADDITIONAL LOCATION INFORMATION:

FOR KYTC USE ONLY

PERMIT TYPE: ☐ Air Right ☐ Entrance ☒ Utilities ☐ Vegetation Removal ☐ Other: _____

ACCESS: ☐ Full ☐ Partial ☒ by Permit **LOCATION:** ☒ Left ☐ Right ☒ Crossing

SECTION 3: GENERAL DESCRIPTION OF WORK

Installation of a 16" WM (material TBD-PVC or DI), with related appurtenances, within easement parallel of Garrett Rd (KY 1238) and also within existing KYTC ROW (C11- C12). In addition to the parallel encroachment of KY 1238, there will be a 150 LF bore and jack at the intersection of KY 313 and KY 1238. All casing pipe will be 24" Steel (C11). A second bore and jack will occur across KY 1238 at approximately 3580 Garrett Rd. This bore and jack will be 60 LF with 24" Steel casing (C13). Installation will occur at a minimum depth of 42". All disturbed areas shall be seeded and restored to KYTC Standard Specifications.

THE UNDERSIGNED APPLICANT(s), being duly authorized representative(s) or owner(s), DO AGREE TO ALL ORIGINAL UNEDITED TERMS AND CONDITIONS ON THE TC 99-1A, pages 1-4.

Brett Pyles

SIGNATURE

11-12-24

DATE

This is not a permit unless and until the applicant(s) receives an approved TC 99-1B from KYTC. This application shall become void if not approved by the cancellation date. The cancellation date shall be a minimum of one year from the date the applicant submits their application.

APPLICATION FOR ENCROACHMENT PERMIT

KYTC KEPT #: 04202500060

SECTION 1: APPLICANT CONTACT INFORMATION

APPLICANT Meade County Water District	ADDRESS 1003 Armory Place		
EMAIL bpyles@meadecountywater.com	CITY Brandenburg	STATE KY	ZIP 40108
CONTACT NAME 1 Brett Pyles	EMAIL bpyles@meadecountywater.com	PHONE # 270-422-5006	
		CELL #	
CONTACT NAME 2 (if applicable) Kari Horn	EMAIL kari.horn@hdrinc.com	PHONE # 502-909-3264	
		CELL #	

SECTION 2: PROPOSED WORK LOCATION

ADDRESS KY 144	CITY Ekron	STATE Kentucky	ZIP 40117
COUNTY Meade	ROUTE # KY 144	MILE POINT 28.5	LONGITUDE (X) 37.885698
			LATITUDE (Y) -86.101103

ADDITIONAL LOCATION INFORMATION:

FOR KYTC USE ONLY

PERMIT TYPE: ☐ Air Right ☐ Entrance ☒ Utilities ☐ Vegetation Removal ☐ Other: _____

ACCESS: ☐ Full ☐ Partial ☒ by Permit **LOCATION:** ☐ Left ☐ Right ☒ Crossing

SECTION 3: GENERAL DESCRIPTION OF WORK

There will be a 70 LF bore and jack at KY 144 Brandenburg Rd. All casing pipe will be 24" Steel (see sheet C07). Installation will occur at a minimum depth of 42". All disturbed areas shall be seeded and restored to KYTC Standard Specifications.

THE UNDERSIGNED APPLICANT(s), being duly authorized representative(s) or owner(s), DO AGREE TO ALL ORIGINAL UNEDITED TERMS AND CONDITIONS ON THE TC 99-1A, pages 1-4.



SIGNATURE

11-12-24

DATE

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APPLICATION FOR ENCROACHMENT PERMIT

KYTC KEPT #: 04202500060

SECTION 1: APPLICANT CONTACT INFORMATION

APPLICANT Meade County Water District	ADDRESS 1003 Armory Place		
EMAIL bpyles@meadecountywater.com	CITY Brandenburg	STATE KY	ZIP 40108
CONTACT NAME 1 Brett Pyles	EMAIL bpyles@meadecountywater.com	PHONE # 270-422-5006	
		CELL #	
CONTACT NAME 2 (if applicable) Kari Horn	EMAIL kari.horn@hdrinc.com	PHONE # 502-909-3264	
		CELL #	

SECTION 2: PROPOSED WORK LOCATION

ADDRESS 170 Big Spring Rd	CITY Ekron	STATE Kentucky	ZIP 40117
COUNTY Meade	ROUTE # KY333	MILE POINT	LONGITUDE (X) 37.875220
			LATITUDE (Y) -86.097391

ADDITIONAL LOCATION INFORMATION:

FOR KYTC USE ONLY

PERMIT TYPE: ☐ Air Right ☐ Entrance ☒ Utilities ☐ Vegetation Removal ☐ Other: _____

ACCESS: ☐ Full ☐ Partial ☒ by Permit **LOCATION:** ☐ Left ☐ Right ☒ Crossing

SECTION 3: GENERAL DESCRIPTION OF WORK

There will be a 50 LF bore and jack at KY333. All casing pipe will be 24" Steel (see sheet C04). Installation will occur at a minimum depth of 42". All disturbed areas shall be seeded and restored to KYTC Standard Specifications.

THE UNDERSIGNED APPLICANT(s), being duly authorized representative(s) or owner(s), DO AGREE TO ALL ORIGINAL UNEDITED TERMS AND CONDITIONS ON THE TC 99-1A, pages 1-4.


SIGNATURE

11-12-24
DATE

This is not a permit unless and until the applicant(s) receives an approved TC 99-1B from KYTC. This application shall become void if not approved by the cancellation date. The cancellation date shall be a minimum of one year from the date the applicant submits their application.



KENTUCKY TRANSPORTATION CABINET
Department of Highways
PERMITS BRANCH

TC 99-1A
Rev. 10/2020
Page 1 of 4

APPLICATION FOR ENCROACHMENT PERMIT

KYTC KEPT #: 04202500060

SECTION 1: APPLICANT CONTACT INFORMATION

APPLICANT Meade County Water District	ADDRESS 1003 Armory Place		
EMAIL bpyles@meadecountywater.com	CITY Brandenburg	STATE KY	ZIP 40108
CONTACT NAME 1 Brett Pyles	EMAIL bpyles@meadecountywater.com	PHONE # 270-422-5006	
		CELL #	
CONTACT NAME 2 (if applicable) Kari Horn	EMAIL kari.horn@hdrinc.com	PHONE # 502-909-3264	
		CELL #	

SECTION 2: PROPOSED WORK LOCATION

ADDRESS 2765 Midway Rd	CITY Brandenburg	STATE Kentucky	ZIP 40108
COUNTY Meade	ROUTE # KY1239	MILE POINT	LONGITUDE (X) 37.954279
			LATITUDE (Y) -86.242005

ADDITIONAL LOCATION INFORMATION:

FOR KYTC USE ONLY

PERMIT TYPE: ☐ Air Right ☐ Entrance ☒ Utilities ☐ Vegetation Removal ☐ Other: _____

ACCESS: ☐ Full ☐ Partial ☒ by Permit **LOCATION:** ☐ Left ☐ Right ☒ Crossing

SECTION 3: GENERAL DESCRIPTION OF WORK

The installation of a new control valve vault site will encroach on the existing KY 1239 ROW near the intersection with Sirocco-Midway Rd (see sheet C-31). Installation will occur at a minimum depth of 42". All disturbed areas shall be seeded and restored to KYTC Standard Specifications.

THE UNDERSIGNED APPLICANT(s), being duly authorized representative(s) or owner(s), DO AGREE TO ALL ORIGINAL UNEDITED TERMS AND CONDITIONS ON THE TC 99-1A, pages 1-4.

SIGNATURE

DATE

This is not a permit unless and until the applicant(s) receives an approved TC 99-1B from KYTC. This application shall become void if not approved by the cancellation date. The cancellation date shall be a minimum of one year from the date the applicant submits their application.



Kentucky Transportation Cabinet
Department of Highways
Division of Maintenance
Permits Branch

TC 99-1 (B)
07/2018
Page 1 of 1

ENCROACHMENT PERMIT

KYTC KEPT #: 04-2025-00060

Permittee: Meade Co. Water Dist.

Permit Type / Subtype: Utilities / Water

Work Completion Date: 3/3/2026

INDEMNITIES		
Type	Amount Required	Tracking Number
Performance Bond	\$0.00	
Cash / Check	\$0.00	
Self-Insured	\$0.00	
Payment Bond	\$0.00	
Liability Insurance	\$0.00	

This permit has been: **APPROVED** ☒ **DENIED** ☐

Chris Hampton	D4 Permits Supervisor	3/3/2025
SIGNATURE	TITLE	DATE

The TC 99-1(B), including the application TC-99 1(A) and all related and accompanying documents and drawings make up the permit. It is not a permit unless both the TC 99-1(A) and TC 99-1(B) are both present.

LOCATION(S)			
Description	County - Route	Latitude	Longitude
	Meade - KY 1238	37.900767	-86.108308
	Meade - KY 1239	37.954288	-86.242005
	Meade - KY 333	37.875210	-86.097415
	Meade - KY 313	37.864792	-86.085971
	Meade - US 60	37.882381	-86.100228
	Meade - KY 144	37.885707	-86.101103

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PERMIT QUICK SEARCH

Search Criteria: Permit / Tracking # ▼

Search Value: [Search](#)

PERMIT GENERAL INFORMATION

Permit/Tracking #: A04-2025-00060

[Follow](#)

Permit Status: Approved

Status Date: 3/3/2025

District: 04 - Elizabethtown

Filing Date: 3/3/2025

Cancellation Date: 3/3/2026

Completion Date: 3/3/2026

Permit Type: Utilities

Permit Subtype: Water

Created By: Kevin Elliott

Created Date: 3/3/2025

Meade Co. Water Dist. : Applicant ▼

Address: 1003 Armory Place
Brandenburg, KY 40108

Phone: (270)422-5006

Email: bpyles@meadecountywater.com

☒ Company[Maintain Contacts](#)
[Application](#) [Attachments](#) [Routing](#) [Comments](#) [Locations/Inspections](#) [Indemnity](#) [Approvals](#)

LOCATION DATA

Description:

MOST RECENT INSPECTION

There are no inspections for this location.

County: Meade

Route: Multiple

BMP/EMP: Multiple

Activity: New Install

Location: Underground

Contract Agr #:

Bridge #:

Description:

Install 16" water main along Ky313 from approximately MP 5.64 to 8.47 and Ky1238 from MP8.36 to 8.85.
Water main crossings on Ky313 at US60, Ky333, Ky144, and Ky1238.
Water valve installation on Ky1239.

[Edit](#)[View on Map](#)[Edit Permit](#)

v1.1.8762.29106



Kentucky Transportation Cabinet
200 Mero Street, Frankfort, KY 40622

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Andy Beshear
Governor

COMMONWEALTH OF KENTUCKY
TRANSPORTATION CABINET
Department of Highways, District 4 Office
634 East Dixie Highway
Elizabethtown, Kentucky 42701
(270) 766-5066
www.transportation.ky.gov/

Jim Gray
Secretary

March 3, 2025

Meade County Water District
Brett Pyles
1003 Armory Place
Brandenburg, Kentucky 40108

Subject: Permit #: 04-2025-00059
Permit Type: Entrance - Private
Approval

Dear Applicant:

Attached is your permit approval and documentation for the subject permit.

Be advised that all work must be done in conformity with permit and application conditions. If you have any questions, please contact the Permits Section at this office.

Sincerely,

Chris Hampton

Chris Hampton
D4 Permits Supervisor

Attachments



An Equal Opportunity Employer M/F/D

NOTICE OF COMPLETION OF ENCROACHMENT PERMIT WORK

PERMITTEE

Name: Meade County Water District
Contact Person: Brett Pyles
Address: 1003 Armory Place
City: Brandenburg
State: Kentucky
Zip: 40108
Telephone: (270) 422-5006

PROJECT IDENTIFICATION

Permit Number: 04-2025-00059

I wish to notify the Department of Highways that the above mentioned permit work and any necessary right-of-way restoration have been completed and are ready for final inspection.

Permittee

Please return this form to the address below when work is completed and ready for final inspection.

Please Return to: Permit Engineer
Department of Highways, District 4 Office
634 East Dixie Highway
Elizabethtown, Kentucky 42701
(270) 766-5066
www.transportation.ky.gov/

LOCATION(S)			
Description	County - Route	Latitude	Longitude
	Meade - KY 144	37.984830	-86.258888

APPLICATION FOR ENCROACHMENT PERMIT

KYTC KEPT #: 04202500059

SECTION 1: APPLICANT CONTACT INFORMATION

APPLICANT Meade County Water District	ADDRESS 1003 Armory Place		
EMAIL bpyles@meadecountywater.com	CITY Brandenburg	STATE KY	ZIP 40108
CONTACT NAME 1 Brett Pyles	EMAIL bpyles@meadecountywater.com	PHONE # 270-422-5006	
		CELL #	
CONTACT NAME 2 (if applicable) Kari Horn	EMAIL kari.horn@hdrinc.com	PHONE # 502-909-3264	
		CELL #	

SECTION 2: PROPOSED WORK LOCATION

ADDRESS Payneville Rd	CITY Brandenburg	STATE Kentucky	ZIP 40108
COUNTY Meade	ROUTE # KY 144	MILE POINT 16	LONGITUDE (X) 37.985088
			LATITUDE (Y) -86.258866

ADDITIONAL LOCATION INFORMATION:

FOR KYTC USE ONLY

PERMIT TYPE: ☐ Air Right ☒ Entrance ☐ Utilities ☐ Vegetation Removal ☐ Other: _____

ACCESS: ☐ Full ☐ Partial ☒ by Permit **LOCATION:** ☒ Left ☐ Right ☐ Crossing

SECTION 3: GENERAL DESCRIPTION OF WORK

A new pump station will be installed off Payneville Rd. The proposed access drive is as shown on sheet C27. All disturbed areas shall be seeded and restored to KYTC Standard Specifications.

Install a minimum sized 15"X28' corrugated metal or concrete entrance pipe for private entrance.

THE UNDERSIGNED APPLICANT(s), being duly authorized representative(s) or owner(s), DO AGREE TO ALL ORIGINAL UNEDITED TERMS AND CONDITIONS ON THE TC 99-1A, pages 1-4.

Brett Pyles

SIGNATURE

11-12-24

DATE

This is not a permit unless and until the applicant(s) receives an approved TC 99-1B from KYTC. This application shall become void if not approved by the cancellation date. The cancellation date shall be a minimum of one year from the date the applicant submits their application.



Kentucky Transportation Cabinet
Department of Highways
Division of Maintenance
Permits Branch

TC 99-1 (B)
07/2018
Page 1 of 1

ENCROACHMENT PERMIT

KYTC KEPT #: 04-2025-00059

Permittee: Meade County Water District

Permit Type / Subtype: Entrance / Private

Work Completion Date: 3/3/2026

INDEMNITIES		
Type	Amount Required	Tracking Number
Performance Bond	\$0.00	
Cash / Check	\$0.00	
Self-Insured	\$0.00	
Payment Bond	\$0.00	
Liability Insurance	\$0.00	

This permit has been: **APPROVED** ☒ **DENIED** ☐

Chris Hampton	D4 Permits Supervisor	3/3/2025
SIGNATURE	TITLE	DATE

The TC 99-1(B), including the application TC-99 1(A) and all related and accompanying documents and drawings make up the permit. It is not a permit unless both the TC 99-1(A) and TC 99-1(B) are both present.

LOCATION(S)			
Description	County - Route	Latitude	Longitude
	Meade - KY 144	37.984830	-86.258888

Kentucky Encroachment Permit Tracking

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PERMIT QUICK SEARCH

Search Criteria: Permit / Tracking # ▼

Search Value: [Search](#)

PERMIT GENERAL INFORMATION

Permit/Tracking #: A04-2025-00059

[Follow](#)

Permit Status: Approved

Status Date: 3/3/2025

District: 04 - Elizabethtown

Filing Date: 3/3/2025

Cancellation Date: 3/3/2026

Completion Date: 3/3/2026

Permit Type: Entrance

Permit Subtype: Private

Created By: Kevin Elliott

Created Date: 3/3/2025

Meade County Water District : Applicant ▼

Address: 1003 Armory Place
Brandenburg, KY 40108

Phone: (270)422-5006

Email: bpyles@meadecountywater.com

☒ Company[Maintain Contacts](#)
[Application](#) [Attachments](#) [Routing](#) [Comments](#) [Locations/Inspections](#) [Indemnity](#) [Approvals](#)

LOCATION DATA

Description:

MOST RECENT INSPECTION

There are no inspections for this location.

County: Meade

Route: 144

BMP/EMP: 15.967 /
15.967

Access Control: By Permit

☒ Adequate Sight Distance?☐ Pavement Required?

Speed Study:

☐ Signal Required?☐ Frontage Rights Required?

Radius Size:

☐ Turn Lane Required?

Description:

Install a minimum sized 15"X28' corrugated metal or concrete entrance pipe for private entrance.

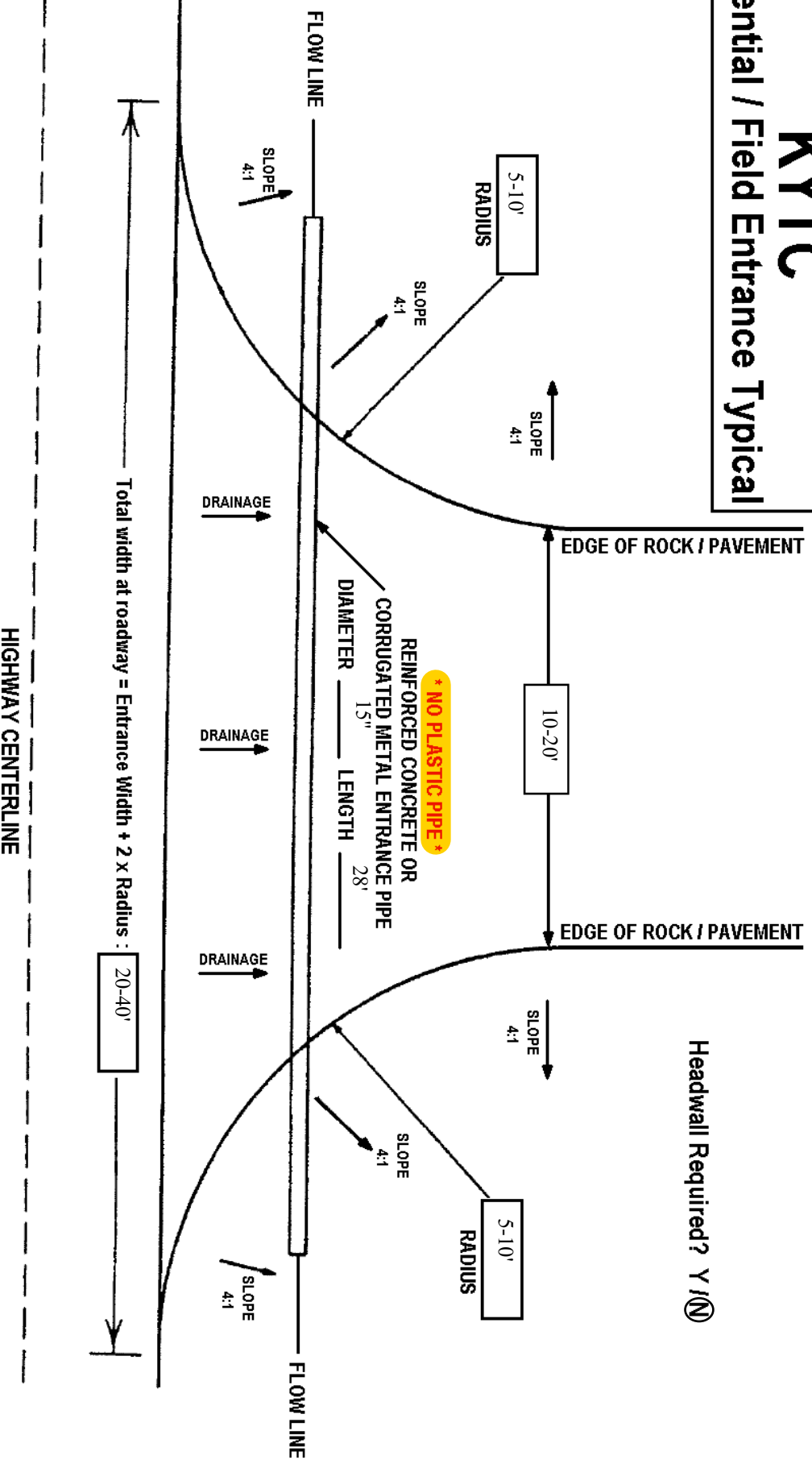
[Edit](#)[View on Map](#)[Edit Permit](#)

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KYTC

Residential / Field Entrance Typical



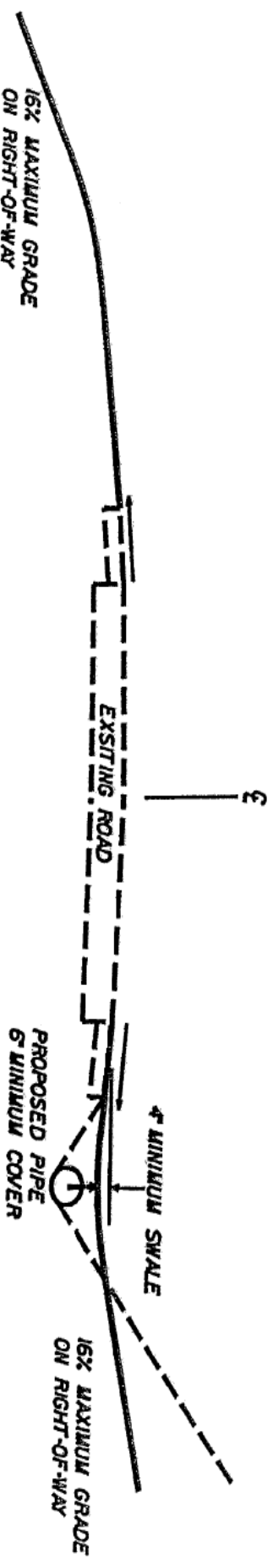
Headwall Required? Y / (N)

Important Notice

BEFORE ANY WORK is performed on KY State Right of Way, contractor shall contact *Kevin Elliott* at 270-766-5066

SEE BACK

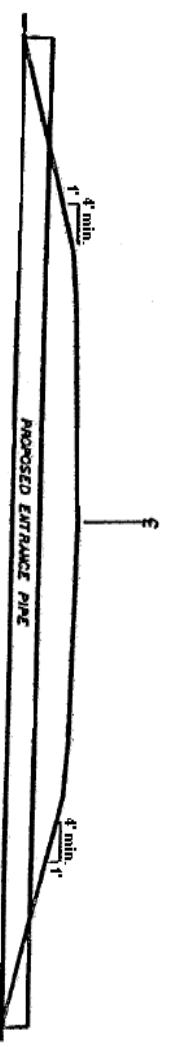
KYTC Residential / Field Entrance Typical



SPECIAL NOTES:

1. CONSTRUCT ENTRANCE SO THAT ALL RUNOFF WILL DRAIN AWAY FROM ROADWAY. NO WATER FROM ENTRANCE IS ALLOWED ONTO THE SHOULDER OR DRIVING LANE
2. DITCHING OR OTHER EXCAVATION MAY BE NECESSARY TO ASSURE PROPER PIPE COVERAGE AND PROVIDE POSITIVE DRAINAGE
3. ENTRANCE ROCK/PAVEMENT SHALL NOT EXTEND ABOVE EDGE OF ROADWAY
4. EDGE OF ENTRANCE MUST BE MINIMUM 5' FROM PROPERTY LINE

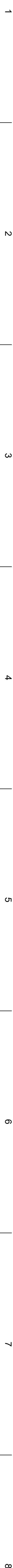
TYPICAL PIPE SECTION



Important Notice

AFTER ALL WORK is completed on KY State Right of Way, applicant shall contact *Kevin Elliott* at 270-766-5066 to request an inspection

SEE BACK

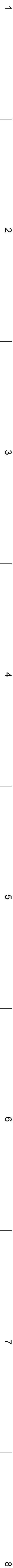


MEADE COUNTY WATER DISTRICT
2024 ARPA WATER SYSTEM IMPROVEMENTS
MEADE COUNTY, KENTUCKY

0 10' 20' FILENAME C-27.DWG
SCALE 1" = 20'

SHEET
C-27





MEADE COUNTY WATER DISTRICT
2024 ARPA WATER SYSTEM IMPROVEMENTS
MEADE COUNTY, KENTUCKY

PAYNEVILLE PUMP STATION
SITE LAYOUT - ALTERNATE BID

	FILENAME C-27A.DWG SCALE 1" = 20'	SHEET C-27A

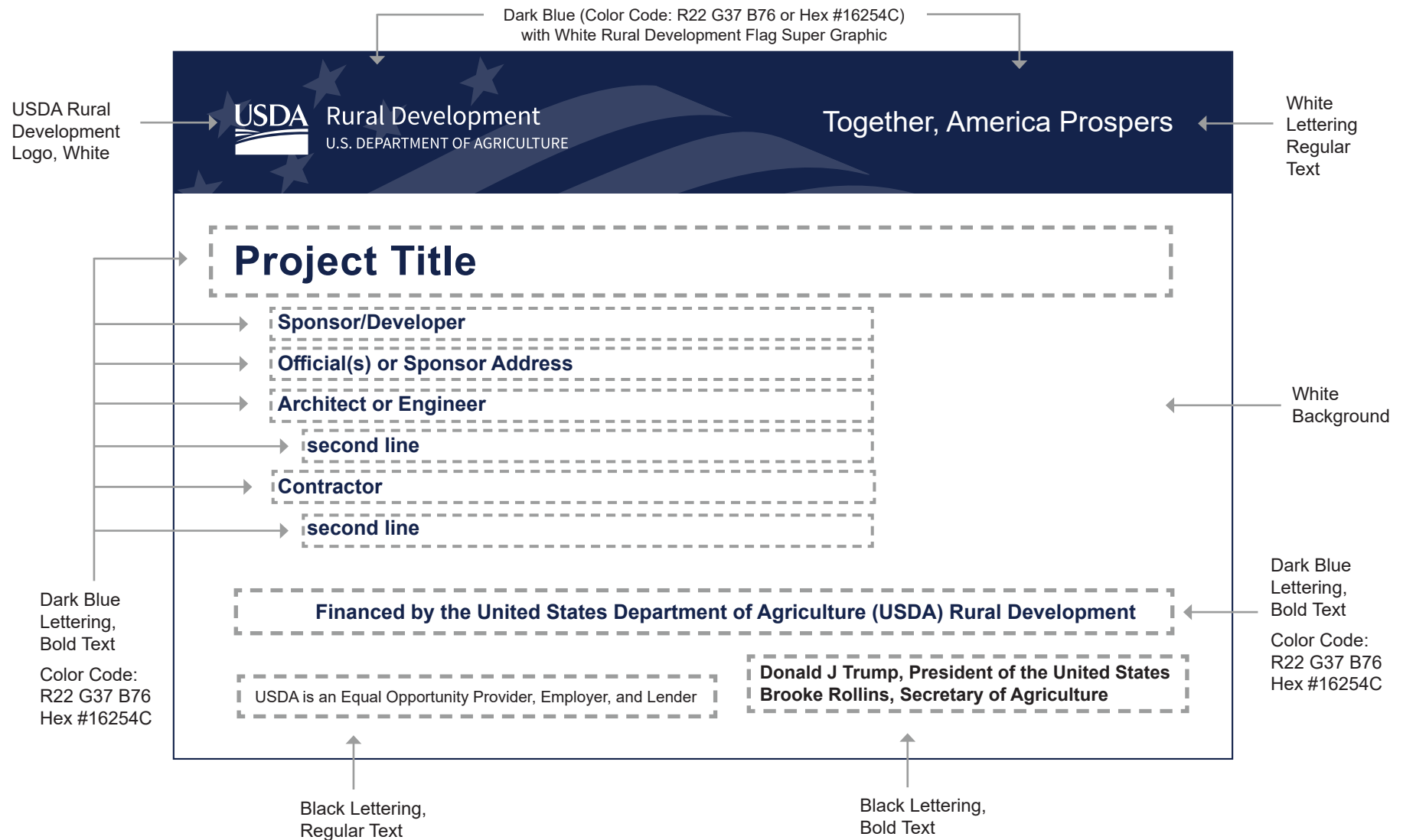


APPENDIX B

USDA RURAL DEVELOPMENT PROJECT SIGN TEMPLATE

Temporary Construction Sign for Rural Development Projects

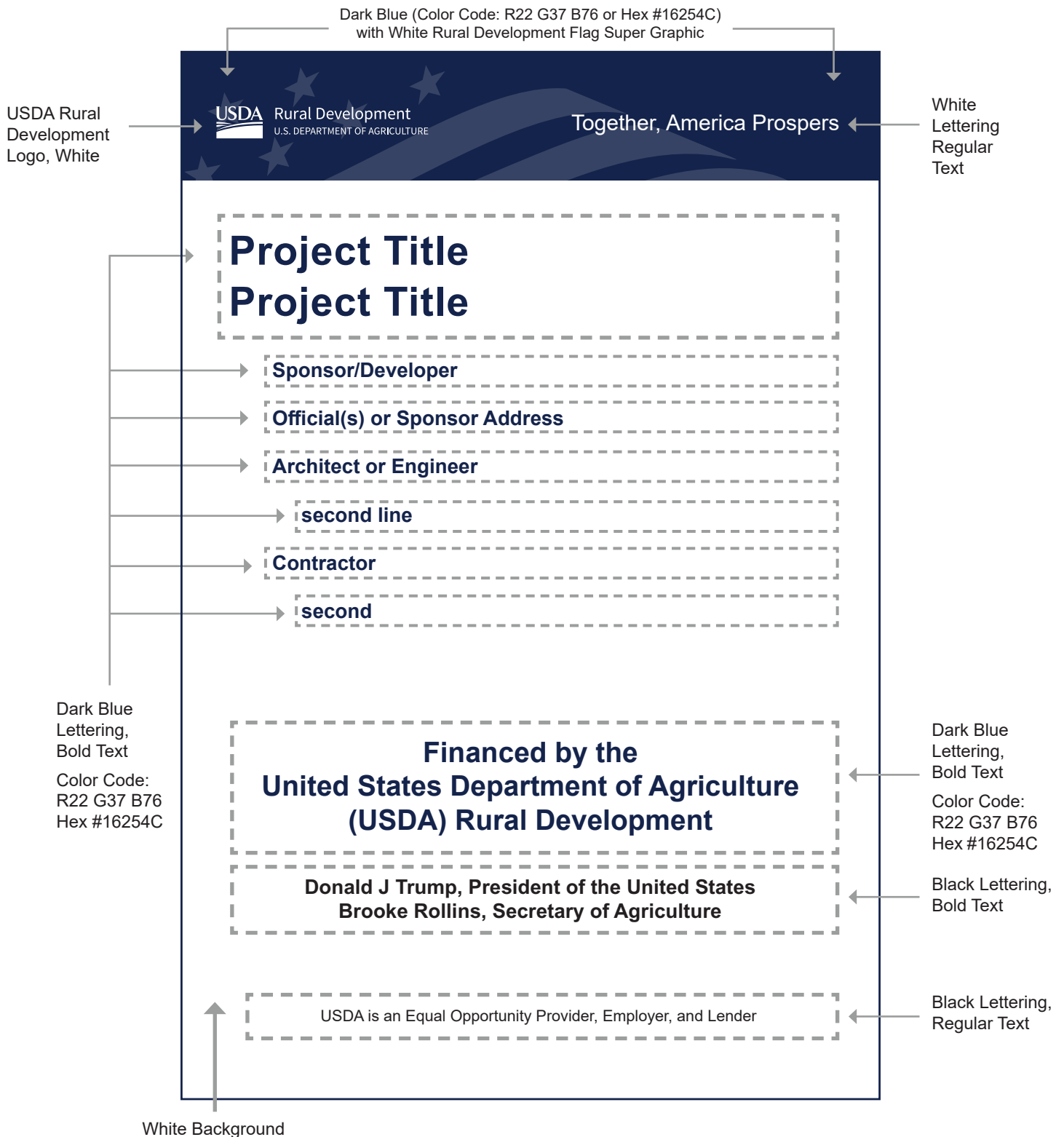
Recommended Font: Arial



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

Temporary Construction Sign for Rural Development Projects

Recommended Font: Arial



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

APPENDIX C

SCADA IMPROVEMENTS – SUGGESTED LIST OF MATERIALS

Flaherty Pump Station - Suggested Materials for Retrofit

ITEM #	QTY	MANUFACTURER	MODEL #	DESCRIPTION
1	1	Automation Direct	BX-DM1E-M-D	BRX Do-More PLC Controller, Ethernet, RS485, 24VDC
2	1	Automation Direct	BX-08AD-3	BRX Analog Input Card, 8 Ch, 16 Bit, Sink/Source
3	1	Automation Direct	BX-04DA-3	BRX Analog Output Card, 4 Ch, 16 Bit, Sink/Source
4	2	Automation Direct	BX-16ND3	BRX 16 Digital Inputs, 24VDC
5	1	Automation Direct	BX-16TD2	BRX 16 Digital Outputs, 24VDC, Sourcing
6	1	Automation Direct	BX-P-LCOMEX	POM communication module, 1-port
7	1	Automation Direct	BX-RTB05-2	BRX Terminal Block Kit, 180 Degree, Screw Terminals
8	1	Automation Direct	BX-RTB08-2	BRX Terminal Block Kit, 180 Degree, Screw Terminals
9	3	Automation Direct	BX-RTB10-2	BRX Terminal Block Kit, 180 Degree, Screw Terminals

Payneville Pump Station - Suggested Materials for RTU

ITEM #	QTY	MANUFACTURER	MODEL #	DESCRIPTION
1	1	Saginaw	SCE-36H3012SSLP	Nema 4X enclosure, 36" x 30" 12", 304SS
2	1	Saginaw	SCE-36P30	Subpanel, 34.20x28.20
3	1	Automation Direct	BX-DM1E-18ED13-D	BRX Do-More CPU, 10 DC Inputs, 8 DC Outputs, 1 AI, 1 AO, 24VDC
4	1	Automation Direct	BX-RTB18	BRX Terminal Block Kit, Screw Terminals
5	1	Automation Direct	BX-08AD-3	BRX Analog Input Card, 8 AI, 16 Bit, Sink/Source
6	2	Automation Direct	PSP-24-240S	24Vdc / 120W, 10.0 Amp, Power Supply
7	1	Automation Direct	SE-SL3001	VPN Router
8	1	Automation Direct	FAZ-D15-1-SP	1 Pole, 15 Amp Circuit Breaker, D Curve, UL1077
9	4	Automation Direct	FAZ-D5-1-SP	1 Pole, 5 Amp Circuit Breaker, D Curve, UL1077
10	2	Automation Direct	KN-D12-BLU	Double-level terminal block, Blue, Pkg 100
11	1	Automation Direct	KN-TG12	Three Level Terminal Block with Ground, Pck. 20
12	1	Automation Direct	KN-DG12	Terminal Block, Double Level, Plus Gnd, 20 Pack
13	1	Aveva	EDGEHK-01-N	USB Port Hardkey for Aveva License
14	1	Aveva	EDGEDR-01-N20	Aveva Development/Runtime license for 1500 tags
15	1	Maple Systems	OMI6918BP-B05M7D	18" HMI, 1366X768, 24VDC Windows 10 IoT Ent 2019 LTSC
16	1	APC	BR-1000G	APC Pro-1000 UPS
17	8	Automation Direct	781-1C-24D	Relay 24vdc, 1PDT, 15A
18	8	Automation Direct	781-1C-SKT	Relay Socket 1-Pole
19	1	Allen-Bradley	1492-REC15	Duplex Receptacle, 15A, 120V, Din Rail Mounted
20	2	E-Rail	111.013	Mounting rail, PR30, plated, 2M
21	1	Automation Direct	BX-16ND3	BRX 16 Digital Inputs, 24VDC
22	1	Automation Direct	BX-RTB08-2	BRX Terminal Block Kit, 180 degree, Screw Type, 8 Pins
23	1	Automation Direct	BX-P-ECOMEX	BRX Ethernet Communication POM Module
24	1	Automation Direct	BX-04DA-3	BRX Analog Output Card, 4 AO, 16 Bit, Sink/Source
25	1	Automation Direct	BX-RTB05-2	BRX Terminal Block Kit, 180 degree, Screw Type, 5 Pins
26	1	Automation Direct	BX-RTB10-2	BRX Terminal Block Kit, 180 degree, Screw Type, 10 Pins

Flaherty Tank - Suggested Materials for RTU

ITEM #	QTY	MANUFACTURER	MODEL #	DESCRIPTION
1	1	Saginaw	SCE-24EL2410SSLP	Enclosure, Nema 4X, SS, 24x24x10
2	1	Saginaw	SCE-24P24	Subpanel, 21" x 21"
3	1	Automation Direct	BX-DM1E-18ED2-D	BRX Do-More CPU, 10 DC Inputs, 8 DC Outputs, 1 AI, 1 AO, 24VDC
4	1	Automation Direct	BX-RTB18	BRX Terminal Block Kit, Screw Terminals
5	1	Lasca	OM-SGD-24-M-4-20	Smart Panel Meter, 4-20-mA Input, 24 VDC
6	1	Meanwell	DRC-100B	Power Supply / UPS / Charger, 24VDC, 100W
7	1	Automation Direct	FAZ-D15-1-SP	1 Pole, 15 Amp Circuit Breaker, D Curve, UL1077
8	4	Automation Direct	FAZ-D5-1-SP	1 Pole, 5 Amp Circuit Breaker, D Curve, UL1077
9	2	Automation Direct	KN-D12-BLU	Double-level terminal block, Blue, Pkg 100
10	1	Automation Direct	KN-TG12	Three Level Terminal Block with Ground, Pck. 20
11	1	Automation Direct	KN-DG12	Terminal Block, Double Level, Plus Gnd, 20 Pack
12	1	Automation Direct	BX-P-ECOMEX	BRX Ethernet POM Module
13	4	Automation Direct	781-1C-24D	Relay 24vdc, 1PDT, 15A
14	4	Automation Direct	781-1C-SKT	Relay Socket 1-Pole
15	1	Allen-Bradley	1492-REC15	Duplex Receptacle, 15A, 120V, Din Rail Mounted
16	2	E-Rail	111.013	Mounting rail, PR30, plated, 2M
17	1	Automation Direct	BX-04AD-3	BRX 4 Analog Inputs, 4-20ma
18	1	Automation Direct	BX-RTB05-1	BRX Terminal Block Kit, 180 degree, spring clamp, 5 Pins
19	2	Battery Mart	SLA-12V1-3	Battery, Gell Cell, 12Vdc

Garrett Tank - Suggested Materials for RTU

ITEM #	QTY	MANUFACTURER	MODEL #	DESCRIPTION
1	1	Saginaw	SCE-24EL2410SSLP	Enclosure, Nema 4X, SS, 24x24x10
2	1	Saginaw	SCE-24P24	Subpanel, 21" x 21"
3	1	Automation Direct	BX-DM1E-18ED2-D	BRX Do-More CPU, 10 DC Inputs, 8 DC Outputs, 1 AI, 1 AO, 24VDC
4	1	Automation Direct	BX-RTB18	BRX Terminal Block Kit, Screw Terminals
5	1	Lascar	OM-SGD-24-M-4-20	Smart Panel Meter, 4-20-mA Input, 24 VDC
6	1	Meanwell	DRC-100B	Power Supply / UPS / Charger, 24VDC, 100W
7	1	Automation Direct	FAZ-D15-1-SP	1 Pole, 15 Amp Circuit Breaker, D Curve, UL1077
8	4	Automation Direct	FAZ-D5-1-SP	1 Pole, 5 Amp Circuit Breaker, D Curve, UL1077
9	2	Automation Direct	KN-D12-BLU	Double-level terminal block, Blue, Pkg 100
10	1	Automation Direct	KN-TG12	Three Level Terminal Block with Ground, Pck. 20
11	1	Automation Direct	KN-DG12	Terminal Block, Double Level, Plus Gnd, 20 Pack
12	1	Automation Direct	BX-P-ECOMEX	BRX Ethernet POM Module,
13	4	Automation Direct	781-1C-24D	Relay 24vdc, 1PDT, 15A
14	4	Automation Direct	781-1C-SKT	Relay Socket 1-Pole
15	1	Allen-Bradley	1492-REC15	Duplex Receptacle, 15A, 120V, Din Rail Mounted
16	2	E-Rail	111.013	Mounting rail, PR30, plated, 2M
17	1	Automation Direct	BX-04AD-3	BRX 4 Analog Inputs, 4-20ma
18	1	Automation Direct	BX-RTB05-1	BRX Terminal Block Kit, 180 degree, spring clamp, 5 Pins
19	2	Battery Mart	SLA-12V1-3	Battery, Gell Cell, 12Vdc

Payneville Tank - Suggested Materials for RTU

ITEM #	QTY	MANUFACTURER	MODEL #	DESCRIPTION
1	1	Saginaw	SCE-24EL2410SSLP	Enclosure, Nema 4X, SS, 24x24x10
2	1	Saginaw	SCE-24P24	Subpanel, 21" x 21"
3	1	Automation Direct	BX-DM1E-18ED2-D	BRX Do-More CPU, 10 DC Inputs, 8 DC Outputs, 1 AI, 1 AO, 24VDC
4	1	Automation Direct	BX-RTB18	BRX Terminal Block Kit, Screw Terminals
5	1	Lascar	OM-SGD-24-M-4-20	Smart Panel Meter, 4-20-mA Input, 24 VDC
6	1	Meanwell	DRC-100B	Power Supply / UPS / Charger, 24VDC, 100W
7	1	Automation Direct	FAZ-D15-1-SP	1 Pole, 15 Amp Circuit Breaker, D Curve, UL1077
8	4	Automation Direct	FAZ-D5-1-SP	1 Pole, 5 Amp Circuit Breaker, D Curve, UL1077
9	2	Automation Direct	KN-D12-BLU	Double-level terminal block, Blue, Pkg 100
10	1	Automation Direct	KN-TG12	Three Level Terminal Block with Ground, Pck. 20
11	1	Automation Direct	KN-DG12	Terminal Block, Double Level, Plus Gnd, 20 Pack
12	1	Automation Direct	BX-P-ECOMEX	BRX Ethernet POM Module,
13	4	Automation Direct	781-1C-24D	Relay 24vdc, 1PDT, 15A
14	4	Automation Direct	781-1C-SKT	Relay Socket 1-Pole
15	1	Allen-Bradley	1492-REC15	Duplex Receptacle, 15A, 120V, Din Rail Mounted
16	2	E-Rail	111.013	Mounting rail, PR30, plated, 2M
17	1	Automation Direct	BX-04AD-3	BRX 4 Analog Inputs, 4-20ma
18	1	Automation Direct	BX-RTB05-1	BRX Terminal Block Kit, 180 degree, spring clamp, 5 Pins
19	2	Battery Mart	SLA-12V1-3	Battery, Gell Cell, 12Vdc

Midway-Sirocco Road Control Valve - Suggested Materials for RTU

ITEM #	QTY	MANUFACTURER	MODEL #	DESCRIPTION
1	1	Saginaw	SCE-24EL2410SSLP	Enclosure, Nema 4X, SS, 24x24x10
2	1	Saginaw	SCE-24P24	Subpanel, 21" x 21"
3	1	Automation Direct	BX-DM1E-18ED13-D	BRX Do-More CPU, 10 DC Inputs, 8 DC Outputs, 1 AI, 1 AO, 24VDC
4	1	Automation Direct	BX-RTB18	BRX Terminal Block Kit, Screw Terminals
5	1	Meanwell	DRC-100B	Power Supply / UPS / Charger, 24VDC, 100W
6	1	Automation Direct	FAZ-D15-1-SP	1 Pole, 15 Amp Circuit Breaker, D Curve, UL1077
7	4	Automation Direct	FAZ-D5-1-SP	1 Pole, 5 Amp Circuit Breaker, D Curve, UL1077
8	2	Automation Direct	KN-D12-BLU	Double-level terminal block, Blue, Pkg 100
9	1	Automation Direct	KN-TG12	Three Level Terminal Block with Ground, Pck. 20
10	1	Automation Direct	KN-DG12	Terminal Block, Double Level, Plus Gnd, 20 Pack
11	4	Automation Direct	781-1C-24D	Relay 24vdc, 1PDT, 15A
12	4	Automation Direct	781-1C-SKT	Relay Socket 1-Pole
13	1	Allen-Bradley	1492-REC15	Duplex Receptacle, 15A, 120V, Din Rail Mounted
14	2	E-Rail	111.013	Mounting rail, PR30, plated, 2M
15	0	Automation Direct	BX-16ND3	BRX 16 Digital Inputs, 24VDC
16	0	Automation Direct	BX-RTB08-1	BRX Terminal Block Kit, 180 degree, spring clamp, 5 Pins
17	2	Battery Mart	SLA-12V1-3	Battery, Gell Cell, 12Vdc

New Highland Church Road Control Valve - Suggested Materials for RTU

ITEM #	QTY	MANUFACTURER	MODEL #	DESCRIPTION
1	1	Saginaw	SCE-24EL2410SSLP	Enclosure, Nema 4X, SS, 24x24x10
2	1	Saginaw	SCE-24P24	Subpanel, 21" x 21"
3	1	Automation Direct	BX-DM1E-18ED13-D	BRX Do-More CPU, 10 DC Inputs, 8 DC Outputs, 1 AI, 1 AO, 24VDC
4	1	Automation Direct	BX-RTB18	BRX Terminal Block Kit, Screw Terminals
5	1	Meanwell	DRC-100B	Power Supply / UPS / Charger, 24VDC, 100W
6	1	Automation Direct	FAZ-D15-1-SP	1 Pole, 15 Amp Circuit Breaker, D Curve, UL1077
7	4	Automation Direct	FAZ-D5-1-SP	1 Pole, 5 Amp Circuit Breaker, D Curve, UL1077
8	2	Automation Direct	KN-D12-BLU	Double-level terminal block, Blue, Pkg 100
9	1	Automation Direct	KN-TG12	Three Level Terminal Block with Ground, Pck. 20
10	1	Automation Direct	KN-DG12	Terminal Block, Double Level, Plus Gnd, 20 Pack
11	4	Automation Direct	781-1C-24D	Relay 24vdc, 1PDT, 15A
12	4	Automation Direct	781-1C-SKT	Relay Socket 1-Pole
13	1	Allen-Bradley	1492-REC15	Duplex Receptacle, 15A, 120V, Din Rail Mounted
14	2	E-Rail	111.013	Mounting rail, PR30, plated, 2M
15	0	Automation Direct	BX-16ND3	BRX 16 Digital Inputs, 24VDC
16	0	Automation Direct	BX-RTB08-1	BRX Terminal Block Kit, 180 degree, spring clamp, 5 Pins
17	2	Battery Mart	SLA-12V1-3	Battery, Gell Cell, 12Vdc

Hardin County Water District 1 Interconnect Meter - Suggested Materials for RTU

ITEM #	QTY	MANUFACTURER	MODEL #	DESCRIPTION
1	1	Saginaw	SCE-24EL2410SSLP	Enclosure, Nema 4X, SS, 24x24x10
2	1	Saginaw	SCE-24P24	Subpanel, 21" x 21"
3	1	Meanwell	DRC-100B	Power Supply / UPS / Charger, 24VDC, 100W
4	1	Automation Direct	FAZ-D15-1-SP	1 Pole, 15 Amp Circuit Breaker, D Curve, UL1077
5	4	Automation Direct	FAZ-D5-1-SP	1 Pole, 5 Amp Circuit Breaker, D Curve, UL1077
6	2	Automation Direct	KN-D12-BLU	Double-level terminal block, Blue, Pkg 100
7	1	Automation Direct	KN-TG12	Three Level Terminal Block with Ground, Pck. 20
8	1	Automation Direct	KN-DG12	Terminal Block, Double Level, Plus Gnd, 20 Pack
9	4	Automation Direct	781-1C-24D	Relay 24vdc, 1PDT, 15A
10	4	Automation Direct	781-1C-SKT	Relay Socket 1-Pole
11	1	Allen-Bradley	1492-REC15	Duplex Receptacle, 15A, 120V, Din Rail Mounted
12	2	E-Rail	111.013	Mounting rail, PR30, plated, 2M
13	2	Battery Mart	SLA-12V1-3	Battery, Gell Cell, 12Vdc

MCWD - Office - Suggested Materials for RTU

ITEM #	QTY	MANUFACTURER	MODEL #	DESCRIPTION
1	1	Saginaw	SCE-24EL2410SSLP	Enclosure, Nema 4X, SS, 24x24x10
2	1	Saginaw	SCE-24P24	Subpanel, 21" x 21"
3	1	Automation Direct	BX-DM1E-M-D	BRX Do-More PLC Controller, Ethernet, RS485, 24VDC
4	1	Automation Direct	BX-P-LCOMEX	POM communication module, 1-port
5	1	Meanwell	DRC-100B	Power Supply / UPS / Charger, 24VDC, 100W
6	1	Automation Direct	SE3-SW8U	Ethernet Switch, 8-port

MCWD Office - Server - Suggested Materials for RTU

ITEM #	QTY	MANUFACTURER	MODEL #	DESCRIPTION
1	1	Microsoft	P73-07807	Windows Server 2019 Standard Operating System
2	1	Lenovo	7X10A0BKNA	ST550 ThinkServer, Intel Xeon, 16GB DDR4 Ram
3	4	Lenovo	7TP7A01601	ThinkSystem RDX 500GB Cartridges
4	4	Axiom	7X77A01303-AX	Memory, 16GB, DDR4-2666, ECC RDIMM
5	1	Lenovo	4X30L79883	Wired Keyboard and Mouse
6	1	APC	BR1500G	UPS, 1500VA, 120V
7	1	Linksys	MR8300	Gigabit Wireless Gateway Router

MCWD Office - Work Station 1 - Suggested Materials for RTU

ITEM #	QTY	MANUFACTURER	MODEL #	DESCRIPTION
1	1	Lenovo	30BX001AUS	ThinkStation, Intel Xeon, 16GB DDR4, 512 SSHD, W10 Pro
2	1	Lenovo	4X30L79883	Wired Keyboard and Mouse
3	1	Sharpe	PNR426	42" Class LCD Display. 1920X1080
4	1	APC	BR1500G	UPS, 1500VA, 120V

MCWD Office - Work Station 2 - Suggested Materials for RTU

ITEM #	QTY	MANUFACTURER	MODEL #	DESCRIPTION
1	1	Lenovo	30BX001AUS	ThinkStation, Intel Xeon, 16GB DDR4, 512 SSHD, W10 Pro
2	1	Lenovo	4X30L79883	Wired Keyboard and Mouse
3	1	Sharpe	PNR426	42" Class LCD Display. 1920X1080
4	1	APC	BR1500G	UPS, 1500VA, 120V