

PROJECT MANUAL

FOR

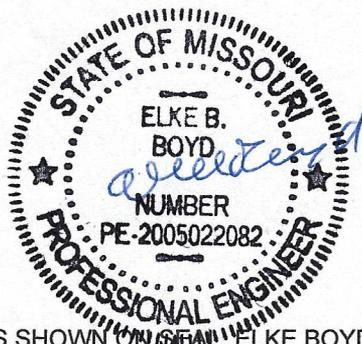
HARTSBURG WWTF - TREATMENT UPGRADES

OWNER'S REPRESENTATIVE: BOONE COUNTY REGIONAL SEWER DISTRICT

PROJECT LOCATION: HARTSBURG WASTEWATER TREATMENT FACILITY
0.5 MILES SE OF 2ND STREET & KATY TRAIL INTERSECTION
HARTSBURG, MO 65039

PREPARED BY: LOCHMUELLER GROUP
820 SOUTH MAIN STREET
ST. CHARLES, MO 63302
PROJECT NUMBER: 524-1025-01W - PHASE 2

THE RESPONSIBILITY OF THE UNDERSIGNED ENGINEER IS LIMITED TO THE TECHNICAL SPECIFICATIONS CONTAINED HEREIN, SHE/HE DISCLAIMS ANY RESPONSIBILITY FOR OTHER DOCUMENTS, INCLUDING GEOTECHNICAL REPORTS WHICH DO NOT BEAR HIS/HER SEAL AND SIGNATURE.



NAME AS SHOWN ON SEAL: ELKE BOYD, PE, BCEE

LICENSE NUMBER: 2005022082

DATE: 10/31/2025

NOTICE OF PRE-BID CONFERENCE

HARTSBURG WWTF - TREATMENT UPGRADES

OWNER'S REPRESENTATIVE: BOONE COUNTY REGIONAL SEWER DISTRICT

OWNER'S REPRESENTATIVE PROJECT NUMBER: 08-2025

ENGINEER'S PROJECT NUMBER: 524-1025-01W - PHASE 2

A pre-bid conference has been scheduled for **Wednesday, November 19, 2025 at 11 AM** in the **office of the Boone County Regional Sewer District at 1314 N. 7th Street, Columbia, MO**. A virtual option will **be available** by visiting www.bcrsd.com and clicking on the "Bids and Public Notices" tab. Information for virtual attendance can be found by clicking the link for this project. Representatives of the Owner and Engineer will be present to discuss the Project. Bidders are encouraged, but not required, to attend the pre-bid conference. The conference will be followed by an optional tour of the Site.

PROJECT LOCATION: HARTSBURG WASTEWATER TREATMENT FACILITY
0.5 MILES SE OF 2ND STREET & KATY TRAIL INTERSECTION
HARTSBURG, MO 65039

CONSULTING ENGINEER: LOCHMUELLER GROUP
820 SOUTH MAIN STREET
ST. CHARLES, MO 63302
573-340-5288

OWNERS' REPRESENTATIVE: BOONE COUNTY REGIONAL SEWER DISTRICT
1314 NORTH 7TH STREET
COLUMBIA, MO 65201
573-443-2774

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ADVERTISEMENT FOR BIDS

**Boone County Regional Sewer District (BCRSD)
1314 North 7th Street, Columbia, MO 65201
Hartsburg WWTF - Treatment Upgrades**

General Notice

The BCRSD (Owner) is requesting Bids for the construction of the following Project:

**Hartsburg WWTF - Treatment Upgrades
Owner's Project Number: 08-2025
Engineer's Project Number: 524-1025-01W - Phase 2**

Bids for the construction of the Project will be received at the **office of the BCRSD** located at 1314 North 7th Street, Columbia MO 65201, until **Wednesday, December 3, 2025 at 2:00 PM** local time. At that time the Bids received will be publicly opened and read aloud.

The Project includes the following Work

The Base Bid consists of acquisition of aeration and gravel filter equipment for the Village of Hartsburg 2-cell wastewater lagoon. Alternates include replacement of the existing aeration system and installation of the filter, site fencing, repair of valve boxes, adjustment of the outfall pipe and installation of a flow meter.

Obtaining the Bidding Documents

Information and Bidding Documents for the Project can be found at the following designated website:

<https://www.adsplanroom.net>

Bidding Documents may be viewed at no cost. Hardcopies or downloads may be obtained from the designated website for a non-refundable fee. Prospective Bidders are **required** to register with the designated website as a plan holder, even if Bidding Documents are obtained from a 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 plan holders, reports, 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.

Pre-bid Conference

A pre-bid conference for the Project will be held on **Wednesday, November 19, 2025 at 11:00 AM at the office of the BCRSD. A virtual option will be available** by visiting www.bcrsd.com and clicking on the "Bids and Public Notices" tab. Information for virtual attendance can be found by clicking the link for this project. Attendance at the pre-bid conference is encouraged but not required. The conference will be followed by an optional tour of the Site.

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.

This Advertisement is issued by:

Owner: BCRSD

By: Jesse Stephens, PE

Title: Facilities Engineering Manager and Interim Executive Director

Date: Monday, November 3, 2025

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.

ARTICLE 2—BIDDING DOCUMENTS

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

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

ARTICLE 3—QUALIFICATIONS OF BIDDERS

- 3.01 To demonstrate Bidder's qualifications to perform the Work, after submitting its Bid and within **ten (10)** days of Owner's request, Bidder must submit the following information:
- 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. Completed Business Entity Certification, Enrollment Documentation, and Affidavit of Work Authorization.
 - D. Bidder's state or other contractor license number, if applicable.
 - E. Subcontractor and Supplier qualification information.
 - F. Other required information regarding qualifications.
- 3.02 A Bidder's failure to submit required qualification information within the times indicated may disqualify Bidder from receiving an award of the Contract.
- 3.03 No requirement in this Article 3 to submit information will prejudice the right of Owner to seek additional pertinent information regarding Bidder's qualifications.

ARTICLE 4—PRE-BID CONFERENCE

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

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

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

5.02 Existing Site Conditions

A. Subsurface and Physical Conditions; Hazardous Environmental Conditions

1. The Supplementary Conditions identify the following regarding existing conditions at or adjacent to the Site:
 - a. Those reports of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data.
2. Copies of reports and drawings referenced above have been included in the appendix to the technical specifications for reference, only. 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. In addition to the documents regarding existing Site conditions referred to in Paragraph 5.02.A, the following other documents relating to conditions at or adjacent to the Site are known to Owner and made available to Bidders for reference:

1. Wastewater System Improvements drawings, dated August 1989.

Owner will make copies of these other Site-related documents available to any Bidder on request.

- B. Owner has not verified the contents of these other Site-related documents, and Bidder may not rely on the accuracy of any data or information in such documents. Bidder is responsible for any interpretation or conclusion Bidder draws from the other Site-related documents.
- C. The other Site-related documents are not part of the Contract Documents.
- D. Bidders are encouraged to review the other Site-related documents, but Bidders will not be held accountable for any data or information in such documents. The requirement to review and take responsibility for documentary Site information is limited to information in (1) the Contract Documents and (2) the Technical Data.

5.04 Site Visit and Testing by Bidders

- A. Bidder is encouraged 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 to the Site will be available upon request.

- C. Bidders visiting the Site are required to arrange their own transportation to the Site.
- D. All access to the Site other than during a regularly scheduled Site visit must be coordinated through the following BCRSD personnel: **Jesse Stephens, PE at jstephens@bcrsd.com**. Bidder may conduct the Site visit during regular business hours.
- 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 all applicable Laws and Regulations regarding location of utilities, obtain all permits, and comply with all terms and conditions established by Owner or by property owners or other entities controlling the Site with respect to schedule, access, existing operations, security, liability insurance, and applicable safety programs.
- 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 noted in the Supplementary Conditions.

5.06 *Other Work at the Site*

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

ARTICLE 6—BIDDER'S REPRESENTATIONS AND CERTIFICATIONS

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

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

ARTICLE 7—INTERPRETATIONS AND ADDENDA

- 7.01 Owner on its own initiative may issue Addenda to clarify, correct, supplement, or change the Bidding Documents.
- 7.02 Bidder shall submit all questions about the meaning or intent of the Bidding Documents to Engineer in writing. Contact information and submittal procedures for such questions are as follows:
- A. **Lochmueller Group, Elke Boyd, PE at elke.boyd@lochgroup.com.**
- 7.03 Interpretations or clarifications considered necessary by Engineer in response to such questions will be issued by Addenda delivered to all registered plan holders. Questions received less than seven days prior to the date for opening of Bids may not be answered.
- 7.04 Only responses set forth in an Addendum will be binding. Oral and other interpretations or clarifications will be without legal effect. Responses to questions are not part of the Contract Documents unless set forth in an Addendum that expressly modifies or supplements the Contract Documents.

ARTICLE 8—BID SECURITY

- 8.01 A Bid must be accompanied by Bid security made payable to Owner in an amount of **five (5)** percent of Bidder's maximum Bid price (determined by adding the base bid and all alternates) and in the form of a Bid bond issued by a surety meeting the requirements of Paragraph 6.01 of the General Conditions. Such Bid bond will be issued in the form included in the Bidding Documents.
- 8.02 The Bid security of the apparent Successful Bidder will be retained until Owner awards the contract to such Bidder, and such Bidder has executed the Contract, furnished the required Contract security, and met the other conditions of the Notice of Award, whereupon the Bid security will be released. If the Successful Bidder fails to execute and deliver the Contract and furnish the required Contract security within 15 days after the Notice of Award, Owner may consider Bidder to be in default, annul the Notice of Award, and the Bid security of that Bidder will be forfeited, in whole in the case of a penal sum bid bond, and to the extent of Owner's damages in the case of a damages-form bond. Such forfeiture will be Owner's exclusive remedy if Bidder defaults.
- 8.03 The Bid security of other Bidders that Owner believes to have a reasonable chance of receiving the award may be retained by Owner until the earlier of 7 days after the Effective Date of the

Contract or 61 days after the Bid opening, whereupon Bid security furnished by such Bidders will be released.

- 8.04 Bid security of other Bidders that Owner believes do not have a reasonable chance of receiving the award will be released within 7 days after the Bid opening.

ARTICLE 9—CONTRACT TIMES

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

ARTICLE 10—SUBSTITUTE AND “OR EQUAL” ITEMS

- 10.01 The Contract for the Work, as awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents without consideration during the bidding and Contract award process of possible substitute or “or-equal” items. In cases in which the Contract allows the Contractor to request that Engineer authorize the use of a substitute or “or-equal” item of material or equipment, application for such acceptance may not be made to and will not be considered by Engineer until after the Effective Date of the Contract.
- 10.02 All prices that Bidder sets forth in its Bid will be based on the presumption that the Contractor will furnish the materials and equipment specified or described in the Bidding Documents, as supplemented by Addenda. Any assumptions regarding the possibility of post-Bid approvals of “or-equal” or substitution requests are made at Bidder’s sole risk.

ARTICLE 11—SUBCONTRACTORS, SUPPLIERS, AND OTHERS

- 11.01 The apparent Successful Bidder, and any other Bidder so requested, must submit to Owner a list of the Subcontractors or Suppliers proposed for any portions of the Work as specified in the Bid Form.
- 11.02 If requested by Owner, such list must be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor or Supplier. If Owner or Engineer, after due investigation, has reasonable objection to any proposed Subcontractor or Supplier, Owner may, before the Notice of Award is given, request apparent Successful Bidder to submit an acceptable substitute, in which case apparent Successful Bidder will submit a substitute, Bidder’s Bid price will be increased (or decreased) by the difference in cost occasioned by such substitution, and Owner may consider such price adjustment in evaluating Bids and making the Contract award.
- 11.03 If apparent Successful Bidder declines to make any such substitution, Owner may award the Contract to the next lowest Bidder that proposes to use acceptable Subcontractors and Suppliers. Declining to make requested substitutions will constitute grounds for forfeiture of the Bid security of any Bidder. Any Subcontractor or Supplier, so listed and against which Owner or Engineer makes no written objection prior to the giving of the Notice of Award will be deemed acceptable

to Owner and Engineer subject to subsequent revocation of such acceptance as provided in Paragraph 7.07 of the General Conditions.

ARTICLE 12—PREPARATION OF BID

- 12.01 The Bid Form is included with the Bidding Documents.
- A. All blanks on the Bid Form must be completed in ink and the Bid Form signed in ink. Erasures or alterations must be initialed in ink by the person signing the Bid Form. A Bid price must be indicated for each section, Bid item, alternate, adjustment unit price item, and unit price item listed therein.
- B. If the Bid Form expressly indicates that submitting pricing on a specific alternate item is optional, and Bidder elects to not furnish pricing for such optional alternate item, then Bidder may enter the words “No Bid” or “Not Applicable.”
- 12.02 If Bidder has obtained the Bidding Documents as Electronic Documents, then Bidder shall prepare its Bid on a paper copy of the Bid Form printed from the Electronic Documents version of the Bidding Documents. The printed copy of the Bid Form must be clearly legible, printed on 8½ inch by 11-inch paper and as closely identical in appearance to the Electronic Document version of the Bid Form as may be practical. The Owner reserves the right to accept Bid Forms which nominally vary in appearance from the original paper version of the Bid Form, providing that all required information and submittals are included with the Bid.
- 12.03 A Bid by a corporation must be executed in the corporate name by a corporate officer (whose title must appear under the signature), accompanied by evidence of authority to sign. The corporate address and state of incorporation must be shown.
- 12.04 A Bid by a partnership must be executed in the partnership name and signed by a partner (whose title must appear under the signature), accompanied by evidence of authority to sign. The official address of the partnership must be shown.
- 12.05 A Bid by a limited liability company must be executed in the name of the firm by a member or other authorized person and accompanied by evidence of authority to sign. The state of formation of the firm and the official address of the firm must be shown.
- 12.06 A Bid by an individual must show the Bidder’s name and official address.
- 12.07 A Bid by a joint venture must be executed by an authorized representative of each joint venturer in the manner indicated on the Bid Form. The joint venture must have been formally established prior to submittal of a Bid, and the official address of the joint venture must be shown.
- 12.08 All names must be printed in ink below the signatures.
- 12.09 The Bid must contain an acknowledgment of receipt of all Addenda, the numbers of which must be filled in on the Bid Form.
- 12.10 Postal and e-mail addresses and telephone number for communications regarding the Bid must be shown.
- 12.11 The Bid must contain evidence of Bidder’s authority to do business in the state where the Project is located, or Bidder must certify in writing that it will obtain such authority within the time for acceptance of Bids and attach such certification to the Bid.
- 12.12 If Bidder is required to be licensed to submit a Bid or perform the Work in the state where the Project is located, the Bid must contain evidence of Bidder’s licensure, or Bidder must certify in

writing that it will obtain such licensure within the time for acceptance of Bids and attach such certification to the Bid. Bidder's state contractor license number, if any, must also be shown on the Bid Form.

ARTICLE 13—BASIS OF BID

13.01 Unit Price

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

13.02 Base Bid with Alternates

- A. Bidders must submit a Bid on a unit price basis for the base Bid and include a separate price for each alternate 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.

ARTICLE 14—SUBMITTAL OF BID

- 14.01 The Bidding Documents include one separate unbound copy of the Bid Form, and, if required, the Bid Bond Form. The unbound copy of the Bid Form is to be completed and submitted with the Bid security and the other documents required to be submitted under the terms of Article 2 of the Bid Form.
- 14.02 A Bid must be received no later than the date and time prescribed and at the place indicated in the Advertisement or invitation to bid and must be enclosed in a plainly marked package with the Project title, and, if applicable, the designated portion of the Project for which the Bid is submitted, the name and address of Bidder, and must be accompanied by the Bid security and other required documents. If a Bid is sent by mail or other delivery system, the sealed envelope containing the Bid must be enclosed in a separate package plainly marked on the outside with the notation "BID ENCLOSED." A mailed Bid must be addressed to the location designated in the Advertisement.
- 14.03 Bids received after the date and time prescribed for the opening of bids, or not submitted at the correct location or in the designated manner, will not be accepted and will be returned to the Bidder unopened.

ARTICLE 15—MODIFICATION AND WITHDRAWAL OF BID

- 15.01 Mistakes in bids can be corrected or withdrawn with written notification before the opening of bids. An unopened Bid may be withdrawn by an appropriate document duly executed in the same manner that a Bid must be executed and delivered to the place where Bids are to be submitted prior to the date and time for the opening of Bids. Upon receipt of such notice, the unopened Bid will be returned to the Bidder.
- 15.02 If a Bidder wishes to modify its Bid prior to Bid opening, Bidder must withdraw its initial Bid in the manner specified in Paragraph 15.01 and submit a new Bid prior to the date and time for the opening of Bids.
- 15.03 After opening, changes are not allowed if they harm competition or the awarding agency's interests. Bidders may withdraw a bid if a clear mistake is evident or proven. If within 24 hours after Bids are opened any Bidder files a duly signed written notice with Owner and promptly thereafter demonstrates to the reasonable satisfaction of Owner that there was a material and substantial mistake in the preparation of its Bid, the Bidder may withdraw its Bid, and the Bid security will be returned. Thereafter, if the Work is rebid, the Bidder will be disqualified from further bidding on the Work. Decisions on corrections or withdrawal must be documented in writing. Awards may be cancelled if necessary.

ARTICLE 16—OPENING OF BIDS

- 16.01 Bids received by the deadline will be opened publicly at the date, time, and place specified in the Advertisement for Bids and read aloud in the presence of one or more witnesses. The name of each Bidder and the amounts of the base Bids and major alternates, if any, will be recorded as well as other relevant information as deemed appropriate. The record and each Bid will be made available to upon request.

ARTICLE 17—BIDS TO REMAIN SUBJECT TO ACCEPTANCE

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

ARTICLE 18—EVALUATION OF BIDS AND AWARD OF CONTRACT

- 18.01 Owner reserves the right to reject any or all Bids, including without limitation, nonconforming, nonresponsive, unbalanced, or conditional Bids. Owner also reserves the right to waive all minor Bid informalities not involving price, time, or changes in the Work.
- 18.02 Owner will reject the Bid of any Bidder that Owner finds, after reasonable inquiry and evaluation, to not be responsible.
- 18.03 If Bidder purports to add terms or conditions to its Bid, takes exception to any provision of the Bidding Documents, or attempts to alter the contents of the Contract Documents for purposes of the Bid, whether in the Bid itself or in a separate communication to Owner or Engineer, then Owner will reject the Bid as nonresponsive.
- 18.04 If Owner awards the contract for the Work, Bids will be accepted without changes. They will be evaluated based on lowest cost and most responsible Bidder. The contract shall be awarded with

reasonable promptness by appropriate written notice to the lowest responsible and responsive Bidder whose Bid meets the requirements and criteria set forth in the Advertisement for Bids.

18.05 *Evaluation of Bids*

- A. In evaluating Bids, Owner will consider whether the Bids comply with the prescribed requirements, and such alternates, unit prices, and other data, as may be requested in the Bid Form or prior to the Notice of Award.
- B. In the comparison of Bids, alternates will be applied in the same order of priority as listed in the Bid Form. For comparison purposes alternates will be accepted, if any, following the order of priority established in the Bid Form, until doing so would cause the budget to be exceeded. After determination of the Successful Bidder based on this comparative process and on the responsiveness, responsibility, and other factors set forth in these Instructions, the award may be made to said Successful Bidder on its base Bid and any combination of its additive alternate Bids for which Owner determines funds will be available at the time of award and in the best interest of the project.
- C. For the determination of the apparent low Bidder when unit price bids are submitted, Bids will be compared on the basis of the total of the products of the estimated quantity of each item and unit price Bid for that item, together with any lump sum items.

18.06 In evaluating whether a Bidder is responsible, Owner will consider the qualifications of the Bidder and may consider the qualifications and experience of Subcontractors and Suppliers proposed for those portions of the Work for which the identity of Subcontractors and Suppliers must be submitted as provided in the Bidding Documents. Most responsible bidder may be based on previous experience, ability to meet deadlines, etc.

18.07 Owner may conduct such investigations as Owner deems necessary to establish the responsibility, qualifications, and financial ability of Bidders and any proposed Subcontractors or Suppliers.

ARTICLE 19—BONDS AND INSURANCE

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

19.02 Article 8, Bid Security, of these Instructions, addresses any requirements for providing bid bonds as part of the bidding process.

ARTICLE 20—SIGNING OF AGREEMENT

20.01 When Owner issues a Notice of Award to the Successful Bidder, it will be accompanied by the unexecuted counterparts of the Agreement along with the other Contract Documents as identified in the Agreement. Within 15 days thereafter, Successful Bidder must execute and deliver the required number of counterparts of the Agreement and any bonds and insurance documentation required to be delivered by the Contract Documents to Owner. Within 10 days thereafter, Owner will deliver one fully executed counterpart of the Agreement to Successful

Bidder, together with printed and electronic copies of the Contract Documents as stated in Paragraph 2.02 of the General Conditions.

ARTICLE 21—SALES AND USE TAXES

21.01 Owner is exempt from Missouri state sales and use taxes on materials and equipment to be incorporated in the Work. (Exemption No. 12464929). Said taxes must not be included in the Bid. Refer to Paragraph SC-7.10 of the Supplementary Conditions for additional information.

ARTICLE 22—SUPPLEMENTAL INSTRUCTIONS

22.01 Attention of Bidder is drawn to additional contract clauses laid out in the Supplemental Conditions with respect to termination, Equal Employment Opportunity, wage rates, Anti-Lobbying and other requirements under the American Resue Plan Act (ARPA).

SECTION 00 20 01

ADDENDUM NUMBER _____

The revisions hereby supersede any and all data with which they may conflict as indicated in the specifications and related documents issued in the original set or prior addenda. Each trade is responsible for changes in its work caused by changes in the work of other trades. This addendum is a part of and shall be attached to the original set of specifications for the work.

ITEM 1 - PROJECT INFORMATION

- 1.01 Date of Addendum: _____
- 1.02 Owner: Boone County Regional Sewer District
- 1.03 Owner's Project Number: 08-2025
- 1.04 Engineer: Lochmueller Group
- 1.05 Engineer's Project Number: 524-1025-01W-Phase 2
- 1.06 Project: Hartburg WWTF - Treatment Upgrades

ITEM 2 - TO PROSPECTIVE BIDDERS

- 2.01 This Addendum forms a part of the Contract Documents and modifies the Bidding Documents dated _____, and prior Addenda, as listed, with amendments and additions noted below.
- 2.02 Bidder is to acknowledge receipt of this Addendum in the space provided in the Bid Form. Failure to do so may disqualify the Bidder.
- 2.03 This addendum consists of _____ page(s) and the following drawings:
 - A. _____

ITEM 3 - CHANGES TO PRIOR ADDENDA

- 3.01 Changes to Addendum number: _____
 - A. _____

ITEM 4 - CHANGES TO THE PROJECT MANUAL, PROCUREMENT AND/OR CONTRACT REQUIREMENTS AND TECHNICAL SPECIFICATIONS

- 4.01 Changes to Document/Section: _____
 - A. _____

ITEM 5 - CHANGES TO THE DRAWINGS

- 5.01 Changes to Drawing: _____
 - A. _____

ITEM 6 - GENERAL CLARIFICATIONS

- A. _____

ITEM 7 - ATTACHMENTS

- A. _____

END OF SECTION 00 20 01

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: Boone County Regional Sewer District, located at 1314 North 7th Street, Columbia MO 65201.
- 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. 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;
 - D. 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; and
 - E. Required Bidder Qualification Statement with supporting data.

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

3.01 *Unit Price Bids*

- A. **Base Bid - Major Equipment Procurement** - Bidder will perform the following Work at the indicated unit prices:

Item No.	Description	Unit	Estimated Quantity	Bid Unit Price	Bid Amount
1	Treatment & Aeration Systems Equipment	LS	1	\$	\$
2	Contractor's Procurement Costs	LS	1	\$	\$
Base Bid - Total of all Extended Prices for Unit Price Work (subject to final adjustment based on actual quantities)					\$

- B. **Alternate 1 Bid - Installation of Major Equipment** - Bidder will perform the following Work at the additional indicated unit prices:

Alternate 1 - Installation of Major Equipment					
Item No.	Description	Unit	Estimated Quantity	Bid Unit Price	Bid Amount
1	Mobilization/Demobilization	LS	1	\$	\$
2	Site Clearing, Fence Removal, Access Ctrl	LS	1	\$	\$
3	Earthwork, net cut	CY	450	\$	\$
4	Filter Non-Woven Geotextile, 8 oz	SF	1,780	\$	\$
5	Filter HPDE Liner, 60 mil	SF	1,320	\$	\$
6	Filter Uniform Graded Clean Rock	TN	182	\$	\$
7	Filter Insulating Wood Chips	CY	20	\$	\$
8	Filter Wall Framing & Sheathing	SF	800	\$	\$
9	Filter System Installation	LS	1	\$	\$
10	Precast Level Control Manhole, 48 in	EA	2	\$	\$
11	Sewer Yard Piping, 6" DIP	LF	45	\$	\$
12	Sewer Gate Valve, 6" DIP	EA	3	\$	\$
13	Air Yard Piping, 4" HDPE DR11	LF	205	\$	\$
14	Miscellaneous Power and Electric Items	LS	1	\$	\$
15	Concrete Blower Pad	SF	30	\$	\$
16	Blower Building Piping and Valves	LS	1	\$	\$
17	Blower Installation	LS	1	\$	\$
18	Lagoon Aeration Installation	LS	1	\$	\$
19	Gravel Drive	SY	132	\$	\$
20	Seeding and Site Restoration	LS	1	\$	\$
Alternate 1 - Total of all Extended Prices for Unit Price Work (subject to final adjustment based on actual quantities)					\$

- C. **Alternate 2 Bid - Site Fencing** - Bidder will perform the following Work at the additional indicated unit prices:

Item No.	Description	Unit	Estimated Quantity	Bid Unit Price	Bid Amount
1	Woven Wire Fence with Barbed Wire	LF	86	\$	\$
2	6-Bar Gate, 12' wide	LS	2	\$	\$
Alternate 2 - Total of all Extended Prices for Unit Price Work (subject to final adjustment based on actual quantities)					\$

- D. **Alternate 3 Bid - Outfall Piping** - Bidder will perform the following Work at the additional indicated unit prices:

Item No.	Description	Unit	Estimated Quantity	Bid Unit Price	Bid Amount
1	Repair broken transfer pipe valve box	EA	2	\$	\$
2	Relay outfall pipe, complete	LS	1	\$	\$
3	Ultrasonic Cartridge Flowmeter	LS	1	\$	\$
Alternate 3 - Total of all Extended Prices for Unit Price Work (subject to final adjustment based on actual quantities)					\$

- E. Bidder acknowledges that:

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

ARTICLE 4—TIME OF COMPLETION

- 4.01 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 calendar days indicated in the Agreement.
- 4.02 Bidder accepts the provisions of the Agreement as to liquidated damages.

ARTICLE 5—BIDDER’S ACKNOWLEDGEMENTS: ACCEPTANCE PERIOD, INSTRUCTIONS, AND RECEIPT OF ADDENDA

5.01 *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.

5.02 *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.

5.03 *Receipt of Addenda*

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

Addendum Number	Addendum Date

ARTICLE 6—BIDDER’S REPRESENTATIONS AND CERTIFICATIONS

6.01 *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 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.
 - 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.

6.02 *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 6.02.A:
 - a. Corrupt practice means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process.
 - b. Fraudulent practice means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Owner, (b) to establish bid prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition.
 - c. Collusive practice means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish bid prices at artificial, non-competitive levels.
 - d. Coercive practice means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

BIDDER hereby submits this Bid as set forth above:

Bidder:

(typed or printed name of organization)

By: _____
(individual's signature)

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Date: _____
(typed or printed)

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

Attest: _____
(individual's signature)

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Date: _____
(typed or printed)

Address for giving notices:

Bidder's Contact:

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Phone: _____

Email: _____

Address: _____

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

BID BOND (PENAL SUM FORM)

<p>Bidder</p> <p>Name: [Full formal name of Bidder]</p> <p>Address (<i>principal place of business</i>): [Address of Bidder's principal place of business]</p>	<p>Surety</p> <p>Name: [Full formal name of Surety]</p> <p>Address (<i>principal place of business</i>): [Address of Surety's principal place of business]</p>
<p>Owner</p> <p>Name: Boone County Regional Sewer District</p> <p>Address (<i>principal place of business</i>): 1314 North 7th Street Columbia, MO 65201</p>	<p>Bid</p> <p>Project (<i>name and location</i>): Hartsburg WWTF - Treatment Upgrades 0.5 miles SE of 2nd St & Katy Trail Intersection Hartsburg, MO 65039</p> <p>Bid Due Date: December 3, 2025</p>
<p>Bond</p> <p>Penal Sum: 5% of Total Bid Price</p> <p>Date of Bond: December 3, 2025</p>	
<p>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.</p>	
<p>Bidder</p> <p style="text-align: center;">_____</p> <p style="text-align: center;"><i>(Full formal name of Bidder)</i></p>	<p>Surety</p> <p style="text-align: center;">_____</p> <p style="text-align: center;"><i>(Full formal name of Surety) (corporate seal)</i></p>
<p>By: _____</p> <p style="text-align: center;"><i>(Signature)</i></p>	<p>By: _____</p> <p style="text-align: center;"><i>(Signature) (Attach Power of Attorney)</i></p>
<p>Name: _____</p> <p style="text-align: center;"><i>(Printed or typed)</i></p>	<p>Name: _____</p> <p style="text-align: center;"><i>(Printed or typed)</i></p>
<p>Title: _____</p>	<p>Title: _____</p>
<p>Attest: _____</p> <p style="text-align: center;"><i>(Signature)</i></p>	<p>Attest: _____</p> <p style="text-align: center;"><i>(Signature)</i></p>
<p>Name: _____</p> <p style="text-align: center;"><i>(Printed or typed)</i></p>	<p>Name: _____</p> <p style="text-align: center;"><i>(Printed or typed)</i></p>
<p>Title: _____</p>	<p>Title: _____</p>
<p><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></p>	

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

QUALIFICATIONS STATEMENT

ARTICLE 1—GENERAL INFORMATION

1.01 Provide contact information for the Business:

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

1.02 Provide information on the Business’s organizational structure:

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

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

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

ARTICLE 2—LICENSING

2.01 Provide information regarding project pertinent licensure for Business:

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

ARTICLE 3—CONSTRUCTION EXPERIENCE

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

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

3.02 List a minimum of five (5) and a maximum of six (6) projects of this type and of equal or larger magnitude for at least three (3) different clients 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.

ARTICLE 4—REQUIRED ATTACHMENTS

4.01 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. Schedule B (Previous Experience with Similar Projects) as required by Paragraph 5.02.
- C. Additional items as pertinent.

Schedule B—Previous Experience with Similar Projects

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

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

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

Schedule B—Previous Experience with Similar Projects

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

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

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

NOTICE OF AWARD

Date of Issuance: ___[date]

Owner: Boone County Regional Sewer District Owner's Project No.: 08-2025
Engineer: Lochmueller Group Engineer's Project No.: 524-1025-01W-Phase 2
Project: Hartsburg WWTF - Treatment Upgrades

Contract Name: Treatment Upgrades

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:

Upgrades to the domestic wastewater lagoon in Hartsburg, Missouri

The Contract Price of the awarded Contract is \$_____ [Contract Price in numbers and words]_____. 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.

Four (4) 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 10 days of the date of receipt of this Notice of Award:

1. Deliver to Owner four (4) 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.

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

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

Owner: **Boone County Regional Sewer District**

By (signature): _____

Name (printed): _____

Title: _____

Copy: Engineer

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

This Agreement is by and between **Boone County Regional Sewer District (“Owner”)** and _____
_____ (“Contractor”).

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

Owner and Contractor hereby agree as follows:

ARTICLE 1—WORK

1.01 Contractor shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows:

- A. Replacement of the aeration system for the Village of Hartsburg 2-cell wastewater lagoon and addition of an aerated gravel filter system. The project is split as follows:
 - 1. The Base Bid consists of procurement of the aerated gravel filter and aeration equipment.
 - 2. Alternate 1 consists of installation of the aerated gravel filter and aeration equipment.
 - 3. Alternate 2 consists of partial site fencing.
 - 4. Alternate 3 consists of reinstallation of the outfall pipe, addition of a flowmeter and repair of two valve boxes.

ARTICLE 2—THE PROJECT

2.01 The Project, of which the Work under the Contract Documents is a part, is generally described as follows:

Hartsburg WWTF - Treatment Upgrades
0.5 miles SE of 2nd St & Katy Trail Intersection
Hartsburg, MO 65039

ARTICLE 3—ENGINEER

3.01 The Owner has retained Lochmueller Group (“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 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. The Work for each Milestone will be substantially complete on or before the following dates:
1. Milestone 1: Base Bid - Major Equipment Procurement: **June 1, 2026.**
 - a. For Milestone 1, Substantial Completion has been achieved once proof of the complete equipment order has been presented to the Owner.
 2. Milestone 2: Alternate 1 - Installation of Major Equipment: **September 30, 2026.**
 3. Milestone 3: Alternates 2 and 3, as awarded: **September 30, 2026.**
- B. The Work for each Milestone will be ready for final payment in accordance with Paragraph 15.06 of the General Conditions on or before the following dates:
1. Milestone 1: Base Bid - Major Equipment Procurement: **June 15, 2026.**
 - b. For Milestone 1, Readiness for Final Payment has been achieved once the complete equipment order has been received and stored onsite or as approved by the Owner.
 2. Milestone 2: Alternate 1 - Installation of Major Equipment: **October 30, 2026.**
 3. Milestone 3: Alternates 2 and 3, as awarded: **October 30, 2026.**

4.03 *Liquidated Damages*

- A. Contractor and Owner recognize that time is of the essence as stated in Paragraph 4.01 above and that Owner will suffer financial and other losses if the Work is not completed and Milestones not achieved within the 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 **one thousand dollars (\$1,000)** for each day that expires after the time (as duly adjusted pursuant to the Contract) specified above for Substantial Completion of any Milestone, until the Work is substantially complete.
 - c. Liquidated damages for failing to timely attain Substantial Completion for each Milestone are not additive, and will not be imposed concurrently.
 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, as applicable for each Milestone, Contractor shall pay Owner **five hundred dollars (\$500)** for each day that expires after such time until the Work is completed and ready for final payment.
 - a. Liquidated damages for failing to timely attain final completion for each Milestone are not additive, and will not be imposed concurrently.
 3. *Overlap of Substantial and Final Completion:* Liquidated damages for failing to timely attain Substantial Completion and final completion are not additive, and will not be imposed concurrently.

- a. During periods when the Work under more than one Milestone has not been completed within the Contract Times, as duly modified, only the liquidated damages for the Milestone subject to the highest dollar amount are assessed.
- B. If Owner recovers liquidated damages for a delay in completion by Contractor, then such liquidated damages are Owner's sole and exclusive remedy for such delay, and Owner is precluded from recovering any other damages, whether actual, direct, excess, or consequential, for such delay, except for special damages (if any) specified in this Agreement.

ARTICLE 5—CONTRACT PRICE

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

Unit Price Work - Base Bid - Major Equipment Procurement					
Item No.	Description	Unit	Estimated Quantity	Unit Price	Extended Price
1	Treatment & Aeration Systems Equipment	LS	1	\$	\$
2	Contractor's Procurement Costs	LS	1	\$	\$
Base Bid - Total of all Extended Prices for Unit Price Work (subject to final adjustment based on actual quantities)					\$

Total of all Base Bid Extended Prices for Unit Price Work (subject to final adjustment based on actual quantities): \$ _____ [words] _____.

Alternate 1 - Installation of Major Equipment					
Item No.	Description	Unit	Estimated Quantity	Bid Unit Price	Bid Amount
1	Mobilization/Demobilization	LS	1	\$	\$
2	Site Clearing, Fence Removal, Access Ctrl	LS	1	\$	\$
3	Earthwork, net cut	CY	450	\$	\$
4	Filter Non-Woven Geotextile, 8 oz	SF	1,780	\$	\$
5	Filter HPDE Liner, 60 mil	SF	1,320	\$	\$
6	Filter Uniform Graded Clean Rock	TN	182	\$	\$

7	Filter Insulating Wood Chips	CY	20	\$	\$
8	Filter Wall Framing & Sheathing	SF	800	\$	\$
9	Filter System Installation	LS	1	\$	\$
10	Precast Level Control Manhole, 48 in	EA	2	\$	\$
11	Sewer Yard Piping, 6" DIP	LF	45	\$	\$
12	Sewer Gate Valve, 6" DIP	EA	3	\$	\$
13	Air Yard Piping, 4" HDPE DR11	LF	205	\$	\$
14	Miscellaneous Power and Electric Items	LS	1	\$	\$
15	Concrete Blower Pad	SF	30	\$	\$
16	Blower Building Piping and Valves	LS	1	\$	\$
17	Blower Installation	LS	1	\$	\$
18	Lagoon Aeration Installation	LS	1	\$	\$
19	Gravel Drive	SY	132	\$	\$
20	Seeding and Site Restoration	LS	1	\$	\$
Alternate 1 - Total of all Extended Prices for Unit Price Work (subject to final adjustment based on actual quantities)					\$

Total of all Alternate 1 Extended Prices for Unit Price Work (subject to final adjustment based on actual quantities): \$ _____ [words] _____.

Unit Price Work - Alternate 2 - Site Fencing					
Item No.	Description	Unit	Estimated Quantity	Unit Price	Extended Price
1	Woven Wire Fence with Barbed Wire	LF	86	\$	\$
2	Iron Gate, 12' wide	LS	2	\$	\$
Alternate 2 - Total of all Extended Prices for Unit Price Work (subject to final adjustment based on actual quantities)					\$

Total of all Alternate 2 Extended Prices for Unit Price Work (subject to final adjustment based on actual quantities): \$ _____ [words] _____.

Unit Price Work - Alternate 3 - Outfall Piping					
Item No.	Description	Unit	Estimated Quantity	Unit Price	Extended Price
1	Repair broken transfer pipe valve box	EA	2	\$	\$
2	Relay outfall pipe, complete	LS	1	\$	\$
3	Flowmeter, complete	LS	1	\$	\$
Alternate 3 - Total of all Extended Prices for Unit Price Work (subject to final adjustment based on actual quantities)					\$

Total of all Alternate 3 Extended Prices for Unit Price Work (subject to final adjustment based on actual quantities): \$ _____ [words] _____.

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.

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] 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 of each Milestone, 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. Ninety (90) percent of the value of the Work completed (with the balance being retainage).
 - 1) If seventy five (75) percent or more of the Work has been completed, as determined by Engineer, and if the character and progress of the Work have been satisfactory to Owner and Engineer, then as long as the character and progress of

the Work remain satisfactory to Owner and Engineer, there will be no additional retainage.

- b. One hundred (100) percent of cost of materials and equipment not incorporated in the Work, but securely stored on site or per Owner's instructions, with paid receipts presented with Application for Payment.
- B. Upon Substantial Completion, Owner shall pay an amount sufficient to increase total payments to Contractor to one hundred (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 two hundred (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 five (5) 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.
 - 5. Specifications as listed in the table of contents of the project manual (copy of list attached).
 - 6. Drawings (not attached but incorporated by reference) consisting of **nine (9)** sheets with each sheet bearing the following general title: **Hartsburg WWTF - Treatment Upgrades**.
 - 7. Addenda (numbers [number] to [number], inclusive).
 - 8. 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 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.
 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 [date on which Contract becomes effective] (which is the Effective Date of the Contract).

Owner:

Contractor:

(typed or printed name of organization)

(typed or printed name of organization)

By: _____
(individual's signature)

By: _____
(individual's signature)

Date: _____
(date signed)

Date: _____
(date signed)

Name: _____
(typed or printed)

Name: _____
(typed or printed)

Title: _____
(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)

Attest: _____
(individual's signature)

Title: _____
(typed or printed)

Title: _____
(typed or printed)

Address for giving notices:

Address for giving notices:

Designated Representative:

Designated Representative:

Name: _____
(typed or printed)

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Title: _____
(typed or printed)

Address:

Address:

Phone: _____

Phone: _____

Email: _____

Email: _____

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

License No.: _____
(where applicable)

State: _____

NOTICE TO PROCEED

Owner: Boone County Regional Sewer District Owner's Project No.: 08-2025
Engineer: Lochmueller Group Engineer's Project No.: 524-1025-01W
Contractor: _____ Contractor's Project No.: _____
Project: Hartsburg WWTF - Treatment Upgrades
Contract Name: Hartsburg WWTF - Treatment Upgrades
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 date by which Substantial Completion for each Milestone must be achieved is as follows:

1. Milestone 1: Base Bid - Major Equipment Procurement: **June 1, 2026.**
2. Milestone 2: Alternate 1 - Installation of Major Equipment: **September 30, 2026.**
3. Milestone 3: Alternates 2 and 3, as awarded: **September 30, 2026.**

The date by which readiness for final payment must be achieved is as follows

1. Milestone 1: Base Bid - Major Equipment Procurement: **June 15, 2026.**
2. Milestone 2: Alternate 1 - Installation of Major Equipment: **October 30, 2026.**
3. Milestone 3: Alternates 2 and 3, as awarded: **October 30, 2026.**

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

Coordinate with the Boone County Regional Sewer District for access to the Site and continued operations of the wastewater treatment facility.

Owner: Boone County Regional Sewer District
By (signature): _____
Name (printed): _____
Title: _____
Date Issued: _____
Copy: Engineer

PERFORMANCE BOND

<p>Contractor</p> <p>Name: [Full formal name of Contractor]</p> <p>Address (principal place of business): [Address of Contractor's principal place of business]</p>	<p>Surety</p> <p>Name: [Full formal name of Surety]</p> <p>Address (principal place of business): [Address of Surety's principal place of business]</p>
<p>Owner</p> <p>Name: Boone County Regional Sewer District</p> <p>Mailing address (principal place of business): 1314 North 7th Street Columbia, MO 65201</p>	<p>Contract</p> <p>Description (name and location): Hartsburg WWTF - Treatment Upgrades 0.5 miles SE of 2nd St & Katy Trail Intersection Hartsburg, MO 65039</p> <p>Contract Price: [Amount from Contract]</p> <p>Effective Date of Contract: [Date from Contract]</p>
<p>Bond</p> <p>Bond Amount: [Amount]</p> <p>Date of Bond: [Date]</p> <p><i>(Date of Bond cannot be earlier than Effective Date of Contract)</i></p> <p>Modifications to this Bond form: <input type="checkbox"/> None <input type="checkbox"/> See Paragraph 16</p>	
<p>Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth in this Performance Bond, do each cause this Performance Bond to be duly executed by an authorized officer, agent, or representative.</p>	
Contractor as Principal	Surety
<i>(Full formal name of Contractor)</i>	<i>(Full formal name of Surety) (corporate seal)</i>
By: _____ <i>(Signature)</i>	By: _____ <i>(Signature)(Attach Power of Attorney)</i>
Name: _____ <i>(Printed or typed)</i>	Name: _____ <i>(Printed or typed)</i>
Title: _____	Title: _____
Attest: _____ <i>(Signature)</i>	Attest: _____ <i>(Signature)</i>
Name: _____ <i>(Printed or typed)</i>	Name: _____ <i>(Printed or typed)</i>
Title: _____	Title: _____
<p><i>Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party is considered plural where applicable.</i></p>	

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

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

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

14. Definitions

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

PAYMENT BOND

<p>Contractor</p> <p>Name: [Full formal name of Contractor]</p> <p>Address (<i>principal place of business</i>): [Address of Contractor's principal place of business]</p>	<p>Surety</p> <p>Name: [Full formal name of Surety]</p> <p>Address (<i>principal place of business</i>): [Address of Surety's principal place of business]</p>
<p>Owner</p> <p>Name: Boone County Regional Sewer District</p> <p>Mailing address (<i>principal place of business</i>): 1314 North 7th Street Columbia, MO 65201</p>	<p>Contract</p> <p>Description (<i>name and location</i>): Hartsburg WWTF - Treatment Upgrades 0.5 miles SE of 2nd St & Katy Trail Intersection Hartsburg, MO 65039</p> <p>Contract Price: [Amount, from Contract]</p> <p>Effective Date of Contract: [Date, from Contract]</p>
<p>Bond</p> <p>Bond Amount: [Amount]</p> <p>Date of Bond: [Date]</p> <p><i>(Date of Bond cannot be earlier than Effective Date of Contract)</i></p> <p>Modifications to this Bond form: <input type="checkbox"/> None <input type="checkbox"/> See Paragraph 18</p>	
<p>Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth in this Payment Bond, do each cause this Payment Bond to be duly executed by an authorized officer, agent, or representative.</p>	
Contractor as Principal	Surety
<i>(Full formal name of Contractor)</i>	<i>(Full formal name of Surety) (corporate seal)</i>
By: _____ <i>(Signature)</i>	By: _____ <i>(Signature)(Attach Power of Attorney)</i>
Name: _____ <i>(Printed or typed)</i>	Name: _____ <i>(Printed or typed)</i>
Title: _____	Title: _____
Attest: _____ <i>(Signature)</i>	Attest: _____ <i>(Signature)</i>
Name: _____ <i>(Printed or typed)</i>	Name: _____ <i>(Printed or typed)</i>
Title: _____	Title: _____
<p><i>Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party is considered plural where applicable.</i></p>	

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

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

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

SECTION 00 61 51
CERTIFICATION OF OWNER'S ATTORNEY

I, the undersigned, _____, the duly authorized
and acting legal representative of _____
_____, do hereby certify as follows:

I have examined the attached contract(s) and surety bonds and the manner of execution thereof, and I am of the opinion that each of the aforesaid agreements 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 terms, conditions and provisions thereof.

(Signature)

(Date)

Contractor's Application for Payment

Owner: <u>Boone County Regional Sewer District</u>	Owner's Project No.: <u>08-2025</u>
Engineer: <u>Lochmueller Group</u>	Engineer's Project No.: <u>524-1025-01W</u>
Contractor: _____	Contractor's Project No.: _____
Project: <u>Hartsburg WWTF - Treatment Upgrades</u>	
Contract: <u>Hartsburg WWTF - Treatment Upgrades</u>	

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)	\$	-

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:** _____

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

Progress Estimate - Unit Price Work

Contractor's Application for Payment

Owner: Boone County Regional Sewer District
Engineer: Lochmueller Group
Contractor: _____
Project: Hartsburg WWTF - Treatment Upgrades
Contract: Hartsburg WWTF - Treatment Upgrades

Owner's Project No.: 08-2025
Engineer's Project No.: 524-1025-01W
Contractor's Project No.: _____

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

A	B	C	D	E	F	G	H	I	J	K	L
Bid Item No.	Description	Contract Information				Work Completed		Materials Currently Stored (not in G) (\$)	Work Completed and Materials Stored to Date (H + I) (\$)	% of Value of Item (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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					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
Original Contract Totals					\$ -		\$ -	\$ -	\$ -		\$ -

Progress Estimate - Unit Price Work

Contractor's Application for Payment

Owner: Boone County Regional Sewer District
Engineer: Lochmueller Group
Contractor: _____
Project: Hartsburg WWTF - Treatment Upgrades
Contract: Hartsburg WWTF - Treatment Upgrades

Owner's Project No.: 08-2025
Engineer's Project No.: 524-1025-01W
Contractor's Project No.: _____

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

A	B	C	D	E	F	G	H	I	J	K	L
Bid Item No.	Description	Contract Information				Work Completed		Materials Currently Stored (not in G) (\$)	Work Completed and Materials Stored to Date (H + I) (\$)	% of Value of Item (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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					-		-		-		-
					-		-		-		-
					-		-		-		-
Change Order Totals					\$ -		\$ -	\$ -	\$ -		\$ -
Original Contract and Change Orders											
Project Totals					\$ -		\$ -	\$ -	\$ -		\$ -

CERTIFICATE OF SUBSTANTIAL COMPLETION

Owner: Boone County Regional Sewer District Owner's Project No.: 08-2025
Engineer: Lochmueller Group Engineer's Project No.: 524-1025-01W-Ph2
Contractor: Contractor's Project No.:
Project: Hartsburg WWTF- Treatment Upgrades
Contract Name: Hartsburg WWTF- Treatment Upgrades

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: _____

NOTICE OF ACCEPTABILITY OF WORK

Owner: Boone County Regional Sewer District Owner’s Project No.: 08-2025
Engineer: Lochmueller Group Engineer’s Project No.: 524-1025-01W
Contractor: Contractor’s Project No.:
Project: Hartsburg WWTF - Treatment Upgrades
Contract Name: Treatment Upgrades
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: _____

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

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STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

ARTICLE 1—DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

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

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

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

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

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

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

1.02 Terminology

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

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

ARTICLE 2—PRELIMINARY MATTERS

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

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

2.02 *Copies of Documents*

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

2.03 *Before Starting Construction*

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

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

2.04 *Preconstruction Conference; Designation of Authorized Representatives*

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

2.05 *Acceptance of Schedules*

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

2.06 *Electronic Transmittals*

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

ARTICLE 3—CONTRACT DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 *Intent*

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

3.02 *Reference Standards*

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

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

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies*

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

B. *Resolving Discrepancies*

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

3.04 *Requirements of the Contract Documents*

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

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

3.05 *Reuse of Documents*

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

ARTICLE 4—COMMENCEMENT AND PROGRESS OF THE WORK

4.01 *Commencement of Contract Times; Notice to Proceed*

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

4.02 *Starting the Work*

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

4.03 *Reference Points*

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

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

4.04 *Progress Schedule*

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

4.05 *Delays in Contractor's Progress*

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

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

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

5.01 *Availability of Lands*

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

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

5.02 *Use of Site and Other Areas*

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

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

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

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

5.03 *Subsurface and Physical Conditions*

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

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

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

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

- D. *Limitations of Other Data and Documents:* Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto;
2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings;
3. the contents of other Site-related documents made available to Contractor, such as record drawings from other projects at or adjacent to the Site, or Owner's archival documents concerning the Site; or
4. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions, or information.

5.04 *Differing Subsurface or Physical Conditions*

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

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

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

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

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

5.05 *Underground Facilities*

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

3. verifying the actual location of those Underground Facilities shown or indicated in the Contract Documents as being within the area affected by the Work, by exposing such Underground Facilities during the course of construction;
 4. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and
 5. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.
- B. *Notice by Contractor:* If Contractor believes that an Underground Facility that is uncovered or revealed at the Site was not shown or indicated on the Drawings, or was not shown or indicated on the Drawings with reasonable accuracy, then Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing regarding such Underground Facility.
- C. *Engineer's Review:* Engineer will:
1. promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated on the Drawings, or was not shown or indicated with reasonable accuracy;
 2. identify and communicate with the owner of the Underground Facility; prepare recommendations to Owner (and if necessary issue any preliminary instructions to Contractor) regarding the Contractor's resumption of Work in connection with the Underground Facility in question;
 3. obtain any pertinent cost or schedule information from Contractor; determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Underground Facility; and
 4. advise Owner in writing of Engineer's findings, conclusions, and recommendations.

During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.

- D. *Owner's Statement to Contractor Regarding Underground Facility:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the Underground Facility in question addressing the resumption of Work in connection with such Underground Facility, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations in whole or in part.
- E. *Early Resumption of Work:* If at any time Engineer determines that Work in connection with the Underground Facility may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the Underground Facility in question and conditions affected by its presence have been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.
- F. *Possible Price and Times Adjustments*
1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, to the extent that any existing Underground Facility at the Site that was not shown

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

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

5.06 *Hazardous Environmental Conditions at Site*

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

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

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

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

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

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

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

ARTICLE 6—BONDS AND INSURANCE

6.01 *Performance, Payment, and Other Bonds*

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

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

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

6.02 *Insurance—General Provisions*

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

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

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

6.03 *Contractor's Insurance*

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

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

6.04 *Builder's Risk and Other Property Insurance*

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

6.05 *Property Losses; Subrogation*

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

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

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

6.06 *Receipt and Application of Property Insurance Proceeds*

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

ARTICLE 7—CONTRACTOR'S RESPONSIBILITIES

7.01 *Contractor's Means and Methods of Construction*

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

7.02 *Supervision and Superintendence*

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

7.03 *Labor; Working Hours*

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

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

7.04 *Services, Materials, and Equipment*

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

7.05 *"Or Equals"*

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

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

7.06 *Substitutes*

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

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

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

7.07 *Concerning Subcontractors and Suppliers*

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

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

7.08 *Patent Fees and Royalties*

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

7.09 *Permits*

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

7.10 *Taxes*

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

7.11 *Laws and Regulations*

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

7.12 *Record Documents*

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

7.13 *Safety and Protection*

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

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

7.14 *Hazard Communication Programs*

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

7.15 *Emergencies*

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

7.16 *Submittals*

A. *Shop Drawing and Sample Requirements*

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

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

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

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

D. Resubmittal Procedures for Shop Drawings and Samples

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

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

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

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

7.17 *Contractor's General Warranty and Guarantee*

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

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

7.18 *Indemnification*

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

7.19 *Delegation of Professional Design Services*

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

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

ARTICLE 8—OTHER WORK AT THE SITE

8.01 *Other Work*

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

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

8.02 *Coordination*

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

8.03 *Legal Relationships*

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

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

ARTICLE 9—OWNER'S RESPONSIBILITIES

9.01 *Communications to Contractor*

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

9.02 *Replacement of Engineer*

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

9.03 *Furnish Data*

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

9.04 *Pay When Due*

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

- 9.05 *Lands and Easements; Reports, Tests, and Drawings*
- A. Owner's duties with respect to providing lands and easements are set forth in Paragraph 5.01.
 - B. Owner's duties with respect to providing engineering surveys to establish reference points are set forth in Paragraph 4.03.
 - C. Article 5 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of conditions at the Site, and drawings of physical conditions relating to existing surface or subsurface structures at the Site.
- 9.06 *Insurance*
- A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 6.
- 9.07 *Change Orders*
- A. Owner's responsibilities with respect to Change Orders are set forth in Article 11.
- 9.08 *Inspections, Tests, and Approvals*
- A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 14.02.B.
- 9.09 *Limitations on Owner's Responsibilities*
- A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.
- 9.10 *Undisclosed Hazardous Environmental Condition*
- A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 5.06.
- 9.11 *Evidence of Financial Arrangements*
- A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract (including obligations under proposed changes in the Work).
- 9.12 *Safety Programs*
- A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed.
 - B. Owner shall furnish copies of any applicable Owner safety programs to Contractor.

ARTICLE 10—ENGINEER'S STATUS DURING CONSTRUCTION

10.01 *Owner's Representative*

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

10.02 *Visits to Site*

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

10.03 *Resident Project Representative*

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

10.04 *Engineer's Authority*

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

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

10.05 *Determinations for Unit Price Work*

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

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

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

10.07 *Limitations on Engineer's Authority and Responsibilities*

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

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

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

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

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

10.08 *Compliance with Safety Program*

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

ARTICLE 11—CHANGES TO THE CONTRACT

11.01 *Amending and Supplementing the Contract*

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

11.02 *Change Orders*

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

11.03 *Work Change Directives*

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

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

11.04 *Field Orders*

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

11.05 *Owner-Authorized Changes in the Work*

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

11.06 *Unauthorized Changes in the Work*

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

11.07 *Change of Contract Price*

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

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

11.08 *Change of Contract Times*

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

11.09 *Change Proposals*

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

B. *Change Proposal Procedures*

1. *Submittal:* Contractor shall submit each Change Proposal to Engineer within 30 days after the start of the event giving rise thereto, or after such initial decision.
2. *Supporting Data:* The Contractor shall submit supporting data, including the proposed change in Contract Price or Contract Time (if any), to the Engineer and Owner within 15 days after the submittal of the Change Proposal.
 - a. Change Proposals based on or related to delay, interruption, or interference must comply with the provisions of Paragraphs 4.05.D and 4.05.E.
 - b. Change proposals related to a change of Contract Price must include full and detailed accounts of materials incorporated into the Work and labor and equipment used for the subject Work.

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

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

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

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

11.10 *Notification to Surety*

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

ARTICLE 12—CLAIMS

12.01 *Claims*

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

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

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

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

13.01 *Cost of the Work*

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

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

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

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

c. *Construction Equipment Rental*

- 1) Rentals of all construction equipment and machinery, and the parts thereof, in accordance with rental agreements approved by Owner as to price (including any surcharge or special rates applicable to overtime use of the construction equipment or machinery), and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs will be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts must cease when the use thereof is no longer necessary for the Work.
- 2) Costs for equipment and machinery owned by Contractor or a Contractor-related entity will be paid at a rate shown for such equipment in the equipment rental rate book specified in the Supplementary Conditions. An hourly rate will be computed by dividing the monthly rates by 176. These computed rates will include all operating costs.
- 3) With respect to Work that is the result of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price ("changed Work"), included costs will be based on the time the equipment or machinery is in use on the changed Work and the costs of transportation, loading, unloading, assembly, dismantling, and removal when directly attributable to the changed Work. The cost of any such equipment or machinery, or parts thereof, must cease to accrue when the use thereof is no longer necessary for the changed Work.

- d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.
- e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.
- f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of builder's risk or other property insurance established in accordance with Paragraph 6.04), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses will be included in the Cost of the Work for the purpose of determining Contractor's fee.

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

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

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

D. *Contractor's Fee*

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

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

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

13.02 Allowances

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

13.03 Unit Price Work

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

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

E. *Adjustments in Unit Price*

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

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

14.01 *Access to Work*

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

14.02 *Tests, Inspections, and Approvals*

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

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

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

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

14.03 *Defective Work*

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

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

14.04 *Acceptance of Defective Work*

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

14.05 *Uncovering Work*

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

14.06 *Owner May Stop the Work*

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

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

14.07 Owner May Correct Defective Work

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

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

15.01 Progress Payments

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

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

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

C. *Review of Applications*

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

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

D. *Payment Becomes Due*

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

E. *Reductions in Payment by Owner*

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

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

15.02 *Contractor's Warranty of Title*

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

15.03 *Substantial Completion*

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

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

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

15.04 *Partial Use or Occupancy*

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

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

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

15.05 *Final Inspection*

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

15.06 *Final Payment*

A. *Application for Payment*

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

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

15.07 *Waiver of Claims*

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

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

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

15.08 *Correction Period*

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

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

ARTICLE 16—SUSPENSION OF WORK AND TERMINATION

16.01 *Owner May Suspend Work*

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

16.02 *Owner May Terminate for Cause*

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

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

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

16.03 *Owner May Terminate for Convenience*

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

16.04 *Contractor May Stop Work or Terminate*

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

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

ARTICLE 17—FINAL RESOLUTION OF DISPUTES

17.01 *Methods and Procedures*

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

ARTICLE 18—MISCELLANEOUS

18.01 *Giving Notice*

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

18.02 *Computation of Times*

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

18.03 *Cumulative Remedies*

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

18.04 *Limitation of Damages*

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

18.05 *No Waiver*

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

18.06 *Survival of Obligations*

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

18.07 *Controlling Law*

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

18.08 *Assignment of Contract*

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

18.09 *Successors and Assigns*

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

18.10 *Headings*

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

SUPPLEMENTARY CONDITIONS OF THE CONSTRUCTION CONTRACT

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SUPPLEMENTARY CONDITIONS OF THE CONSTRUCTION CONTRACT

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

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

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

ARTICLE 1—DEFINITIONS AND TERMINOLOGY

No Supplementary Conditions in this Article.

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. No provisions or requirements of the contract shall be construed as a waiver of any governmental or other immunity of the Owner, the Village of Hartsburg, Missouri, their officials or any of their employees in the course of their official duties.
- C. *Evidence of Owner's Insurance:* After receipt from Contractor of the signed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor copies of the policies of insurance to be provided by Owner in this Contract (if any). Owner may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision. No provisions or requirements of the Contract shall be construed as a waiver of any governmental or other immunity of the Owner, the Village of Hartsburg, Missouri, their officials or any of their employees in the course of their official duties.

ARTICLE 3—CONTRACT DOCUMENTS: INTENT, REQUIREMENTS, REUSE

No Supplementary Conditions in this Article.

ARTICLE 4—COMMENCEMENT AND PROGRESS OF THE WORK

4.05 *Delays in Contractor's Progress*

SC-4.05 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 as scheduled.
- 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 one half (0.5) inch of precipitation (as rain equivalent, based on the snow/rain conversion indicated in the table entitled Foreseeable Bad Weather Days; such table is hereby incorporated in this SC-4.05.C by reference.
 - ii) Ambient outdoor air temperature at 11:00 a.m. is equal to or less than the following low temperature threshold: 32 degrees Fahrenheit; or, at 3:00 p.m. the ambient outdoor temperature is equal to or greater than the following high temperature threshold: 100 degrees Fahrenheit.
 - iii. Columbia Public Schools announces on their website that school has been cancelled due to hazardous road conditions.
 - 2) Determination of actual bad weather days during performance of the Work will be based on the weather records measured and recorded by the National Weather Service weather monitoring station at the Columbia Regional Airport Station (KCOU).
 - 3) Contractor shall anticipate the number of foreseeable bad weather days per month indicated in the table in Exhibit A—Foreseeable Bad Weather Days.
 - 4) In each month, every bad weather day exceeding the number of foreseeable bad weather days established in the table in Exhibit A—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.

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

5.03 *Subsurface and Physical Conditions*

SC-5.03 Add the following new paragraphs immediately after Paragraph 5.03.D:

- E. The following table lists the reports of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data, and specifically identifies the Technical Data in the report upon which Contractor may rely:

Report Title	Date of Report	Technical Data
Geohydrologic Evaluation Report	August 11, 2025	Geohydrologic Data

- F. The following table lists the 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 specifically identifies the Technical Data upon which Contractor may rely:

Drawings Title	Date of Drawings	Technical Data
None		

5.06 *Hazardous Environmental Conditions*

SC-5.06 Add the following new paragraphs immediately after Paragraph 5.06.A.3:

- 4. The following table lists the reports known to Owner relating to Hazardous Environmental Conditions at or adjacent to the Site, and the Technical Data (if any) upon which Contractor may rely:

Report Title	Date of Report	Technical Data
None		

- 5. The following table lists the drawings known to Owner relating to Hazardous Environmental Conditions at or adjacent to the Site, and Technical Data (if any) contained in such Drawings upon which Contractor may rely: **[If there are no such drawings, so indicate in the table]**

Drawings Title	Date of Drawings	Technical Data
None		

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. *Performance Bond Form:* The performance bond that Contractor furnishes shall be in the form of EJCDC® C-610, Performance Bond (2010, 2013, or 2018 edition) or another form containing the same information and otherwise meeting all requirements herein.
2. *Required Payment Bond Form:* The payment bond that Contractor furnishes shall be in the form of EJCDC® C-615, Payment Bond (2010, 2013, or 2018 edition) or another form containing the same information and otherwise meeting all requirements herein.

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:
 1. The Village of Hartsburg, MO.
- 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	\$3,448,710.00
Bodily injury by disease—aggregate	\$3,448,710.00

Workers' Compensation and Related Policies	Policy limits of not less than:
Employer's Liability	
Each accident	\$3,448,710.00
Each employee	\$3,448,710.00
Policy limit	\$3,448,710.00
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:	\$3,448,710.00

- 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:
2. Personal injury coverage.
- 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	\$3,448,710.00
Products—Completed Operations Aggregate	\$3,448,710.00
Personal and Advertising Injury	\$3,448,710.00
Bodily Injury and Property Damage—Each Occurrence	\$3,448,710.00

- 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	\$3,448,710.00
Each Accident	\$3,448,710.00
Property Damage	
Each Accident	\$3,448,710.00
[or]	
Combined Single Limit	
Combined Single Limit (Bodily Injury and Property Damage)	\$3,448,710.00

- 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	\$0 to \$3,448,710.00
General Aggregate	\$0 to \$3,448,710.00

- 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. The combination of the Commercial General Liability limits and the Umbrella Liability shall meet or exceed \$3,448,710.00, cumulatively.
- 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	\$3,448,710.00
General Aggregate	\$3,448,710.00

- 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	\$3,448,710.00
Annual Aggregate	\$3,448,710.00

6.04 *Builder's Risk and Other Property Insurance*

SC-6.04 Delete Paragraph 6.04.A of the General Conditions and substitute the following in its place:

A. Installation Floater

1. Contractor shall provide and maintain installation floater insurance on a broad form or "all risk" policy providing coverage for materials, supplies, machinery, fixtures, and equipment that will be incorporated into the Work ("Covered Property"). Coverage under the Contractor's installation floater will include loss from covered "all risk" causes (perils) to Covered Property:
 - a. of the Contractor, and Covered Property of others that is in Contractor's care, custody, and control;
 - b. while in transit to the Site, including while at temporary storage sites;
 - c. while at the Site awaiting and during installation, erection, and testing;
 - d. continuing at least until the installation or erection of the Covered Property is completed, and the Work into which it is incorporated is accepted by Owner.
2. The installation floater coverage cannot be contingent on an external cause or risk, or limited to property for which the Contractor is legally liable.
3. The installation floater coverage will be in an amount sufficient to protect Contractor's interest in the Covered Property. The Contractor will be solely responsible for any deductible carried under this coverage.
4. This policy will include a waiver of subrogation applicable to Owner, Contractor, Engineer, all Subcontractors, and the officers, directors, partners, employees, agents and other consultants and subcontractors of any of them.

SC-6.04 Delete Paragraphs 6.04.B through D of the General Conditions in their entirety.

ARTICLE 7—CONTRACTOR’S RESPONSIBILITIES

7.03 Labor; Working Hours

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

- D. Contractor shall be responsible for the cost of any overtime pay or other expense incurred by the Owner for Engineer’s services (including those of the Resident Project Representative, if any), Owner’s representative, and construction observation services, occasioned by the performance of Work on Saturday, Sunday, any legal holiday, or as overtime on any regular work day. If Contractor is responsible but does not pay, or if the parties are unable to agree as to the amount owed, then Owner may impose a reasonable set-off against payments due under Article 15.

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 Missouri 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 supplies and materials to be incorporated into the Work.
 - 2. Owner’s exemption does not apply to construction tools, machinery, equipment, or other property purchased by or leased by Contractor, or to supplies or materials not incorporated into the Work.

ARTICLE 8—OTHER WORK AT THE SITE

No Supplementary Conditions in this Article.

ARTICLE 9—OWNER’S RESPONSIBILITIES

SC-9.13 Add the following new paragraph immediately after Paragraph 9.12 of the General Conditions:

9.13 Owner’s Site Representative

- A. Owner will furnish an “Owner’s Site Representative” to represent Owner at the Site and assist Owner in observing the progress and quality of the Work. The Owner’s Site Representative is not Engineer’s consultant, agent, or employee.

ARTICLE 10—ENGINEER’S STATUS DURING CONSTRUCTION

10.03 Resident Project Representative

SC-10.03 Add the following new subparagraph immediately after Paragraph 10.03.A:

1. On this Project, by agreement with the Owner, the Engineer will not furnish a Resident Project Representative to represent Engineer at the Site or assist Engineer in observing the progress and quality of the Work.

ARTICLE 11—CHANGES TO THE CONTRACT

No Supplementary Conditions in this Article.

ARTICLE 12—CLAIMS

No Supplementary Conditions in this Article.

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

No Supplementary Conditions in this Article.

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

No Supplementary Conditions in this Article.

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

15.01 Progress Payments

SC-15.01 Replace Paragraph 15.03.D of the General Conditions with the following Paragraph 15.03.D:

- D. *Payment Becomes Due:* Thirty (30) days after presentation of the Contractor's 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.

15.03 Substantial Completion

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

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

ARTICLE 16—SUSPENSION OF WORK AND TERMINATION

16.02 Owner May Terminate for Cause

SC-16.02 Supplement Paragraph 16.02 of the General Conditions with the following provisions:

- H. *Termination for Default*: The Owner may terminate or suspend this Contract, in whole or in part, upon ten (10) days advance written notice if: (1) the Contractor breaches any duty, obligation, or service required pursuant to this Contract. If the Contract is terminated by the Owner pursuant to Contract or this Appendix, the Contractor shall be liable for damages, including any additional costs of procuring similar goods or services from another source. If the termination results from acts or omissions of the Contractor, including but not limited to misappropriation or nonperformance of required goods, the Contractor shall return to the Owner immediately any funds, misappropriated or unexpended, that have been paid to the Contractor by the Owner.

16.03 *Owner May Terminate for Convenience*

SC-16.03 Supplement Paragraph 16.03 of the General Conditions with the following provisions:

- C. *Termination for Convenience*: The Contract may be terminated by the Owner without cause, in whole or in part, at any time during the term specified in the Contract, by providing the other party thirty (30) calendar days advance written notice of the termination. The Contract may be suspended by the Owner without cause, in whole or in part, at any time during the term specified in the Contract, by providing the Contractor thirty (30) calendar days advance written notice of the suspension.

SC-16.05 Add the following new paragraph immediately after Paragraph 16.04.

16.05 *Termination for Non-Appropriation*

- A. If expected or actual funding is withdrawn, reduced, or limited in any way prior to the termination date set forth in the Contract, the Owner may, upon ten (10) days advance written notice to the Contractor, terminate or suspend this Contract in whole or in part. If the Contract is terminated or suspended as provided in this Section: (1) the Owner will be liable only for payment in accordance with the terms of this Contract for goods delivered prior to the effective date of termination or suspension; and (2) the Contractor shall be released from any obligation to provide such further goods pursuant to the Contract as are affected by the termination or suspension.

SC-16.06 Add the following new paragraph immediately after Paragraph 16.05.

16.06 *Non-Waiver of Rights*

- A. Nothing herein shall limit, waive, or extinguish any right or remedy provided by this Contract or by law or equity that either party may have if any of the obligations, terms, and conditions set forth in this Contract are breached by the other party.

ARTICLE 17—FINAL RESOLUTIONS OF DISPUTES

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

17.02 *Attorneys' Fees*

- A. For any matter subject to final resolution under this Article, the prevailing party shall be entitled to an award of its attorneys' fees incurred in the final resolution proceedings, in an equitable amount to be determined in the discretion of the court, arbitrator, arbitration

panel, or other arbiter of the matter subject to final resolution, taking into account the parties' initial demand or defense positions in comparison with the final result.

ARTICLE 18—MISCELLANEOUS

SC-18 Add the following new paragraphs immediately after Paragraph 8.10 of the General Conditions:

18.11 *Equal Employment Opportunity*

- A. The Contractor hereby agrees that it will incorporate or cause to be incorporated into any contract for construction work, or modification thereof, as defined in the regulations of the Secretary of Labor at 41 CFR Chapter 60, which is paid for in whole or in part with funds obtained from the Federal Government or borrowed on the credit of the Federal Government pursuant to a grant, contract, loan, insurance, or guarantee, or undertaken pursuant to any Federal program involving such grant, contract, loan, insurance, or guarantee, the following equal opportunity clause:
- B. During the performance of this Contract, the Contractor agrees as follows:
 - 1. The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, gender identity, or national origin. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, sexual orientation, gender identity, or national origin. Such action shall include, but not be limited to the following: Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.
 - 2. The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, sexual orientation, gender identity, or national origin.
 - 3. The Contractor will not discharge or in any other manner discriminate against any employee or applicant for employment because such employee or applicant has inquired about, discussed, or disclosed the compensation of the employee or applicant or another employee or applicant. This provision shall not apply to instances in which an employee who has access to the compensation information of other employees or applicants as a part of such employee's essential job functions discloses the compensation of such other employees or applicants to individuals who do not otherwise have access to such information, unless such disclosure is in response to a formal complaint or charge, in furtherance of an investigation, proceeding, hearing, or action, including an investigation conducted by the employer, or is consistent with the contractor's legal duty to furnish information.
 - 4. The Contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice

to be provided advising the said labor union or workers' representatives of the contractor's commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

5. The Contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.
 6. The Contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the administering agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.
 7. In the event of the Contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated, or suspended in whole or in part and the contractor may be declared ineligible for further Government contracts or federally assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.
 8. The Contractor will include the portion of the sentence immediately preceding paragraph (1) and the provisions of paragraphs (1) through (8) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The Contractor will take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provisions, including sanctions for noncompliance: Provided, however, that in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the administering agency, the contractor may request the United States to enter into such litigation to protect the interests of the United States.
- C. The Contractor further agrees that it will be bound by the above equal opportunity clause with respect to its own employment practices when it participates in federally assisted construction work: Provided, that if the party so participating is a State or local government, the above equal opportunity clause is not applicable to any agency, instrumentality or subdivision of such government which does not participate in work on or under the contract.
 - D. The Contractor agrees that it will assist and cooperate actively with the administering agency and the Secretary of Labor in obtaining the compliance of contractors and subcontractors with the equal opportunity clause and the rules, regulations, and relevant orders of the Secretary of Labor, that it will furnish the administering agency and the Secretary of Labor such information as they may require for the supervision of such compliance, and that it will otherwise assist the administering agency in the discharge of the agency's primary responsibility for securing compliance.
 - E. The Contractor further agrees that it will refrain from entering into any contract or contract modification subject to Executive Order 11246 of September 24, 1965, with a contractor debarred from, or who has not demonstrated eligibility for, Government contracts and

federally assisted construction contracts pursuant to the Executive Order and will carry out such sanctions and penalties for violation of the equal opportunity clause as may be imposed upon contractors and sub-contractors by the administering agency or the Secretary of Labor pursuant to Part II, Subpart D of the Executive Order. In addition, the Contractor agrees that if it fails or refuses to comply with these undertakings, the administering agency may take any or all of the following actions: Cancel, terminate, or suspend in whole or in part this grant (contract, loan, insurance, guarantee); refrain from extending any further assistance to the applicant under the program with respect to which the failure or refund occurred until satisfactory assurance of future compliance has been received from such applicant; and refer the case to the Department of Justice for appropriate legal proceedings.

18.12 *Contract Work Hours and Safety Standards Act*

- A. Where applicable, all contracts in excess of \$100,000 that involve the employment of mechanics or laborers shall include a provision for compliance with 40 U.S.C 3702 and 3704 of the Contract Work Hours and Safety Standards Act, as supplemented by the Department of Labor regulations (29 CFR part 5). Under Section 3702 of the Act, each Contractor shall be required to compute the wages of every mechanic and laborer on the basis of a standard workweek of forty (40) hours. Work in excess of the standard workweek 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 forty (40) hours in the workweek. The requirements of 40 U.S.C. 3704 are applicable to construction work and provides that no laborer or mechanic shall 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.

18.13 *Rights to Inventions Made Under a Contract or Agreement*

- A. If a Contractor wishes to enter into a contract with a small business firm or nonprofit organization regarding the substitution of parties, assignment or performance of experimental, developmental, or research work under that "funding agreement," the recipient or subrecipient must comply with the requirements of 37 CFR Part 401.

18.14 *Clean Air Act & Federal Water Pollution Control Act*

- A. Where applicable, all contracts for the purchase of goods in excess of \$150,000, Contractor agrees to comply with all applicable standards, orders, and regulations issued pursuant to the Clean Air Act, as amended, 42 U.S.C. § 7401. Contractor agrees to comply with all applicable standards, orders, or regulations issued pursuant to the Federal Water Pollution Control Act, as amended, 33 U.S.C. 1251. Contractor agrees to report each violation of the Clean Air Act and the Water Pollution Control Act to Owner and understands that the Owner will, in turn, report each violation as required to assure notification to the Federal Emergency Management Agency, and the appropriate Environmental Protection Agency Regional Office. Contractor agrees to include these requirements in each subcontract exceeding \$150,000 financed in whole or in part with Federal assistance.

18.15 *Suspension and Debarment*

- A. If this Contract is a covered transaction for purposes of federally funded grant requirements, the Contractor is required to verify that none of the Contractor, its principals, as defined at 49 CFR 29.995, or affiliates, as defined at 49 CFR 29.905, are excluded or disqualified as

defined at 49 CFR 29.940 and 29.945. The Contractor is required to comply with 49 CFR 29, Subpart C and must include the requirement to comply with 49 CFR 29, Subpart C in any lower tier covered transaction it enters into. Debarment status may be verified at <https://www.sam.gov>. By signing and submitting this Contract, the Contractor certifies as follows:

- B. The certification in this clause is a material representation of fact relied upon by Owner. If it is later determined that the Contractor knowingly rendered an erroneous certification, in addition to remedies available to Owner, the Federal Government may pursue available remedies, including but not limited to suspension and/or debarment. The Contractor agrees to comply with the requirements of 49 CFR 29, Subpart C while performing this Contract and further agrees to include a provision requiring such compliance in its lower tier covered transactions.

18.16 *Byrd Anti-Lobbying Amendment*

- A. Contractor certifies 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 or a Member of Congress in connection with obtaining any Federal contract, grant, or any other award covered by 31 U.S.C. § 1352. Contractor shall 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 recipient who in turn will forward the certifications to the awarding agency.

18.17 *Procurement of Recovered Materials*

- A. Where applicable, within the performance of this Contract involving the use of materials, the Contractor shall make maximum use of products containing recovered materials that are EPA-designated items unless the product cannot be acquired. Contractor agrees to comply with all other applicable requirements of Section 6002 of the Solid Waste Disposal Act.

18.18 *Prohibition on Certain Telecommunications and Video Surveillance Services or Equipment*

- A. Contractor agrees to comply with all requirements of 2 CFR 200.216 regarding prohibition on certain telecommunications and video surveillance services or equipment. Contractor asserts that this Contract does not relate to such prohibited telecommunications and video surveillance services or equipment.

18.19 *Domestic Preference*

- A. Contractor should, to the greatest extent practicable under Federal award, provide a preference of the purchase, acquisition, or use of goods, products, or materials produced in the United States (including but not limited to iron, aluminum, steel, cement, and other manufactured products) pursuant with 2 CFR § 200.322. The requirements of this section must be included in all subawards including all contracts and purchase orders for work or products under this award.

18.20 *Compliance with Law:*

- A. Comply with all applicable local, state, and federal laws and regulations, regardless of whether laws are specifically reference in the Agreement.

18.21 *Prevailing Wage:*

- A. Contractor agrees to pay not less than the prevailing hourly rate of wages to all of its workers performing work for the public use or benefit or that uses public funds under this Agreement, or, alternatively, as applicable, the public works contracting minimum wage. The prevailing hourly rate of wages shall be those as set out in the Wage Order attached to and made part of the Contract. Each worker shall be paid the locally prevailing wage or public works contracting minimum wage, as applicable, pursuant §§290.210 – 290.340, RSMo and pursuant to each workers' scope of work and in accordance with the occupational titles and work descriptions set forth in state regulation.
- B. Contractor agrees to keep full and accurate records of the names, occupations and crafts of every worker employed by it in connection with the Agreement, together with an accurate record of the number of hours worked by each worker and the actual wages paid for a period of one year following completion of the Work. Contractor shall provide these records at the end of each month during the Project. Contractor shall post a legible list of prevailing wage rates in a prominent and easily accessible place at the work site for the full time that any worker is on the job. Upon completion of the Project and prior to final payment, Contractor agrees to complete and certify in an affidavit stating that the Contractor has fully complied with the Missouri Prevailing Wage law.
- C. Contractor agrees to be responsible for payment of any penalty to the Owner of One Hundred Dollars (\$100) per day (or portion of a day) for each worker that is paid less than the prevailing rate for any work performed under this Agreement by Contractor.

18.22 *Occupational Safety and Health Administration (OSHA) Training:*

- A. In accordance with Section 292.675, RSMo., the Contract and any subcontractor under such Contractor shall require all on-site employees to complete a ten-hour Occupational Safety and Health Administration (OSHA) construction safety program for their on-site employees which includes a course in construction safety and health approved by OSHA or a similar program approved by the Missouri Department of Labor and Industrial Relations which is at least as stringent as an approved OSHA program, unless such employees have previously completed the required program. All employees who have not previously completed the program are required to complete the program within sixty days of beginning work on such construction project, or such employees must hold documentation of prior completion of the program.
- B. Pursuant to Section 292.675 RSMo, if the Contractor fails to comply with the requirements of said section, the Contractor shall forfeit as a penalty to the Owner two thousand five hundred dollars (\$2,500.00) plus one hundred dollars (\$100.00) for each on-site employee employed by the Contractor or subcontractor, for each calendar day, or portion thereof, such on-site employee is employed without the required training
- C. Allegations of violation of the referenced section and imposition of the penalty described in this Section shall be investigated and determined by the Missouri Department of Labor and Industrial Relations. In the event that the Missouri Department of Labor and Industrial Relations has determined that a violation of Section 292.675 RSMo has occurred and that a penalty shall be assessed, the Owner shall withhold and retain all sums and amounts due and owing when making payments to Contractor under this contract.

- D. Affidavit for any Public Works Project Contract: Within 60 days of issuance of Notice to Proceed, Contractor shall provide an acceptable notarized affidavit stating that Contractor has verified the completion of a 10-hour construction safety program with respect to the employees working in connection with the contracted services.

18.23 *Employment of Unauthorized Aliens Prohibited:*

- A. Effective January 1, 2009, and pursuant to the State of Missouri's RSMO 285.530 (1), no business entity or employer shall knowingly employ, hire for employment, or continue to employ an unauthorized alien to perform work within the State of Missouri.
- B. RSMO 285.530 pertains to all solicitations for services over \$5,000 and does not apply to solicitations for goods, only. If a solicitation is for services and goods, RSMO 285.530 applies, if the services portion of the solicitation is over \$5,000.
- C. As a condition for the award of any contract or grant in excess of five thousand dollars (\$5,000) by the state or by any political subdivision of the state to a business entity:
 - 1. The business entity shall comply with the provisions of Section 285.525 through 285.550 RSMO.
 - 1. The business entity shall, by sworn affidavit and provision of documentation, affirm its enrollment and participation in a federal work authorization program with respect to the employees working in connection with the contracted services. Documentation may, for example, consist of the electronic signature page of the E-Verify program's Memorandum of Understanding (MOU).
 - 2. Every such business entity shall sign an affidavit affirming that it does not knowingly employ any person who is an unauthorized alien in connection with the contracted services. [RSMO 285.530 (2)]

18.24 *Anti-Discrimination Against Israel Act:*

- A. By signing the Agreement, Contractor certifies that it is in compliance with the Missouri Anti-Discrimination Against Israel Act and is not currently engaged in and shall not, for the duration of the Contract, engage in a boycott of goods or services from 1) the State of Israel; 2) companies doing business in or with Israel or authorized by, licensed by, or organized under the laws of the State of Israel; or 3) persons or entities doing business in the State of Israel.

EXHIBIT A—FORESEEABLE BAD WEATHER DAYS

Month	Number of Foreseeable Bad Weather Days in Month Based on Precipitation as Rain Equivalent (≥ 0.5 inches)	Ambient Outdoor Air Temperature (degrees F)	
		Number of Foreseeable Bad Weather Days in Month Based on Low Temperature ($\leq 32^{\circ}\text{F}$ at 11:00 a.m.)	Number of Foreseeable Bad Weather Days in Month Based on High Temperature ($\geq 100^{\circ}\text{F}$ at 3:00 p.m.)
January	1	12	0
February	1	10	0
March	3	2	0
April	4	0	0
May	4	0	0
June	4	0	0
July	3	0	1
August	2	0	2
September	2	0	1
October	2	0	0
November	2	3	0
December	2	10	0

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.

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

Owner: Boone County Regional Sewer District Owner's Project No.: 08-2025
Engineer: Lochmueller Group Engineer's Project No.: 524-1025-01W-Ph2
Contractor: Contractor's Project No.:
Project: Hartsburg WWTF - Treatment Upgrades
Contract Name: Treatment Upgrades
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:

Notes to User—Check one or both of the following

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:

CHANGE ORDER NO.: [Number of Change Order]

Owner: Boone County Regional Sewer District Owner's Project No.: 08-2025
 Engineer: Lochmueller Group Engineer's Project No.: 524-1025-01W-Ph2
 Contractor: Contractor's Project No.:
 Project: Hartsburg WWTF - Treatment Upgrades
 Contract Name: Hartsburg WWTF - Treatment Upgrades
 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)

Authorized by Owner

By: _____

Title: _____

Date: _____

Authorized by Owner

Approved by Funding Agency (if applicable)

By: _____

Title: _____

Date: _____

FIELD ORDER NO.: [Number of Field Order]

Owner: Boone County Regional Sewer District Owner's Project No.: 08-2025
Engineer: Lochmueller Group Engineer's Project No.: 524-1025-01W-Ph2
Contractor: Contractor's Project No.:
Project: Hartsburg WWTF - Treatment Upgrades
Contract Name: Hartsburg WWTF - Treatment Upgrades
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: _____

EXHIBIT
BUSINESS ENTITY CERTIFICATION, ENROLLMENT DOCUMENTATION,
AND AFFIDAVIT OF WORK AUTHORIZATION

BUSINESS ENTITY CERTIFICATION:

The bidder/contractor must certify their current business status by completing either Box A or Box B or Box C on this Exhibit.

- BOX A:** To be completed by a non-business entity as defined below.
- BOX B:** To be completed by a business entity who has not yet completed and submitted documentation pertaining to the federal work authorization program as described at http://www.dhs.gov/files/programs/gc_1185221678150.shtm.
- BOX C:** To be completed by a business entity who has current work authorization documentation on file with a Missouri state agency including Division of Purchasing and Materials Management.

Business entity, as defined in section 285.525, RSMo, pertaining to section 285.530, RSMo, is any person or group of persons performing or engaging in any activity, enterprise, profession, or occupation for gain, benefit, advantage, or livelihood. The term “**business entity**” shall include but not be limited to self-employed individuals, partnerships, corporations, contractors, and subcontractors. The term “**business entity**” shall include any business entity that possesses a business permit, license, or tax certificate issued by the state, any business entity that is exempt by law from obtaining such a business permit, and any business entity that is operating unlawfully without such a business permit. The term “**business entity**” shall not include a self-employed individual with no employees or entities utilizing the services of direct sellers as defined in subdivision (17) of subsection 12 of section 288.034, RSMo.

Note: Regarding governmental entities, business entity includes Missouri schools, Missouri universities (other than stated in Box C), out of state agencies, out of state schools, out of state universities, and political subdivisions. A business entity does not include Missouri state agencies and federal government entities.

BOX A – CURRENTLY NOT A BUSINESS ENTITY

I certify that _____ (Company/Individual Name) **DOES NOT CURRENTLY MEET** the definition of a business entity, as defined in section 285.525, RSMo pertaining to section 285.530, RSMo as stated above, because: (check the applicable business status that applies below)

- I am a self-employed individual with no employees; **OR**
- The company that I represent employs the services of direct sellers as defined in subdivision (17) of subsection 12 of section 288.034, RSMo.

I certify that I am not an alien unlawfully present in the United States and if _____ (Company/Individual Name) is awarded a contract for the services requested herein under _____ (Bid/SFS/Contract Number) and if the business status changes during the life of the contract to become a business entity as defined in section 285.525, RSMo, pertaining to section 285.530, RSMo, then, prior to the performance of any services as a business entity, _____ (Company/Individual Name) agrees to complete Box B, comply with the requirements stated in Box B and provide the _____ (insert agency name) with all documentation required in Box B of this exhibit.

Authorized Representative’s Name (Please Print)

Authorized Representative’s Signature

Company Name (if applicable)

Date

EXHIBIT __, continued

(Complete the following if you DO NOT have the E-Verify documentation and a current Affidavit of Work Authorization already on file with the State of Missouri. If completing Box B, do not complete Box C.)

BOX B – CURRENT BUSINESS ENTITY STATUS

I certify that _____ (Business Entity Name) **MEETS** the definition of a business entity as defined in section 285.525, RSMo, pertaining to section 285.530.

Authorized Business Entity Representative's
Name (Please Print)

Authorized Business Entity
Representative's Signature

Business Entity Name

Date

E-Mail Address

As a business entity, the bidder/contractor must perform/provide each of the following. The bidder/contractor should check each to verify completion/submission of all of the following:

- Enroll and participate in the E-Verify federal work authorization program (Website: <http://www.uscis.gov/e-verify>; Phone: 888-464-4218; Email: e-verify@dhs.gov) with respect to the employees hired after enrollment in the program who are proposed to work in connection with the services required herein; AND
- Provide documentation affirming said company's/individual's enrollment and participation in the E-Verify federal work authorization program. Documentation shall include EITHER the E-Verify Employment Eligibility Verification page listing the bidder's/contractor's name and company ID OR a page from the E-Verify Memorandum of Understanding (MOU) listing the bidder's/contractor's name and the MOU signature page completed and signed, at minimum, by the bidder/contractor and the Department of Homeland Security – Verification Division. If the signature page of the MOU lists the bidder's/contractor's name and company ID, then no additional pages of the MOU must be submitted; AND
- Submit a completed, notarized Affidavit of Work Authorization provided on the next page of this Exhibit.

AFFIDAVIT OF WORK AUTHORIZATION:

The bidder/contractor who meets the section 285.525, RSMo, definition of a business entity must complete and return the following Affidavit of Work Authorization.

Comes now _____ (Name of Business Entity Authorized Representative) as _____ (Position/Title) first being duly sworn on my oath, affirm _____ (Business Entity Name) is enrolled and will continue to participate in the E-Verify federal work authorization program with respect to employees hired after enrollment in the program who are proposed to work in connection with the services related to contract(s) with the State of Missouri for the duration of the contract(s), if awarded in accordance with subsection 2 of section 285.530, RSMo. I also affirm that _____ (Business Entity Name) does not and will not knowingly employ a person who is an unauthorized alien in connection with the contracted services provided under the contract(s) for the duration of the contract(s), if awarded.

In Affirmation thereof, the facts stated above are true and correct. (The undersigned understands that false statements made in this filing are subject to the penalties provided under section 575.040, RSMo.)

_____	_____
Authorized Representative's Signature	Printed Name
_____	_____
Title	Date
_____	_____
E-Mail Address	E-Verify Company ID Number

Subscribed and sworn to before me this _____ of _____. I am
(DAY) (MONTH, YEAR)
commissioned as a notary public within the County of _____, State of
(NAME OF COUNTY)
_____, and my commission expires on _____.
(NAME OF STATE) (DATE)

Signature of Notary Date

(Complete the following if you have the E-Verify documentation and a current Affidavit of Work Authorization already on file with the State of Missouri. If completing Box C, do not complete Box B.)

BOX C – AFFIDAVIT ON FILE - CURRENT BUSINESS ENTITY STATUS

I certify that _____ (Business Entity Name) **MEETS** the definition of a business entity as defined in section 285.525, RSMo, pertaining to section 285.530, RSMo, and have enrolled and currently participates in the E-Verify federal work authorization program with respect to the employees hired after enrollment in the program who are proposed to work in connection with the services related to contract(s) with the State of Missouri. We have previously provided documentation to a Missouri state agency or public university that affirms enrollment and participation in the E-Verify federal work authorization program. The documentation that was previously provided included the following.

- ✓ The E-Verify Employment Eligibility Verification page OR a page from the E-Verify Memorandum of Understanding (MOU) listing the bidder’s/contractor’s name and the MOU signature page completed and signed by the bidder/contractor and the Department of Homeland Security – Verification Division
- ✓ A current, notarized Affidavit of Work Authorization (must be completed, signed, and notarized within the past twelve months).

Name of **Missouri State Agency** or **Public University*** to Which Previous E-Verify Documentation Submitted: _____

(*Public University includes the following five schools under chapter 34, RSMo: Harris-Stowe State University – St. Louis; Missouri Southern State University – Joplin; Missouri Western State University – St. Joseph; Northwest Missouri State University – Maryville; Southeast Missouri State University – Cape Girardeau.)

Date of Previous E-Verify Documentation Submission: _____

Previous **Bid/Contract Number** for Which Previous E-Verify Documentation Submitted: _____

(if known)

Authorized Business Entity Representative’s Name (Please Print)

Authorized Business Entity Representative’s Signature

E-Verify MOU Company ID Number

E-Mail Address

Business Entity Name

Date

FOR STATE USE ONLY

Documentation Verification Completed By:

Buyer

Date



Certification Regarding Debarment and Suspension

Applicant Name: _____

Project Name: _____

Project No.: _____ SAM.gov UEI No.: _____

The prospective participant certifies to the best of its knowledge and belief that it and its principals:

- a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any governmental (federal, state, or local) entity;
- b) Have not within a three-year period preceding this certification been convicted of or had a civil judgment rendered against them for:
 - 1) Commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (federal, state, or local) transaction or contract under a public transaction;
 - 2) Violation of federal or state antitrust statutes relating to the submission of offers; or
 - 3) Commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
- c) Are not presently indicted for, or otherwise criminally or civilly charged by a governmental entity (federal, state, or local) with, commission of any of the offenses enumerated in paragraph (1)(b) of this certification; and
- d) Have not, within a three-year period preceding this certification, had one or more public transactions (federal, state, or local) terminated for cause or default.

I understand that a false statement on this certification may be grounds for rejection of this proposal or termination of the award.

I am able to certify to the above statements.

I am unable to certify to the above statements and attached my explanation.

Typed Name of Authorized Representative

Title of Authorized Representative

Signature of Authorized Representative

Date



MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF ENVIRONMENTAL QUALITY
FINANCIAL ASSISTANCE CENTER

Certification Regarding Debarment and Suspension Instructions

The Missouri Department of Natural Resources receives assistance from the federal government, and the funds provided to a community constitute a sub-agreement. Accordingly, each prospective recipient of a grant, loan, or cooperative agreement and any contractor or subcontractor must agree to fully comply with Executive Order 12549, 2 C.F.R. Part 180, and 2 C.F.R. Part 1532 regarding Debarment and Suspension.

“Principals,” for the purposes of this certification, means officers; directors; owners; partners; and persons having primary management or supervisory responsibilities within an entity (e.g., general manager; plant manager; head of a subsidiary, division, or business segment, and similar positions).

The prospective grant, loan, or cooperative agreement recipient should return the signed certification, and explanation if needed, with its application to:

Missouri Department of Natural Resources
Financial Assistance Center
PO Box 176
Jefferson City, MO 65102-0176

Or email to fac@dnr.mo.gov.

The recipient of funding should also obtain a certification from their consulting engineer and prime contractor. The funding recipient shall also check the status on the System for Award Management (SAM) located on the Internet at <https://www.sam.gov/portal/public/SAM/>.

Each prospective subcontractor should submit a completed certification or explanation to the prime contractor for the project.



EPA Project Control Number

CERTIFICATION REGARDING LOBBYING

CERTIFICATION FOR CONTRACTS, GRANTS, LOANS AND COOPERATIVE AGREEMENTS

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, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(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 in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all sub-awards at all tiers (including sub-contracts, sub-grants, and contracts under grants, loans, and cooperative agreements) and that all sub-recipients 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.

Typed Name & Title of Authorized Representative

Signature and Date of Authorized Representative

The public reporting and recordkeeping burden for this collection of information is estimated to average 15 minutes per response. Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques to the Director, Collection Strategies Division, U.S. Environmental Protection Agency (2822T), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460. Include the OMB control number in any correspondence. Do not send the completed form to this address.

Disclosure of Lobbying Activities

Complete this form to disclose lobbying activities pursuant to 31 U.S.C. 1352
(See reverse for public burden disclosure)

1. Type of Federal Action: a. contract _____ b. grant c. cooperative agreement d. loan e. loan guarantee f. loan insurance	2. Status of Federal Action: a. bid/offer/application _____ b. initial award c. post-award	3. Report Type: a. initial filing _____ b. material change For material change only: Year _____ quarter _____ Date of last report _____
4. Name and Address of Reporting Entity: _____ Prime _____ Subawardee _____ Tier _____, if Known: Congressional District, if known:	5. If Reporting Entity in No. 4 is Subawardee, Enter Name and Address of Prime: Congressional District, if known:	
6. Federal Department/Agency:	7. Federal Program Name/Description: CFDA Number, if applicable: _____	
8. Federal Action Number, if known:	9. Award Amount, if known: \$	
10. a. Name and Address of Lobbying Registrant <i>(if individual, last name, first name, MI):</i>	b. Individuals Performing Services <i>(including address if different from No. 10a)</i> <i>(last name, first name, MI):</i>	
11. Information requested through this form is authorized by title 31 U.S.C. section 1352. This disclosure of lobbying activities is a material representation of fact upon which reliance was placed by the tier above when this transaction was made or entered into. This disclosure is required pursuant to 31 U.S.C. 1352. This information will be reported to the Congress semi-annually and will be available for public inspection. Any person who fails to file the required disclosure shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.	Signature: _____ Print Name: _____ Title: _____ Telephone No.: _____ Date: _____	
Federal Use Only	Authorized for Local Reproduction Standard Form - LLL (Rev. 7-97)	

INSTRUCTIONS FOR COMPLETION OF SF-LLL, DISCLOSURE OF LOBBYING ACTIVITIES

This disclosure form shall be completed by the reporting entity, whether subawardee or prime Federal recipient, at the initiation or receipt of a covered Federal action, or a material change to a previous filing, pursuant to title 31 U.S.C. section 1352. The filing of a form is required for each payment or agreement to make payment to any lobbying entity 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 a covered Federal action. Complete all items that apply for both the initial filing and material change report. Refer to the implementing guidance published by the Office of Management and Budget for additional information.

1. Identify the type of covered Federal action for which lobbying activity is and/or has been secured to influence the outcome of a covered Federal action.
2. Identify the status of the covered Federal action.
3. Identify the appropriate classification of this report. If this is a followup report caused by a material change to the information previously reported, enter the year and quarter in which the change occurred. Enter the date of the last previously submitted report by this reporting entity for this covered Federal action.
4. Enter the full name, address, city, State and zip code of the reporting entity. Include Congressional District, if known. Check the appropriate classification of the reporting entity that designates if it is, or expects to be, a prime or subaward recipient. Identify the tier of the subawardee, e.g., the first subawardee of the prime is the 1st tier. Subawards include but are not limited to subcontracts, subgrants and contract awards under grants.
5. If the organization filing the report in item 4 checks "Subawardee," then enter the full name, address, city, State and zip code of the prime Federal recipient. Include Congressional District, if known.
6. Enter the name of the federal agency making the award or loan commitment. Include at least one organizational level below agency name, if known. For example, Department of Transportation, United States Coast Guard.
7. Enter the Federal program name or description for the covered Federal action (item 1). If known, enter the full Catalog of Federal Domestic Assistance (CFDA) number for grants, cooperative agreements, loans, and loan commitments.
8. Enter the most appropriate Federal identifying number available for the Federal action identified in item 1 (e.g., Request for Proposal (RFP) number; Invitations for Bid (IFB) number; grant announcement number; the contract, grant, or loan award number; the application/proposal control number assigned by the Federal agency). Included prefixes, e.g., "RFP-DE-90-001."
9. For a covered Federal action where there has been an award or loan commitment by the Federal agency, enter the Federal amount of the award/loan commitment for the prime entity identified in item 4 or 5.
10. (a) Enter the full name, address, city, State and zip code of the lobbying registrant under the Lobbying Disclosure Act of 1995 engaged by the reporting entity identified in item 4 to influence the covered Federal action.

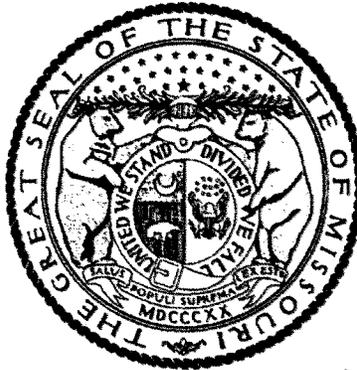
(b) Enter the full names of the individual(s) performing services, and include full address if different from 10(a). Enter Last Name, First Name, and Middle Initial (MI).
11. The certifying official shall sign and date the form, print his/her name, title, and telephone number.

According to the Paperwork Reduction Act, as amended, no persons are 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 OMB No. 0348-0046. Public reporting burden for this collection of information is estimated to average 10 minutes per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the Office of Management and Budget, Paperwork Reduction Project (0348-0046), Washington, DC 20503

Missouri

Division of Labor Standards

WAGE AND HOUR SECTION



MIKE KEHOE, Governor

Annual Wage Order No. 32

Section 010
BOONE COUNTY

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

Original Signed by

Logan Hobbs, Director
Division of Labor Standards

Filed With Secretary of State: _____ **March 10, 2025**

Last Date Objections May Be Filed: **April 9, 2025**

Prepared by Missouri Department of Labor and Industrial Relations

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Asbestos Worker	\$61.64
Boilermaker	\$34.21*
Bricklayer-Stone Mason	\$57.33
Carpenter	\$54.00
Lather	
Linoleum Layer	
Millwright	
Pile Driver	
Cement Mason	\$47.94
Plasterer	
Communication Technician	\$60.91
Electrician (Inside Wireman)	\$60.73
Electrician Outside Lineman	\$83.75
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Elevator Constructor	\$34.21*
Glazier	\$57.72
Ironworker	\$72.58
Laborer	\$45.36
General Laborer	
First Semi-Skilled	
Second Semi-Skilled	
Mason	\$63.31
Marble Mason	
Marble Finisher	
Terrazzo Worker	
Terrazzo Finisher	
Tile Setter	
Tile Finisher	
Operating Engineer	\$67.29
Group I	
Group II	
Group III	
Group III-A	
Group IV	
Group V	
Painter	\$43.55
Plumber	\$72.49
Pipe Fitter	
Roofer	\$56.44
Sheet Metal Worker	\$58.82
Sprinkler Fitter	\$69.16
Truck Driver	\$34.21*
Truck Control Service Driver	
Group I	
Group II	
Group III	
Group IV	

*The Division of Labor Standards received fewer than 1,000 reportable hours for this occupational title. The public works contracting minimum wage is established for this occupational title using data provided by Missouri Economic Research and Information Center.

**The Prevailing Hourly Rate includes any applicable fringe benefit amounts for each occupational title as defined in RSMo Section 290.210.

Heavy Construction Rates for
BOONE County

Section 010

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Carpenter	\$67.38
Millwright	
Pile Driver	
Electrician (Outside Lineman)	\$83.75
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Laborer	\$53.59
General Laborer	
Skilled Laborer	
Operating Engineer	\$69.61
Group I	
Group II	
Group III	
Group IV	
Truck Driver	\$34.21*
Truck Control Service Driver	
Group I	
Group II	
Group III	
Group IV	

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

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

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

*The Division of Labor Standards received fewer than 1,000 reportable hours for this occupational title. Public works contracting minimum wage is established for this occupational title using data provided by Missouri Economic Research and Information Center.

**The Prevailing Hourly Rate includes any applicable fringe benefit amounts for each occupational title.

OVERTIME and HOLIDAYS

OVERTIME

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

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

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

HOLIDAYS

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

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



**DIVISION OF
LABOR
STANDARDS**

MISSOURI DEPARTMENT OF LABOR AND INDUSTRIAL RELATIONS

**PREVAILING WAGE
PROJECT NOTIFICATION –
CONTRACTOR INFORMATION**

New Update

The information below is requested pursuant to Sections 290.210 through 290.340, RSMo.

1. Date of Notification		2. Annual Wage Order Number Included in Bid Specifications	
3. Popular or Descriptive Name of Project			
4. Estimated Project Cost of Completion <i>(total construction contracts to be awarded)</i>		S	
5. Exact Location of Project <u>County</u>		<u>City</u>	
6. Official Name of Public Body or Agency			
7. Name of Contact Person		8. Phone Number <i>(include area code)</i>	
9. Address			
10. Email Address		Website	
11. Contract Award Date	12. Estimated Date of Project Completion	13. Will There Be Any Federal Funds Used in this Contract? <input type="checkbox"/> Yes <input type="checkbox"/> No	

14. Contractor Information Notification

General Contractor: Name _____
 Address _____
 City _____ State _____ ZIP _____
 Phone Number _____ Email Address _____
 Type of Craftsmen Needed by Project _____
 Scope of Work _____

List all Subcontractors: 1. Name _____
 Address _____
 City _____ State _____ ZIP _____
 Phone Number _____ Email Address _____
 Type of Craftsmen Needed by Project _____
 Scope of Work _____

2. Name _____
 Address _____
 City _____ State _____ ZIP _____
 Phone Number _____ Email Address _____
 Type of Craftsmen Needed by Project _____
 Scope of Work _____

3. Name _____
 Address _____
 City _____ State _____ ZIP _____
 Phone Number _____ Email Address _____
 Type of Craftsmen Needed by Project _____
 Scope of Work _____

(Subcontractors continued)

4. Name _____
Address _____
City _____ State _____ ZIP _____
Phone Number _____ Email Address _____
Type of Craftsmen Needed by Project _____
Scope of Work _____

5. Name _____
Address _____
City _____ State _____ ZIP _____
Phone Number _____ Email Address _____
Type of Craftsmen Needed by Project _____
Scope of Work _____

6. Name _____
Address _____
City _____ State _____ ZIP _____
Phone Number _____ Email Address _____
Type of Craftsmen Needed by Project _____
Scope of Work _____

7. Name _____
Address _____
City _____ State _____ ZIP _____
Phone Number _____ Email Address _____
Type of Craftsmen Needed by Project _____
Scope of Work _____

8. Name _____
Address _____
City _____ State _____ ZIP _____
Phone Number _____ Email Address _____
Type of Craftsmen Needed by Project _____
Scope of Work _____

9. Name _____
Address _____
City _____ State _____ ZIP _____
Phone Number _____ Email Address _____
Type of Craftsmen Needed by Project _____
Scope of Work _____

The state of Missouri requires workers on public works projects be paid the prevailing wage. Public bodies have duties as required under Section 290.210 - 290.340, RSMo.

Mail, Fax, or Email completed form to: **DIVISION OF LABOR STANDARDS**
Attn: Prevailing Wage Section
P.O. Box 449, Jefferson City, MO 65102-0449
Phone: 573-751-3403 Fax: 573-751-3721
Email: prevailingwage@labor.mo.gov
Website: www.labor.mo.gov/DLS



*Missouri Department of Labor and Industrial Relations is an equal opportunity employer/program.
TDD/TTY: 800-735-2966 Relay Missouri: 711*

Statement of Compliance
(To be submitted weekly by grant / loan recipient)

City of

Project Number :

I hereby certify the following:

The payroll for the payroll period contains the information required to be provided under § 5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under § 5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete; and the project is in compliance with the requirements of 29 CFR 5.5(a) (1) based upon the most recent payroll copies.

Contractor's Name

Payroll Week Ending Date

Signature of Authorized Representative

Date

Title

SECTION 00 95 01
PROJECT EXEMPTION CERTIFICATE

Per paragraph 7.10 of the Supplementary Conditions, Owner is exempt from payment of sales and compensating use taxes of the State of Missouri and of cities and counties thereof on all materials to be incorporated into the Work.

The Owner will furnish the completed Project Exemption certificate to Contractor for use in the purchase of supplies and materials to be incorporated into the Work upon execution of the Contract between Owner and Contractor.

The attached blank Missouri Department of Revenue Form 5060 (Revised 11-2019) is available at <https://dor.mo.gov/forms/5060.pdf>.



This form is to be completed and given to your contractor.

Exempt Entity and Project Information	Name of Exempt Entity Issuing the Certificate		Missouri Tax Exemption Number			
	Address		City		State	ZIP Code
	E-mail Address					
	Project Number	Project Begin Date (MM/DD/YYYY) ____/____/____	Estimated Project End Date (MM/DD/YYYY) ____/____/____			
	Description of Project					
	Project Location			Certificate Expiration Date (MM/DD/YYYY) ____/____/____		
	Provide a signed copy of this certificate, along with a copy of the exempt entity's Missouri Sales and Use Tax Exemption Letter to each contractor or subcontractor who will be purchasing tangible personal property for use in this project. It is the responsibility of the exempt entity to ensure the validity of the information on the certificate. The exempt entity must issue a new certificate if any of the information changes.					
Signature of Authorized Exempt Entity		Printed Name of Authorized Exempt Entity		Date (MM/DD/YYYY) ____/____/____		

Contractor	The Missouri exempt entity named above hereby authorizes the purchase, without sales tax, of tangible personal property to be incorporated or consumed in the construction project identified herein and no other, pursuant to Section 144.062, RSMo . Under penalties of perjury, I declare that the above information and any attached supplement is true, complete, and correct.					
	Name of Purchasing Contractor		Signature of Contractor		Date (MM/DD/YYYY) ____/____/____	
	Address		City		State	ZIP Code

Subcontractor	Contractors - Present this to your supplier in order to purchase the necessary materials tax exempt. Complete the Subcontractor portion if extending the certificate to your subcontractor. The contractor must sign the form in the space provided below.					
	Name of Purchasing Subcontractor					
	Address		City		State	ZIP Code
	Signature of Contractor		Contractor's Printed Name		Date (MM/DD/YYYY) ____/____/____	

Form 5060 (Revised 11-2019)

Taxation Division
P.O Box 358
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TECHNICAL SPECIFICATIONS

SECTION 01 10 00
SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Project information
2. Contract description
3. Notice to Proceed
4. Contractor's use of Site
5. Work restrictions
6. Permits
7. Specification conventions

B. Related Requirements:

1. Section 01 20 00 - Price and Payment Procedures
2. Section 01 30 00 - Administrative Requirements
3. Section 01 50 00 - Temporary Facilities and Controls
4. Section 01 70 00 - Execution and Closeout Requirements

C. Project Information:

1. Project Name: Hartsburg WWTF - Treatment Upgrades.
2. Project Location: 0.5 miles SE of 2nd Street and Katy Trail Intersection, Hartsburg, MO.
3. Continuing Authority of Wastewater Treatment Facility: Village of Hartsburg, MO.
4. Owner's Representative: Boone County Regional Sewer District (BCRSD).
5. Project Engineer: Lochmueller Group.

1.2 CONTRACT DESCRIPTION

A. The Project includes replacement of the aeration system for the Village of Hartsburg 2-cell wastewater lagoon and addition of an aerated gravel filter system. The project is split as follows:

1. The Base Bid consists of procurement of the aerated gravel filter and aeration equipment.
2. Alternate 1 consists of installation of the aerated gravel filter and aeration equipment.
3. Alternate 2 consists of partial site fencing.
4. Alternate 3 consists of replacement of the outfall pipe, addition of a flow meter and repair of two broken valve boxes.

B. One single contractor shall assume overall responsibility for the Work and perform Work according to the price, conditions and Milestones laid out in the Agreement Between Owner and Contractor.

C. Contract Documents: Advertisement for Bids, Instructions to Bidders, General Conditions, Supplemental Conditions, Contract Drawings, Contract Technical Specifications and

Addenda describe the work to be performed for this Project. Related provisions of this Project include, but are not necessarily limited to the following:

1. Become familiar with existing site conditions and restrictions.
2. Coordinate work of all Subcontractors and material suppliers under this Contract.
3. Testing of all materials and installations.
4. Requirements of the Project Owner.
5. Requirements of the owners of utilities, facilities and/or land impacted by the Contract work.
6. It is recognized that Contract work is unavoidably affected or influenced by governing regulations, natural phenomenon including weather conditions, work of other Contractors, and other forces outside the Contract Documents.

1.3 NOTICE TO PROCEED

1. The Contractor shall not commence Work until proper execution of the Contract and written authorization to proceed has been issued by the Owner. Proper execution of the Contract shall include the submittal of all required surety bonds and insurance certificates

1.4 CONTRACTOR'S USE OF SITE

- A. Restricted Use of Site: Contractor shall have limited use of Project Site to perform the Work under this Contract. Use is limited by the need to facilitate Owner's operations of the treatment system at all times.
 1. Driveways and Entrances: Keep driveways and entrances serving premises clear and available to Owner's employees and representatives as needed. Do not use these areas for parking or for storage of materials.
 2. Schedule deliveries to minimize use of driveways and entrances by construction operations and to minimize space and time requirements for storage of materials and equipment on Site
 3. Schedule construction activities with Owner to minimize disruptions.
- B. Utility Usage: Coordinate and schedule electrical usage and outages with Owner.
- C. Construction Plan: Before start of construction, submit an electronic file in PDF format of construction plan regarding access to Work, use of Site, scheduling and utility outages for acceptance by Owner. After acceptance of plan, construction operations shall comply with accepted plan unless deviations are accepted by Owner in writing.
- D. General: The Contractor must be satisfied by personal examination of the Site as to all local conditions affecting the performance of the Contract. The Contractor is deemed to accept such conditions as found to exist.
- E. All Contractor activities shall be confined within the Site property or construction easements, as shown on the drawings.

F. Existing Underground Facilities:

1. Existing underground utilities, as shown on the Drawings, are located in accordance with available data but locations shall be determined by the Contractor as the Work proceeds. Excavation work shall be done carefully so as to avoid damaging the existing utilities.
2. The Contractor shall provide protection, temporary removal and replacement, or relocation of said obstruction as required for the performance of his Work required in these Contract Documents. No extra payment will be made for this Work.
3. Other obstructions not shown on the Drawings and requiring relocation shall be exposed by the Contractor without injury, or if injured, shall be repaired by the Contractor at the Contractor's expense. Removal of such obstruction or its relocation shall be made by the Contractor according to the provisions of the General Conditions, Article 10 – Changes in the Work.

G. Existing Facilities:

1. The Contractor shall take complete field measurements affecting all existing construction, wiring, piping and equipment in this Contract and shall be solely responsible for proper fit between the Work and existing structures and other equipment. The Contractor shall examine all Work to which connection will be made and if any misalignment is found, shall so arrange the Work that the misalignment is corrected to the satisfaction of the Engineer.
2. Dimensions given on the Drawings related to the existing structures are based on existing construction Drawings and it shall be the responsibility of the Contractor to verify the accuracy of these dimensions as they affect the Work under this Contract. Any discrepancies shall be brought to the attention of the Engineer prior to start of the Work.
3. The Contractor will be held responsible for any damage to existing structures, work, materials or equipment, whether shown on the reference drawings or not, because of Contractor's operations and shall repair or replace any damaged structures, work, materials or equipment to the satisfaction of and at no additional cost to the Owner.
4. The Contractor shall be responsible for all damage to trails, streets, roads, shoulders, ditches, embankments, culverts, bridges, or other public or private property, which may be caused by transporting equipment, materials, or workers to or from Work. The Contractor shall make satisfactory and acceptable arrangements with the agency having jurisdiction over the damaged property concerning its repair or replacement.

H. Unfavorable Construction Conditions:

1. During unfavorable weather, wet ground, or other unsuitable construction conditions, the Contractor shall confine operations to work which will not be affected adversely thereby. No portion of the Work shall be constructed under conditions which would affect adversely the quality or efficiency thereof, unless special means or precautions are taken by the Contractor to perform the Work in a proper and satisfactory manner. No additional time will be granted to the contract for "unfavorable construction conditions".

I. Preservation of Monuments and Stakes:

1. The Contractor shall carefully preserve all monuments, benchmarks, reference points and stakes. In case of monument destruction thereof by the Contractor, the Contractor will be charged with the expense of replacement and shall be responsible for any mistake or loss of time that may be caused. Permanent monuments or benchmarks, which must be removed or disturbed, shall be protected until properly referenced for relocation. The Contractor

shall furnish materials and assistance for the proper replacement of such monuments or benchmarks.

J. Methods of Operation:

1. The Contractor shall inform the Engineer in advance of the method to perform the Work, but the Contractor alone shall be responsible for the safety, adequacy and efficiency of Contractor's plan, equipment and methods.
2. Any method of Work suggested by the Owner or Engineer, but not specified, shall be used at the risk and responsibility of the Contractor, and the Engineer and Owner will assume no responsibility thereof.
3. Review by the Owner or Engineer of any plan or method of Work proposed by the Contractor shall not relieve the Contractor of any responsibility therefore, and such review shall not be considered as an assumption of any risk or liability by the Owner or Engineer, or any officer, agent or employee thereof. The Contractor shall have no claim on account of the failure or inefficiency of any plan or method so reviewed.

1.5 WORK RESTRICTIONS

- A. Comply with restrictions on construction operations on public trails, streets, rights-of-way, and other requirements of authorities having jurisdiction (AHJ).
- B. On-Site Work Hours: Limit Work to between 7:00 a.m. to 7:00 p.m., Monday through Friday, unless otherwise indicated. Work hours may be modified to meet Project requirements if approved by Owner.

1.6 PERMITS

- A. Furnish all necessary permits for construction of Work.
- B. The Work of the Contractor shall not cause of violations of the facilities Missouri State Operating Permit in effect at the time of the Agreement.

1.7 SPECIFICATION CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
- B. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
 1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.

2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings.
3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION 01 10 00

SECTION 01 20 00
PRICE AND PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Testing and inspection.
- B. Application for Payment.
- C. Change procedures.
- D. Defect assessment.
- E. Unit prices.
- F. Alternates.

1.2 TESTING AND INSPECTION

- A. Costs included in Testing and Inspecting are included in the respective Bid Item Contract Price.
 - 1. Execution of tests and inspecting.
 - 2. Reporting results.
 - 3. Costs of incidental labor and facilities required to assist testing or inspecting entity.
 - 4. Costs of testing services used by Contractor separate from Contract Document requirements.
 - 5. Costs of retesting upon failure of previous tests as determined by Engineer.

1.3 APPLICATION FOR PAYMENT

- A. Submit electronic file of each Application for Payment to Owner and Engineer via email on EJCDC C-620 (Contractor's Application for Payment) or Contractor's standard form containing at least the same information.
- B. Content and Format: Use certification page, Unit Price Work Progress Estimate and Stored Materials Summary, as appropriate, for listing items in Application for Payment.
- C. Revise form to list approved Change Orders with each Application for Payment.
- D. Submit updated construction schedule with each Application for Payment.
- E. Payment Period: Submit at intervals stipulated in the Agreement.
- F. Submit submittals with transmittal letter as specified in Section 013300 - Submittal Procedures.

1.4 CHANGE PROCEDURES

- A. Submit name of individual who is authorized to receive change documents and is responsible for informing others in Contractor's employ or Subcontractors of changes to the Work.
- B. Carefully study and compare Contract Documents before proceeding with fabrication and installation of Work. Promptly advise Engineer of any error, inconsistency, omission, or apparent discrepancy.
- C. Requests for Interpretation (RFI) and Clarifications: Allot time in scheduling for liaison with Engineer; establish procedures for handling queries and clarifications.
 - 1. Use Contractor's Standard Form for requesting interpretations.
 - 2. Engineer may respond with a direct answer on the Request for Interpretation form, a Field Order, or Proposal Request.
- D. Engineer may advise of minor changes in the Work not involving adjustment to Contract Price or Contract Time by issuing supplemental instructions on EJCDC C-942 - Field Order.
- E. Engineer may issue a Proposal Request including a detailed description of proposed change with supplementary or revised Drawings and Specifications and/or a change in Contract Time. Contractor will prepare and submit estimate within 5 days.
- F. Contractor may propose changes by submitting a request for change to Engineer, describing proposed change and its full effect on the Work. Include a statement describing reason for the change and the effect on Contract Price and Contract Time with full documentation.
- G. Work Change Directive: Engineer may issue directive, on EJCDC C-940 - Work Change Directive signed by Owner, instructing Contractor to proceed with change in the Work, for subsequent inclusion in a Change Order. Document will describe changes in the Work and designate method of determining any change in Contract Price or Contract Time. Promptly execute change.
- H. Document each quotation for change in Project Cost or Time with sufficient data to allow evaluation of quotation.
- I. Change Order Forms: EJCDC C-941 - Change Order.
 - 1. Execution of Change Orders: Engineer will issue Change Orders for signatures of parties as provided in Conditions of the Contract.
 - 2. Correlation of Contractor Submittals:
 - a. Promptly revise Application for Payment forms to record each authorized Change Order as separate line item and adjust Contract Price.
 - b. Promptly revise Progress Schedules to reflect change in Contract Time, revise sub-schedules to adjust times for other items of Work affected by the change, and resubmit.
 - c. Promptly enter changes in Record Documents.

1.5 DEFECT ASSESSMENT

- A. Replace or supplement the Work, or portions of the Work, not conforming to specified requirements.
- B. If, in the opinion of Engineer, it is not practical to redo or supplement the Work, Engineer will direct appropriate remedy or adjust payment.
- C. Authority of Engineer to assess defects and identify payment adjustments is final.
- D. Nonpayment for Rejected Products: Payment will not be made for rejected products for any of the following reasons:
 - 1. Products wasted or disposed of in a manner that is not acceptable.
 - 2. Products determined as unacceptable before or after placement.
 - 3. Products not completely unloaded from transporting vehicle.
 - 4. Products placed beyond lines and levels of the required Work.
 - 5. Products remaining on hand after completion of the Work.
 - 6. Loading, hauling, and disposing of rejected products.

1.6 UNIT PRICES

- A. Authority: Measurement methods are delineated in individual Specification Sections.
- B. Measurement methods delineated in individual Specification Sections complement criteria of this Section. In event of conflict, requirements of individual Specification Section govern.
- C. Take measurements and compute quantities. Engineer or Owner may verify measurements and quantities. Provide assistance in taking of measurements.
- D. Final payment for Work governed by unit prices will be made on basis of actual measurements and quantities accepted by Engineer multiplied by unit sum/price for Work incorporated in or made necessary by the Work.
- E. Payment Includes: Full compensation for required labor, products, tools, equipment, plant and facilities, transportation, services and incidentals; erection, application, or installation of item of the Work; waste disposal; overhead and profit.

1.7 ALTERNATES

- A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in Owner-Contractor Agreement. The Owner-Contractor Agreement may identify certain Alternates to remain an Owner option for a stipulated period of time.
- B. Coordinate related Work and modify surrounding Work. Description for each Alternate is recognized to be abbreviated but requires that each change shall be complete for scope of Work affected.
 - 1. Coordinate related requirements among Specification Sections as required.

2. Include as part of each Alternate: Miscellaneous devices, appurtenances, and similar items incidental to or necessary for complete installation.
3. Coordinate Alternate with adjacent Work and modify or adjust as necessary to ensure integration.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION 01 20 00

SECTION 01 25 00
SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Quality assurance.
- B. Product options.
- C. Product substitution procedures.

1.2 QUALITY ASSURANCE

- A. Contract is based on products and standards established in Contract Documents without consideration of proposed substitutions.
- B. Products specified define standard of quality, type, function, dimension, appearance, and performance required.
- C. Substitution Proposals: Permitted for specified products except where specified otherwise. Do not substitute products unless substitution has been accepted and approved in writing by Owner.

1.3 PRODUCT OPTIONS

- A. See Section 01 60 00 - Product Requirements.

1.4 PRODUCT SUBSTITUTION PROCEDURES

- A. Engineer will consider requests for substitutions only within 15 days after date of Owner-Contractor Agreement.
- B. Substitutions may be considered when a product becomes unavailable through no fault of Contractor.
- C. Document each request with complete data, substantiating compliance of proposed substitution with Contract Documents, including:
 - 1. Manufacturer's name and address, product, trade name, model, or catalog number, performance and test data, and reference standards.
 - 2. Itemized point-by-point comparison of proposed substitution with specified product, listing variations in quality, performance, and other pertinent characteristics.
 - 3. Reference to Article and Paragraph numbers in Specification Section.
 - 4. Cost data comparing proposed substitution with specified product and amount of net change to Contract Sum.
 - 5. Changes required in other Work.
 - 6. Availability of maintenance service and source of replacement parts as applicable.

7. Certified test data to show compliance with performance characteristics specified.
 8. Samples when applicable or requested.
 9. Other information as necessary to assist Engineer's evaluation.
- D. A request constitutes a representation that Contractor:
1. Has investigated proposed product and determined that it meets or exceeds quality level of specified product.
 2. Will provide same warranty for substitution as for specified product.
 3. Will coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.
 4. Waives claims for additional costs or time extension that may subsequently become apparent.
 5. Will coordinate installation of the accepted substitute, making such changes as may be required for the Work to be complete in all respects.
 6. Will reimburse Owner and Engineer for review or redesign services associated with re-approval by authorities having jurisdiction.
- E. Substitutions will not be considered when they are indicated or implied on Shop Drawing or Product Data submittals without separate written request or when acceptance will require revision to Contract Documents.
- F. Substitution Submittal Procedure:
1. Submit electronic files to Engineer of Request for Substitution for consideration. Limit each request to one proposed substitution.
 2. Submit Shop Drawings, Product Data, and certified test results attesting to proposed product equivalence. Burden of proof is on proposer.
 3. Engineer will notify Contractor in writing of decision to accept or reject request.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION 01 25 00

SECTION 01 30 00
ADMINISTRATIVE REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Coordination and Project conditions.
- B. Preconstruction meeting.
- C. Progress meetings.
- D. Pre-installation meetings.
- E. Closeout meeting.
- F. Alteration procedures.

1.2 COORDINATION AND PROJECT CONDITIONS

- A. Coordinate scheduling, submittals, and Work of various Sections of Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- B. Verify that utility requirements and characteristics of operating equipment are compatible with building utilities. Coordinate Work of various Sections having interdependent responsibilities for installing, connecting to, and placing operating equipment in service.
- C. Coordinate space requirements, supports, and installation of mechanical and electrical Work indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit as closely as practical; place runs parallel with lines of building. Use spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- D. Coordinate completion and clean-up of Work of separate Sections in preparation for Substantial Completion and for portions of Work designated for Owner's partial or complete occupancy.
- E. After Substantial Completion, coordinate access to Site for correction of defective Work and Work not complying with Contract Documents, to minimize disruption of Owner's activities.

1.3 PRECONSTRUCTION MEETING

- A. Engineer will schedule and preside over meeting after Notice of Award.
- B. Attendance Required: Engineer, Owner, Resident Project Representative, and Contractor.
- C. Minimum Agenda:
 - 1. Execution of Owner-Contractor Agreement.
 - 2. Submission of executed bonds and insurance certificates.

3. Distribution of Contract Documents.
 4. Submission of list of Subcontractors, list of products, Schedule of Values, Work method, and Progress Schedule.
 5. Designation of personnel representing parties in Contract, Owner and Engineer.
 6. Communication procedures.
 7. Procedures and processing of submittals, substitutions, requests for interpretations, field orders, proposal request, Change Orders, Applications for Payments, and Contract closeout procedures.
 8. Survey and treatment system layout.
 9. Owner's requirements, use of premises and occupancy.
 10. Use of premises by Contractor.
 11. Scheduling, including activities that may affect Owner's operations at Project Site.
 12. Critical Work sequencing.
 13. Construction facilities and controls.
 14. Temporary utilities provided by Contractor.
 15. Security and housekeeping procedures.
 16. Procedures for testing.
 17. Procedures for maintaining record documents.
 18. Requirements for startup of equipment.
 19. Inspection and acceptance of equipment put into service during construction period.
- D. Engineer: Record minutes and distribute electronically to participants and those affected by decisions made.

1.4 PROGRESS MEETINGS

- A. The Engineer will schedule and administer meetings throughout progress of the work, prepare agendas, preside over meetings, record minutes and distribute copies to participants and those affected by decisions made.
- B. The Contractor will make arrangements for meetings.
- C. Attendance Required: Engineer, Owner/Resident Project Representative and Contractor.
- D. Minimum Agenda:
 1. Review minutes of previous meetings.
 2. Review of Work progress.
 3. Field observations, problems, and decisions.
 4. Review coordination with Owner operations.
 5. Review preparation and installation procedures.
 6. Identification of problems impeding planned progress.
 7. Review of submittal schedule and status of submittals.
 8. Review of off-Site fabrication and delivery schedules.
 9. Maintenance of Progress Schedule.
 10. Corrective measures to regain projected schedules.
 11. Planned progress during succeeding work period.
 12. Coordination of projected progress.
 13. Maintenance of quality and work standards.
 14. Effect of proposed changes on Progress Schedule and coordination.
 15. Other business relating to Work.

1.5 CLOSEOUT MEETING

- A. Contractor is to schedule Project closeout meeting with sufficient time to prepare for requesting Substantial Completion. Preside over meeting and be responsible for minutes.
- B. Attendance Required: Contractor, Engineer, Owner/Resident Project Representative and others appropriate to agenda.
- C. Notify Engineer at least five days in advance of meeting date.
- D. Minimum Agenda:
 - 1. Start-up of facilities and systems.
 - 2. Operations and maintenance manuals.
 - 3. Testing, adjusting, and balancing.
 - 4. System demonstration and observation.
 - 5. Operation and maintenance instructions for Owner's personnel.
 - 6. Contractor's inspection of Work.
 - 7. Contractor's preparation of an initial "punch list."
 - 8. Procedure to request Engineer inspection to determine date of Substantial Completion.
 - 9. Completion time for correcting deficiencies.
 - 10. Inspections by authorities having jurisdiction.
 - 11. Partial release of retainage.
 - 12. Final cleaning.
 - 13. Preparation for final inspection.
 - 14. Closeout Submittals:
 - a. Project record documents.
 - b. Operating and maintenance documents.
 - c. Operating and maintenance materials.
 - d. Affidavits.
 - 15. Final Application for Payment.
 - 16. Contractor's demobilization of Site.
 - 17. Maintenance.
- E. Contractor is to record minutes and distribute electronically within two days after meeting to participants and those affected by decisions made.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION

3.1 ALTERATION PROCEDURES

- A. Entire facility will be used for normal operations during progress of Work. Cooperate with Owner in scheduling operations to minimize conflict and to permit continuous usage.
 - 1. Keep utility and service outages to a minimum and perform only after approval of Owner.
- B. Cut, move, or remove items as necessary for access to alterations and renovation Work. Replace and restore at completion. Comply with Section 017000 - Execution and Closeout Requirements.

- C. Remove unsuitable material not marked for salvage, including rotted wood, corroded metals, and deteriorated masonry and concrete. Replace materials as specified for finished Work.
- D. Remove debris and abandoned items from area and from concealed spaces.
- E. Prepare surface and remove surface finishes to permit installation of new Work and finishes.
- F. Close openings in exterior surfaces to protect existing Work from weather and extremes of temperature and humidity.
- G. Remove, cut, and patch Work to minimize damage and to permit restoring products and finishes to original or specified condition.
- H. Where new Work abuts or aligns with existing Work, provide smooth and even transition.
- I. Finish surfaces as specified in individual product Sections.

END OF SECTION 01 30 00

SECTION 01 32 16
CONSTRUCTION PROGRESS SCHEDULE

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Submittals.
- B. Schedule Format.
- C. Review and Evaluation.
- D. Updating Schedules.
- E. Distribution.

1.2 SUBMITTALS

- A. Within 10 days after date of Owner-Contractor Agreement, submit proposed preliminary schedule for Work.
- B. Submit as electronic file via email to Owner and Engineer.
- C. Submit schedules under transmittal letter form specified in Section 013300 - Submittal Procedures.
- D. Submit updated schedules monthly with each Application for Payment.

1.3 SCHEDULE FORMAT:

- A. Schedule to include at least identification and listing in chronological order of those activities reasonably required to complete the Work, including:
 - 1. Subcontract Work.
 - 2. Major equipment delivery dates including required lead times.
 - 3. Move-in and other preliminary activities.
 - 4. Equipment and equipment system test and startup activities.
 - 5. Project closeout and cleanup.
 - 6. Work sequences, constraints, and milestones.
- B. Listings identified by Specification Section number.
- C. Identification of the following:
 - 1. Timeframe by year, month, and week.
 - 2. Duration, early start, and completion for each activity.
 - 3. Critical activities and Project float.

1.4 UPDATING SCHEDULES

- A. Schedule Updates to Include:
 - 1. Overall percent complete, projected and actual.
 - 2. Completion progress by listed activity and sub-activity, to within five working days prior to submittal.
 - 3. List and explain changes in Work scope and activities modified since prior submittal.
 - 4. Delays in submittals or resubmittals, deliveries, or Work.
 - 5. Adjusted or modified sequences of Work.
 - 6. Other identifiable changes.
 - 7. Revised projections of progress and completion by listed activity and sub-activity.
 - 8. Current and anticipated delaying factors and estimated impact on other activities and completion milestones.
 - 9. Corrective action taken or proposed.
- B. Maintain schedules to record actual start and finish dates of completed activities.
- C. Indicate progress of each activity to date of revision, with projected completion date of each activity. Update schedules to depict current status of Work.
- D. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.
- E. Upon approval of a Change Order, include the change in the next schedule submittal.
- F. Indicate changes required to maintain Date of Substantial Completion.
- G. Submit sorts as required to support recommended changes.
- H. Prepare narrative report to define problem areas, anticipated delays, and impact on schedule. Report corrective action taken or proposed and its effect including effects of changes on schedules of others.

1.5 DISTRIBUTION

- A. Following joint review, distribute copies of updated schedules to Contractor's Project site file, to Subcontractors, suppliers, Engineer, and Owner.
- B. Instruct recipients to promptly report, in writing, problems anticipated by projections shown in schedules.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION 01 32 16

SECTION 01 33 00
SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Definitions.
- B. Submittal procedures.
- C. Construction progress schedules.
- D. Proposed product list.
- E. Product data.
- F. Use of electronic CAD files of Project Drawings.
- G. Shop Drawings.
- H. Other submittals.
- I. Design data.
- J. Test reports.
- K. Certificates.
- L. Manufacturer's instructions.
- M. Manufacturer's field reports.
- N. Erection Drawings.
- O. Construction photographs.
- P. Contractor review.
- Q. Engineer review.

1.2 RELATED SECTIONS

- A. Section 01 32 16 - Construction Progress Schedule
- B. Section 01 70 00 - Execution and Closeout Requirements

1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information that require Engineer's responsive action.
- B. Informational Submittals: Written and graphic information and that do not require Engineer's responsive action. Submittals may be rejected for not complying with requirements.

1.4 SUBMITTAL PROCEDURES

- A. Transmit each submittal with the Shop Drawing Transmittal provided with the Project Manual.
- B. Sequentially number transmittal forms. Mark revised submittals with original number and sequential alphabetic suffix.
- C. Complete all applicable fields of the Shop Drawing Transmittal, including: Project, Contractor, Subcontractor and supplier, pertinent Drawing and detail number, and Specification Section number relevant to submittal.
- D. Apply legible Contractor's stamp to Shop Drawing Transmittal or individual submittals, signed or initialed, certifying that review, approval, verification of products required, field dimensions, adjacent construction Work, and coordination of information is according to requirements of the Work and Contract Documents.
- E. Schedule submittals to expedite Project and submit electronic submittals via email as PDF electronic files. Coordinate submission of related items.
- F. For each submittal for review, allow 15 days excluding delivery time to and from Contractor.
- G. Identify variations in Contract Documents and product or system limitations that may be detrimental to successful performance of completed Work.
- H. Allow space on submittals for Contractor and Engineer review stamps.
- I. When revised for resubmission, identify changes made since previous submission.
- J. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report inability to comply with requirements.
- K. Submittals not requested will not be recognized nor processed.
- L. Incomplete Submittals: Engineer will not review. Complete submittals for each item are required. Delays resulting from incomplete submittals are not the responsibility of Engineer.

1.5 CONSTRUCTION PROGRESS SCHEDULES

- A. Comply with Section 01 32 16 - Construction Progress Schedule.

1.6 PROPOSED PRODUCT LIST

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

1.7 PRODUCT DATA

- A. Product Data: Action Submittal: Submit to Engineer for review for assessing conformance with information given and design concept expressed in Contract Documents.
- B. Submit electronic submittals via email as PDF electronic files.
- C. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- D. Indicate product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- E. After review, produce copies and distribute according to "Submittal Procedures" article and for record documents described in Section 01 70 00 - Execution and Closeout Requirements.

1.8 ELECTRONIC CAD FILES OF PROJECT DRAWINGS

- A. Electronic CAD Files of Project Drawings: CAD files will not be supplied nor accepted.

1.9 SHOP DRAWINGS

- A. Shop Drawings: Action Submittal: Submit to Engineer for assessing conformance with information given and design concept expressed in Contract Documents.
- B. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- C. When required by individual Specification Sections, provide Shop Drawings signed and sealed by a professional Engineer responsible for designing components shown on Shop Drawings.
 - 1. Include signed and sealed calculations to support design.
 - 2. Submit Shop Drawings and calculations in form suitable for submission to and approval by authorities having jurisdiction.
 - 3. Make revisions and provide additional information when required by authorities having jurisdiction.
- D. Submit electronic submittals via email as PDF electronic files.
- E. After review, produce copies and distribute according to "Submittal Procedures" article and for record documents described in Section 01 70 00 - Execution and Closeout Requirements.

1.10 OTHER SUBMITTALS

- A. Closeout Submittals: Comply with Section 01 70 00 - Execution and Closeout Requirements.
- B. Informational Submittal: Submit data for Engineer's knowledge as Contract administrator or for Owner.
- C. Submit information for assessing conformance with information given and design concept expressed in Contract Documents.

1.11 TEST REPORTS

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

1.12 CERTIFICATES

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

1.13 MANUFACTURER'S INSTRUCTIONS

- A. Informational Submittal: Submit manufacturer's installation instructions for Engineer's knowledge as Contract administrator or for Owner.
- B. Submit printed instructions for delivery, storage, assembly, installation, startup, adjusting, and finishing, to Engineer in quantities specified for Product Data.
- C. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

1.14 MANUFACTURER'S FIELD REPORTS

- A. Informational Submittal: Submit reports for Engineer's knowledge as Contract administrator or for Owner.
- B. Submit report electronically within 5 days of observation to Engineer for information.

- C. Submit reports for information for assessing conformance with information given and design concept expressed in Contract Documents.

1.15 ERECTION DRAWINGS

- A. Informational Submittal: Submit Drawings for Engineer's knowledge as Contract administrator or for Owner.
- B. Submit Drawings for information assessing conformance with information given and design concept expressed in Contract Documents.
- C. Data indicating inappropriate or unacceptable Work may be subject to action by Engineer or Owner.

1.16 CONSTRUCTION PHOTOGRAPHS

- A. Provide photographs of Site and construction throughout progress of Work produced by an experienced photographer acceptable to Engineer.
- B. Take photographs as evidence of existing conditions, prior to construction.
- C. Take pictures weekly to visually describe all the work completed.
- D. Each month submit photographs taken during the current payment period with Application for Payment.
- E. Digital Images: Deliver complete set of digital image electronic files on digital media to Owner with Project record documents. Identify electronic media with date photographs were taken and objects photographed. Submit images that have same aspect ratio as sensor, uncropped.
 - 1. Digital Images: Uncompressed TIFF or JPEG format, produced by digital camera with minimum sensor size of 4.0 megapixels, and image resolution of not less than 1024 by 768 pixels.
 - 2. Date and Time: Include date and time in filename for each image.

1.17 CONTRACTOR REVIEW

- A. Review for compliance with Contract Documents and approve submittals before transmitting to Engineer.
- B. Contractor: Responsible for:
 - 1. Determination and verification of materials including manufacturer's catalog numbers.
 - 2. Determination and verification of field measurements and field construction criteria.
 - 3. Checking and coordinating information in submittal with requirements of Work and of Contract Documents.
 - 4. Determination of accuracy and completeness of dimensions and quantities.
 - 5. Confirmation and coordination of dimensions and field conditions at Site.
 - 6. Construction means, techniques, sequences, and procedures.

7. Safety precautions.
 8. Coordination and performance of Work of all trades.
- C. Stamp, sign or initial, and date each submittal to certify compliance with requirements of Contract Documents.
 - D. Do not fabricate products or begin Work for which submittals are required until approved submittals have been received from Engineer.

1.18 ENGINEER REVIEW

- A. Do not make "mass submittals" to Engineer. "Mass submittals" are defined as six or more submittals or items in one day or 20 or more submittals or items in one week. If "mass submittals" are received, Engineer's review time stated above will be extended as necessary to perform proper review. Engineer will review "mass submittals" based on priority determined by Engineer after consultation with Owner and Contractor.
- B. Informational submittals and other similar data are for Engineer's information, do not require Engineer's responsive action, and will not be reviewed or returned with comment.
- C. Submittals made by Contractor that are not required by Contract Documents may be returned without action.
- D. Submittal approval does not authorize changes to Contract requirements unless accompanied by Change Order or Work Change Directive.
- E. Owner may withhold monies due to Contractor to cover additional costs beyond the second submittal review.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION 01 33 00

Shop Drawing Transmittal

Transmittal Date: _____

Transmittal No.: _____

Attention: _____



Lochmueller Group - 820 S. Main St., Ste 207 - St. Charles, MO 63302

Proj. Name:	Engr. Proj. No.:
Proj. Owner:	Owner Proj. No.:
Contractor:	Contr. Attention:
Contr. Address:	

Submittal Date	Subm. No.	Revis. No.	No. of Copies**	Submittal Title	Manufacturer	Mfr/Vendor Dwg/Product No.	Action Taken*
							Copies ret.**
				Spec Section:		Drawing/Detail No.:	
				Spec Section:		Drawing/Detail No.:	
				Spec Section:		Drawing/Detail No.:	
				Spec Section:		Drawing/Detail No.:	
				Spec Section:		Drawing/Detail No.:	
				Spec Section:		Drawing/Detail No.:	
				Spec Section:		Drawing/Detail No.:	
				Spec Section:		Drawing/Detail No.:	
				Spec Section:		Drawing/Detail No.:	
				Spec Section:		Drawing/Detail No.:	
				Spec Section:		Drawing/Detail No.:	

Contractor Remarks:

*Action Taken	**Mark "E" for electronic transfer.	Engineer Comments:
A No Exception Taken - Furnish as Submitted		
B Note Markings / Comments - Furnish as Noted		
C Rejected/Revise and Resubmit		
1 Doesn't meet technical requirements		
2 Not enough information provided		
3 Too few copies submitted		
5 See comments on submittal		
D Engineer's Review Not Required		Engineer's review is for general conformation with the project design concept and contract documents. Markings or comments shall not be construed as relieving the Contractor from compliance with the project plans and specifications, nor departures therefrom. Contractor remains responsible for details and accurcay of dimensions, conformance with the job site and site features, quantities, selection of fabrication processes, means and methods of construction, and performance of their work in a safe manner.
1 Submittal not required		
2 Supplementary information, only		
3 Previously reviewed		

SECTION 01 40 00
QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Quality control.
- B. Tolerances.
- C. References.
- D. Labeling.
- E. Mockup requirements.
- F. Testing and inspection services.
- G. Manufacturers' field services.

1.2 RELATED SECTIONS

- A. Section 01 33 00 - Submittal Procedures

1.3 QUALITY CONTROL

- A. Monitor quality control over suppliers, manufacturers, products, services, Site conditions, and workmanship to produce Work of specified quality.
- B. Comply with specified standards as the minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- C. Perform Work using persons qualified to produce required and specified quality.
- D. Products, materials, and equipment may be subject to inspection by Engineer and Owner at place of manufacture or fabrication. Such inspections shall not relieve Contractor of complying with requirements of Contract Documents.
- E. Supervise performance of Work in such manner and by such means to ensure that Work, whether completed or in progress, will not be subjected to harmful, dangerous, damaging, or otherwise deleterious exposure during construction period.

1.4 TOLERANCES

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

1.5 REFERENCES

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

1.6 LABELING

- A. Attach label from agency approved by authorities having jurisdiction for products, assemblies, and systems required to be labeled by applicable code.
- B. Label Information: Include manufacturer's or fabricator's identification, approved agency identification, and the following information, as applicable, on each label:
 - 1. Model number.
 - 2. Serial number.
 - 3. Performance characteristics.
- C. Manufacturer's Nameplates, Trademarks, Logos, and Other Identifying Marks on Products: Not allowed on surfaces exposed to view in public areas, interior or exterior.

1.7 MOCK-UP REQUIREMENTS

- A. Tests will be performed under provisions identified in this Section and identified in individual product Specification Sections.

- B. Assemble and erect specified or indicated items with specified or indicated attachment and anchorage devices, flashings, seals, and finishes.
- C. Accepted mockups shall be comparison standard for remaining Work.
- D. Where mockup has been accepted by Engineer and is specified in product Specification Sections to be removed, remove mockup and clear area when directed to do so by Engineer.

1.8 TESTING AND INSPECTION SERVICES

- A. Contractor to employ for services of an independent firm to perform tests, inspections, and other services specified in individual Specification Sections and as required by Engineer.
 - 1. Laboratory: Authorized to operate in State of Missouri.
 - 2. Testing Equipment: Calibrated at reasonable intervals with devices of an accuracy traceable to National Bureau of Standards or accepted values of natural physical constants.
- B. Testing, inspections, and source quality control may occur on or off Project Site. Perform off-Site testing as required by Engineer or Owner.
- C. Reports shall be submitted electronically by independent firm to Engineer, Contractor, and authorities having jurisdiction, including observations and results of tests and compliance or noncompliance with Contract Documents.
 - 1. Submit final report showing correction of Work previously reported as noncompliant.
- D. Cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage, safe access, and assistance by incidental labor as requested.
 - 1. Notify Engineer and independent firm 24 hours before expected time for operations requiring services.
 - 2. Make arrangements with independent firm and pay for additional Samples and tests required for Contractor's use.
- E. Employment of testing agency or laboratory shall not relieve Contractor of obligation to perform Work according to requirements of Contract Documents.
- F. Retesting or re-inspection required because of nonconformance with specified or indicated requirements shall be performed by same independent firm on instructions from Engineer. Payment for retesting or re-inspection will be charged to Contractor by deducting testing charges from Contract Sum.
- G. Testing Agency Responsibilities:
 - 1. Test Samples of mixes submitted by Contractor.
 - 2. Cooperate with Contractor in performance of services.
 - 3. Perform indicated sampling and testing of products according to specified standards.
 - 4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
 - 5. Promptly notify Engineer and Contractor of observed irregularities or nonconformance of Work or products.

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

1.9 MANUFACTURER'S FIELD SERVICES

- A. When specified in individual Specification Sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe Site conditions, conditions of surfaces and installation, quality of workmanship, startup of equipment, testing, adjusting, and balancing of equipment and commissioning as applicable, and to initiate instructions when necessary.
- B. Submit qualifications of observer to Engineer 30 days in advance of required observations. Observer is subject to approval of Engineer.
- C. Report observations and Site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturer's written instructions.
- D. Refer to Section 01 33 00 - Submittal Procedures, "Manufacturer's Field Reports" Article.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION 01 40 00

SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Temporary Utilities:
 - 1. Temporary electricity.
 - 2. Temporary sanitary facilities.

- B. Construction Facilities:
 - 1. Field offices and sheds.
 - 2. Vehicular access.
 - 3. Parking.
 - 4. Progress cleaning and waste removal.
 - 5. Traffic regulation.

- C. Temporary Controls:
 - 1. Enclosures and fencing.
 - 2. Security.
 - 3. Water Control.
 - 4. Dust Control.
 - 5. Erosion and sediment control.
 - 6. Noise Control.
 - 7. Pollution control.

- D. Removal of utilities, facilities and controls.

1.2 TEMPORARY FACILITIES

- A. Contractor shall provide the following items as necessary for execution of the Work, including associated costs:
 - 1. Cleaning during construction.
 - 2. Access approaches.
 - 3. Temporary sanitary facilities.
 - 4. Construction aids.
 - 5. Temporary field office for the Contractor.
 - 6. Erosion and sediment control and other necessary temporary controls.
 - 7. Temporary barriers, barricades, fencing, exterior closures and similar devices as necessary for safety and protection of construction, personnel and public.
 - 8. Temporary provisions for protection of installed Work.
 - 9. Temporary electrical service required by Contractor.

1.3 TEMPORARY ELECTRICITY

- A. Temporary power includes power for job trailers, bypass pumping, groundwater dewatering, tools and equipment, and other construction related services.
- B. Provide power outlets with branch wiring and distribution boxes as required for construction operations. Provide suitable, flexible power cords as required for portable construction tools and equipment.
- C. Contractor may use Owner's existing power service, up to the capacity remaining after Owner's operations, as needed for construction operation.
 - 1. Owner will pay cost of this energy used. Exercise measures to conserve energy.
 - 2. Overloading of the Owner's power service will not be permitted.
 - 3. Provide main service disconnect and overcurrent protection at convenient location.
 - 4. Provide temporary electric feeder from existing building electrical service or meter.
 - 5. Do not disrupt Owner's use of service.
 - 6. Permanent convenience receptacles may be used during construction.
 - 7. Existing Power Service Characteristics: 120/240 Volts, 200 Amperes meter base, single-phase, 25 kV transformer.
- D. Complement existing power service capacity and characteristics as required for construction operations.
 - 1. Provide and pay for temporary power service from utility. Provide separate metering.
 - 2. Provide main service disconnect and overcurrent protection at meter.

1.4 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures. Provide facilities at time of Project mobilization. Maintain a clean and sanitary condition daily.

1.5 FIELD OFFICES AND SHEDS

- A. Designated area may be used for field office and storage:
 - 1. Grassy area of the Site property east of the lagoon and UV system.
 - 2. Locate a minimum distance of 30 feet from existing and new structures.
 - 3. Remove temporary materials and construction at Substantial Completion.
- B. Field Office and Storage Sheds:
 - 1. Do not use permanent facilities for field offices or for storage.
 - 2. Structurally sound, secure and watertight enclosures for office and storage spaces.
 - 3. Thermal resistance of floors, walls and ceilings compatible with occupancy and storage requirements.
 - 4. Maintain during progress of Work.
 - 5. At completion of Work remove buildings, foundations, utility services, and debris. Restore areas to same or better condition as original condition.

- C. Field Office:
 - 1. With lighting, electrical outlets and furniture, including cabinets and drawing display table.
 - 2. Install ready for occupancy within 15 days after construction start date established by Notice to Proceed.
- D. Storage Areas and Sheds: Size to storage requirements for products of individual Sections, allowing for access and orderly provision for maintenance and inspection of products to suit requirements.

1.6 VEHICULAR ACCESS

- A. Site access is via the Katy Trail, as approved by Owner, on the routes depicted on the Access Routes Map in the Appendix to these specifications.
- B. Minimize vehicular traffic on the Katy Trail by construction personnel carpooling to the Site from the designated parking area and combining vehicle trips.
- C. Avoid or limit vehicular trips on the Katy Trail to essentials when the ground is saturated to minimize damage to the trail.
- D. Continuously repair the trail during construction with granular material as required to maintain all-weather usage by the public.
- E. Provide unimpeded access for emergency vehicles on streets, roads and the Katy Trail at all times.
- F. Provide means of removing mud from vehicle wheels before entering paved streets. Maintain travel routes in sound condition free of excavated material, products, mud, and the like.
- G. Tracked vehicles are not allowed on paved areas.
- H. Prior to Substantial Completion repair existing facilities damaged by use to original condition.

1.7 PARKING

- A. Construction personnel and construction vehicles may park in the grassy area on each side of the Katy Trail directly east of the intersection of 2nd Street and the Katy Trail in Hartsburg.
- B. Additional parking is available in the grassy area of the Site property east of the lagoon and UV system.
- C. Do not park along the Katy Trail or in the Katy Trail Trailhead parking lot.
- D. If the designated parking space is not adequate, contact the Owner for additional off-Site parking.
- E. Do not allow heavy vehicles or construction equipment parking in paved areas.
- F. Maintain parking areas in sound condition free of excavated material, products, mud, and the like.

- G. At the end of construction, restore the designated parking areas to pre-construction conditions, including repair of potholes, low areas, standing water, and other deficiencies and seeding and strawing.

1.8 PROGRESS CLEANING AND WASTE REMOVAL

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain Site in clean and orderly condition.
- B. Broom clean interior areas before and after interior installations.
- C. Collect and remove waste materials, debris, and rubbish from Site weekly and dispose of off-Site.

1.9 TRAFFIC REGULATION

- A. Provide warning signs and/or traffic cones on the Katy Trail at approaches to Site at times when full usage of the trail may be impaired by Contractor's operations to direct and maintain orderly flow of traffic.
- B. Completely remove warning signs and traffic cones when no longer required.

1.10 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas, to allow for Owner's use of Site, and to protect existing facilities and adjacent properties from damage from construction operations.
- B. Tree and Plant Protection: Preserve and protect existing trees and plants not designated for removal.
 - 1. Protect areas within drip lines from traffic, parking, storage, dumping, chemically injurious materials and liquids, ponding, and continuous running water.
- C. Protect non-owned traffic, stored materials, Site, and structures from damage.

1.11 ENCLOSURES AND FENCING

- A. Construction: Contractor's option.
- B. Provide at least 5-foot-high fence at least around non-fenced portion of construction Site; equip with vehicular gate with locks.

1.12 SECURITY

- A. Protect Work on premises and Owner's operations from theft, vandalism, and unauthorized entry.
- B. Restrict entrance of persons and vehicles to Project Site and existing facilities.
 - 1. Allow entrance only to authorized persons with proper identification.

1.13 WATER CONTROL

- A. Grade Site to drain. Maintain excavations free of water. Provide, operate, and maintain necessary pumping equipment.
- B. Protect Site from puddles or running water. Provide water barriers as required to protect Site from soil erosion.

1.14 DUST CONTROL

- A. Execute Work by methods that minimize raising dust from construction operations.

1.15 EROSION AND SEDIMENT CONTROL

- A. Plan and execute construction by methods to control surface drainage from cuts and fills from borrow and waste disposal areas. Prevent erosion and sedimentation.
- B. Minimize surface area of bare soil exposed at one time.
- C. Provide temporary measures including berms, dikes, drains, and other devices to prevent water flow.
- D. Construct fill and waste areas by selective placement to avoid erosive surface silts and clays.
- E. Periodically inspect earthwork to detect evidence of erosion and sedimentation. Promptly apply corrective measures.
- F. Construct erosion control measures on slopes below denuded areas as indicated on Drawings. Remove devices after the slopes have been stabilized with vegetation, grading or other means.

1.16 NOISE CONTROL

- A. Provide methods, means, and facilities to minimize noise produced by construction operations.

1.17 POLLUTION CONTROL

- A. Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances and pollutants produced by construction operations.
- B. Comply with pollution and environmental control requirements of authorities having jurisdiction.

1.18 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, and materials before Final Application for Payment inspection.

- B. Remove underground installations to minimum depth of 2 feet. Grade Site as indicated on Drawings.
- C. Clean and repair damage caused by installation or use of temporary Work.
- D. Restore existing facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION 01 50 00

SECTION 01 50 50
PLANT OPERATION DURING CONSTRUCTION

PART 1 - GENERAL

1.1 GENERAL

- A. The Work shall consist of furnishing and installing temporary facilities, scheduling of construction and utilizing construction procedures as necessary to maintain wastewater treatment during construction.
- B. The Contactor is responsible for developing a plan for construction activities, scheduling, and sequencing construction to maintain wastewater treatment during construction within the constraints listed herein. Specific requirements which may influence the Contractor's Bid Price and scheduling are included in this Section. However, specific procedures are not limited to the ones included in this Section, and additional and more detailed procedures may be required during construction. If requested by the Engineer, the Contractor shall provide a written plan describing how these requirements will be met. The Contractor is responsible for including all costs in his Bid Price for meeting the requirements described in this Section and for any additional or more detailed procedures required during construction.

1.2 SCOPE

- A. It is essential that treatment of the existing wastewater treatment facilities is not interrupted during construction or diminished in quality by construction procedures or methods.
- B. Connections to the existing piping, installation of valves and tees, installation of the additional basin, and installation or removal of any treatment unit shall be accomplished with minimal interruption of flow and treatment through the facility.
- C. The Contractor shall include in his Bid and bear all expenses incurred, including temporary pumping, piping, and electrical service, if required, and all other appurtenances required to maintain wastewater treatment during construction.
- D. Procedures as set forth herein are included as a guide only and do not relieve the Contractor from any costs to provide and maintain any or all temporary facilities and equipment that may be required to maintain full plant operation during the construction period. The Contractor may use procedures other than those set forth herein with prior approval of the Engineer. The approval of the Engineer shall be only for compliance with the intent of maintaining full operation of the treatment facilities.

1.3 PLANT OPERATION AND MAINTENANCE

- A. The Contractor shall notify the Owner and Engineer one week in advance of any interruption of any treatment unit process or change to a previously agreed upon interruption. Such interruptions shall be strictly coordinated with the Owner.
- B. Existing facilities which are required to be in service during their modification will be operated by the Owner. All temporary facilities, such as pumps, piping, valves and gates utilized in the process will be operated and maintained by the Contractor. Operation of this temporary equipment shall be coordinated with the Engineer. Temporary equipment utilized in the treatment process shall be operated 24 hours per day, if required, to maintain the treatment process. Temporary facilities and equipment not required in the treatment process shall be operated and maintained by the Contractor.
- C. New facilities which are required to be in service before they are completed and/or accepted by the Owner will be operated by the Owner and maintained by the Contractor.
- D. Operation of new or modified facilities by the Owner before these facilities are completed, tested, and accepted does not imply acceptance of these facilities by the Owner.
- E. New or modified facilities and equipment which have been completed, tested, and accepted by the Owner will be operated and maintained by the Owner.

1.4 TEMPORARY FACILITIES

- A. Any and all temporary structures, pumping, piping, and construction required to maintain full wastewater treatment in the existing facilities and to operate new facilities prior to completion of construction shall be furnished and installed by the Contractor.
- B. Temporary utilities shall be provided by the Contractor and energy costs paid per Section 015000 - Temporary Facilities and Controls.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. All permanently installed materials and equipment shall be in accordance with the applicable sections of these Specifications.
- B. Temporary materials and equipment shall be selected by the Contractor and shall conform to the intent of this Section.

PART 3 - EXECUTION

3.1 DEMOLITION

- A. Demolition work shall be in accordance with the Drawings.

3.2 INSTALLATION

- A. Material and equipment that are to become a permanent part of the treatment facilities shall be installed as indicated on the Drawings and in accordance with the applicable sections of these Specifications.

3.3 GENERAL PROCEDURES

- A. The Contractor shall schedule and coordinate his Work so that minimal interruptions are made to plant operations and so that the number of processes shut down or taken out of service are minimized. As a general rule, the Contractor is responsible for completing all Work necessary for an item requiring a shutdown during that time and within the time frame specified.
- B. Full plant access shall be maintained at all times.
- C. Prior to modifications of any existing facility, the Contractor shall assemble labor, materials, and equipment required to complete the modifications with minimal interruption.
- D. The Contractor shall coordinate his work for connections of new piping to existing piping or new pipe to existing structures so that all new piping necessary is installed up to the connection point and connections can be made with minimal process interruption.
- E. Discharge from lowering the lagoon levels, if necessary, shall be coordinated with the Owner.
- F. Modification and connections to more than one of the existing facilities shall not be done simultaneously unless approved by the Engineer. The modification to one existing facility or the connection to one existing pipeline shall be completed before another modification or connection to existing facilities is started.
- G. Where bypass pumping is required, the Contractor shall be responsible for determining pumping requirements. Bypass pumps shall be sized to pump the peak flow for which a bypassed process or portion of the plant is designed.

3.4 TIMING

- A. The Contractor shall coordinate all construction which requires any portion of the treatment facilities to be taken out of service with the Owner. The Contractor shall be prepared to undertake these procedures at times of low plant flow, if necessary.

3.5 SPECIFIC PROCEDURES

- A. The Hartsburg WWTF is generally capable of meeting the current effluent limit listed in its Missouri State Operating Permit in the Appendix to these Specification. The Contractor is responsible for maintaining treatment up to the design capacity of the facility, which is 14,400 gpd. Actual average flow over a recent 5-year period was 3,600 gpd.
- B. The Contractor may temporarily draw down the lagoon, one cell at a time, if needed for the installation of the aeration system. Such drawdown shall be coordinated with Owner.

- C. The Owner may provide assistance in lowering lagoon levels by utilizing the existing main liftstation for storage of dry-weather flow for a limited time period. The Contractor is responsible for drawing down the additional stored volume. Liquid may be pumped from one cell into the other for temporary storage.
- D. Contractor shall verify and have onsite all hardware and materials needed to connect the new floating air lines to the existing piping prior to disconnecting the existing floating air lines and diffusers.
- E. The new blower control panel shall be installed while the existing control panel remains in operation to operate the existing blowers. The existing control panel shall be removed only after the new blowers have been determined to operate as designed.
- F. Blower #1 shall be installed first to ensure that one blower is available for lagoon aeration at all times. The new blower shall be throttled down as needed if supplying the existing diffusers. Once Blower #1 has been put in service and has been determined to operate properly, Blower #2 shall be installed and connected, followed by Blower #3.
- G. The lagoon may be used for temporary storage of flow during construction of the filter and related structures as well as the demolition of existing structures marked for removal. The water level in the lagoon may be raised by temporarily closing off effluent lines, but at no time may come closer than one (1) vertical foot to the lowest point in the berm.
- H. All effluent lines must be fully opened if precipitation is in the forecast (per the Columbia airport weather station) within the next 48 hours and ahead of weekends, holidays or anticipatable bad weather days.
- I. Any bypassing of the new filter construction is to be provided by the Contractor as needed to meet the conditions of this Section.

END OF SECTION 01 50 50

SECTION 01 60 00
PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Products.
- B. Product delivery requirements.
- C. Product storage and handling requirements.
- D. Product options.
- E. Equipment electrical characteristics and components.

1.2 PRODUCTS

- A. At minimum, comply with specified requirements and reference standards.
- B. Specified products define standard of quality, type, function, dimension, appearance, and performance required.
- C. Furnish products of qualified manufacturers that are suitable for intended use. Furnish products of each type by single manufacturer unless specified otherwise. Confirm that manufacturer's production capacity can provide sufficient product, on time, to meet Project requirements.
- D. Do not use materials and equipment removed from existing premises except as specifically permitted by Contract Documents.
- E. Furnish interchangeable components from same manufacturer for components being replaced.

1.3 PRODUCT DELIVERY REQUIREMENTS

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

1.4 PRODUCT STORAGE AND HANDLING REQUIREMENTS

- A. Store and protect products according to manufacturer's instructions.

- B. Store products with seals and labels intact and legible.
- C. Store sensitive products in weather-tight, climate-controlled enclosures in an environment suitable to product.
- D. For exterior storage of fabricated products, place products on sloped supports aboveground.
- E. Provide off-Site storage and protection when Site does not permit on-Site storage or protection following coordination with the Owner.
- F. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- G. Store loose granular materials on solid flat surfaces in well-drained area. Prevent mixing with foreign matter.
- H. Provide equipment and personnel to store products; use methods to prevent soiling, disfigurement, or damage.
- I. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

1.5 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Products complying with specified reference standards or description.
- B. Products Specified by Naming One or More Manufacturers: Products of one of the manufacturers named and complying with Specifications; no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with Provision for Substitutions: Submit Request for Substitution for any manufacturer not named, according to Section 01 25 00 - Substitution Procedures.

PART 2 - PRODUCTS – Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION 01 60 00

SECTION 01 70 00
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Examination.
- B. Preparation.
- C. Field engineering.
- D. Execution.
- E. Cutting and patching.
- F. Protecting installed construction.
- G. Starting of systems.
- H. Demonstration and instruction.
- I. Closeout procedures.
- J. Project record documents.
- K. Operation and maintenance data.
- L. Manual for equipment and systems.
- M. Spare parts and maintenance products.
- N. Maintenance service.
- O. Final cleaning.

1.2 EXAMINATION

- A. Verify that existing Site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.
- B. Verify that existing substrate is capable of structural support or attachment of new Work being applied or attached.
- C. Examine and verify specific conditions described in individual Specification Sections.
- D. Verify that utility services are available with correct characteristics and in correct locations.

1.3 PREPARATION

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

1.4 FIELD ENGINEERING

- A. Locate and protect survey controls and reference points. Promptly notify Engineer of discrepancies discovered.
- B. Control datum for survey is indicated on Drawings.
- C. Verify setbacks and easements; confirm Drawing dimensions and elevations.
- D. Provide field engineering services. Establish elevations, lines, and levels using recognized engineering survey practices.
- E. Maintain complete and accurate log of control and survey Work as Work progresses.
- F. Protect survey control points prior to starting Site Work; preserve permanent reference points during construction.
- G. Promptly report to Engineer loss or destruction of reference point or relocation required because of changes in grades or other reasons.
- H. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Engineer.

1.5 EXECUTION

- A. Comply with manufacturer's installation instructions, performing each step in sequence. Maintain one set of manufacturer's installation instructions at Project Site during installation and until completion of construction.
- B. When manufacturer's installation instructions conflict with Contract Documents, request clarification from Engineer before proceeding.
- C. Verify that field measurements are as indicated on approved Shop Drawings or as instructed by manufacturer.
- D. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.
 - 1. Secure Work true to line and level and within specified tolerances, or if not specified, industry-recognized tolerances.

2. Physically separate products in place and provide electrical insulation or protective coatings to prevent galvanic action or corrosion between dissimilar metals.
 3. Exposed Joints: Provide uniform joint width and arrange to obtain best visual effect. Refer questionable visual effect choices to Engineer for final decision.
- E. Allow for expansion of materials and building movement.
- F. Climatic Conditions and Project Status: Install each unit of Work under conditions to ensure best possible results in coordination with entire Project.
1. Isolate each unit of Work from incompatible Work as necessary to prevent deterioration.
 2. Coordinate enclosure of Work with required inspections and tests to minimize necessity of uncovering Work for those purposes.
- G. Mounting Heights: Where not indicated, mount individual units of Work at industry-recognized standard mounting heights for particular application indicated.
1. Refer questionable mounting height choices to Engineer for final decision.
- H. Adjust operating products and equipment to ensure smooth and unhindered operation.
- I. Clean and perform maintenance on installed Work as frequently as necessary through remainder of construction period. Lubricate operable components as recommended by manufacturer.

1.6 CUTTING AND PATCHING

- A. Employ skilled and experienced Installers to perform cutting and patching.
- B. Submit written request in advance of cutting or altering elements affecting the following:
1. Structural integrity of element.
 2. Integrity of weather-exposed or moisture-resistant elements.
 3. Efficiency, maintenance, or safety of element.
- C. Execute cutting, fitting, and patching, including excavation and fill, to complete Work and to accomplish the following:
1. Fit the several parts together, to integrate with other Work.
 2. Uncover Work to install or correct ill-timed Work.
 3. Remove and replace defective and nonconforming Work.
 4. Remove samples of installed Work for testing.
 5. Provide openings in elements of Work for penetrations of mechanical and electrical Work.
- D. Execute Work by methods to avoid damage to other Work and to provide proper surfaces to receive patching and finishing.
- E. Cut masonry and concrete materials using masonry saw or core drill.
- F. Restore Work with new products according to requirements of Contract Documents.
- G. Fit Work tight to pipes, sleeves, ducts, conduits, and other penetrations through surfaces.
- H. Maintain integrity of wall, ceiling, or floor construction; completely seal voids.

- I. At penetrations of walls, partitions, ceiling, or floor construction, completely seal voids with non-shrink material to full thickness of penetrated element.
- J. Identify any hazardous substances or conditions exposed during the Work to Engineer for decision or remedy.

1.7 PROTECTING INSTALLED CONSTRUCTION

- A. Protect installed Work and provide special protection where specified in individual Specification Sections.
- B. Provide temporary and removable protection for installed products. Control activity in immediate Work area to prevent damage.

1.8 STARTING OF SYSTEMS

- A. Coordinate schedule for startup of various equipment and systems.
- B. Notify Engineer and Owner seven days prior to startup of each item.
- C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.
- D. Verify that tests, meter readings, and electrical characteristics agree with those required by equipment or system manufacturer.
- E. Verify that wiring and support components for equipment are complete and tested.
- F. Execute startup under supervision of manufacturer's representative or Contractors' personnel according to manufacturer's instructions.
- G. When specified in individual Specification Sections, require manufacturer to provide authorized representative who will be present at Site to inspect, check, and approve equipment or system installation prior to startup and will supervise placing equipment or system in operation.
- H. Submit a written report in accordance with Section 013300 - Submittal Procedures stating that equipment or system has been properly installed and is functioning correctly.

1.9 DEMONSTRATION AND INSTRUCTION

- A. Demonstrate operation and maintenance of products to Owner's personnel at least seven days prior to date of Substantial Completion.
- B. Demonstrate Project equipment and coordinate instructions by manufacturer's representative who is knowledgeable about the Project and who shall review the contents of operation and maintenance manuals with Owner's personnel in detail to explain all aspects of operation and maintenance.

- C. Demonstrate startup, operation, control, adjustment, troubleshooting, servicing, maintenance, and shutdown of each item of equipment at agreed upon time.
- D. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.
- E. Allot the required instruction time for each item of equipment and system as specified in individual Specification Sections.

1.10 CLOSEOUT PROCEDURES

- A. Prerequisites to Substantial Completion: Complete following items before requesting Certification of Substantial Completion:
 - 1. Submit maintenance manuals, Project record documents, and other similar final record data in compliance with this Section.
 - 2. Complete facility startup, testing, adjusting, balancing of systems and equipment, demonstrations, and instructions to Owner's operating and maintenance personnel as specified in compliance with this Section.
 - 3. Conduct inspection to establish basis for request that Work is substantially complete. Create comprehensive list (initial punch list) indicating items to be completed or corrected, value of incomplete or nonconforming Work, reason for being incomplete, and date of anticipated completion for each item. Include copy of list with request for Certificate of Substantial Completion.
 - 4. Obtain and submit releases, as required in the Technical Specifications.
 - 5. Deliver tools, spare parts, extra stocks of material, and similar physical items to Owner.
 - 6. Make final change-over of locks and transmit keys directly to Owner. Advise Owner's personnel of change-over in security provisions.
 - 7. Discontinue or change over and remove temporary facilities and services from Project Site, along with construction tools, mockups, and similar elements.
 - 8. Perform final cleaning according to this Section.
- B. Substantial Completion Inspection:
 - 1. When Contractor considers Work to be substantially complete, submit to Engineer:
 - a. Written certificate that Work is substantially complete.
 - b. List of items to be completed or corrected (initial punch list).
 - 2. Within seven (7) days after receipt of request for Substantial Completion, Engineer will make inspection to determine whether Work or designated portion is substantially complete.
 - 3. Should Engineer determine that Work is not substantially complete:
 - a. Engineer will promptly notify Contractor in writing, stating reasons for its opinion.
 - b. Contractor shall remedy deficiencies in Work and send second written request for Substantial Completion to Engineer.
 - c. Engineer will reinspect Work.
 - d. Redo and Inspection of Deficient Work: Repeated until Work passes Engineer's inspection.
 - 4. When Engineer finds that Work is substantially complete, Engineer will:

- a. Prepare Certificate of Substantial Completion on EJCDC C-625 - Certificate of Substantial Completion, accompanied by Contractor's list of items to be completed or corrected as verified and amended by Engineer and Owner (final punch list).
 - b. Submit Certificate to Owner and Contractor for their written acceptance of responsibilities assigned to them in Certificate.
 - 5. After Work is substantially complete, Contractor shall:
 - a. Complete Work listed for completion or correction within time period stipulated.
- C. Prerequisites for Final Completion: Complete following items before requesting final acceptance and final payment.
 - 1. When Contractor considers Work to be complete, submit written certification that:
 - a. Contract Documents have been reviewed.
 - b. Work has been examined for compliance with Contract Documents.
 - c. Work has been completed according to Contract Documents.
 - d. Work is completed and ready for final inspection.
 - 2. Submittals: Submit following:
 - a. Final punch list indicating all items have been completed or corrected.
 - b. Final payment request with final releases and supporting documentation not previously submitted and accepted.
 - c. Specified warranties, workmanship/maintenance bonds, maintenance agreements, and other similar documents.
 - d. Accounting statement for final changes to Contract Sum.
 - e. Contractor affidavit of release of liens on Release and Waiver of Liens.
 - 3. Perform final cleaning for Contractor-soiled areas according to this Section.
- D. Final Completion Inspection:
 - 1. Within seven (7) days after receipt of request for final inspection, Engineer will make inspection to determine whether Work is complete.
 - 2. Should Engineer consider Work to be incomplete or defective:
 - a. Engineer will promptly notify Contractor in writing, listing incomplete or defective Work.
 - b. Contractor shall remedy stated deficiencies and send second written request to Engineer that Work is complete.
 - c. Engineer will reinspect Work.
 - d. Redo and Inspection of Deficient Work: Repeated until Work passes Engineer's inspection.

1.11 PROJECT RECORD DOCUMENTS

- A. Maintain on Site one set of the following record documents; record actual revisions to the Work:
 - 1. Drawings.
 - 2. Specifications.
 - 3. Addenda.
 - 4. Change Orders and other modifications to the Contract.
 - 5. Reviewed Shop Drawings, product data, and Samples.
 - 6. Manufacturer's instruction for assembly, installation, and adjusting.

- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress, not less than weekly.
- E. Specifications: Legibly mark and record, at each product Section, description of actual products installed, including the following:
 - 1. Manufacturer's name and product model and number.
 - 2. Product substitutions or alternates used.
 - 3. Changes made by Addenda, bulletin, Change Order, and modifications.
- F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction as follows:
 - 1. Include Contract modifications such as Addenda, supplementary instructions, change directives, field orders, minor changes in the Work, and change orders.
 - 2. Include locations of concealed elements of the Work.
 - 3. Identify depth of buried utility lines and provide dimensions showing distances from permanent facility components that are parallel to utilities.
 - 4. Dimension ends, corners, and junctions of buried utilities to permanent facility components using triangulation.
 - 5. Identify and locate existing buried or concealed items encountered during Project.
 - 6. Measured depths of foundations in relation to finish floor datum.
 - 7. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - 8. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
 - 9. Field changes of dimension and detail.
 - 10. Details not on original Drawings.
- G. Submit marked-up paper copy documents to Engineer before Substantial Completion.
- H. Submit PDF electronic files of marked-up documents to Engineer with claim for final Application for Payment.

1.12 OPERATION AND MAINTENANCE DATA

- A. Submit in PDF composite electronic indexed file.
- B. Submit data bound in 8-1/2 x 11-inch pages in three-D-side ring binders with durable plastic covers. Two copies are required.
 - 1. Where individual sections of the O&M manual would require over 50 pages for a single item, a single page referring to the name and media type of the electronic section may be provided instead. This page shall also include the basic information of the item, including make, model, manufacturer, size, etc. A copy of the marked-up submittal may be acceptable for this purpose.
- C. Prepare binder cover with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS," title of Project, and subject matter of binder when multiple binders are required.

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

1.13 MANUAL FOR EQUIPMENT AND SYSTEMS

- A. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Engineer will review draft and return one copy with comments. An electronic submittal may be acceptable.
- B. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit documents within ten days after acceptance.
- C. Submit one copy of completed volumes before Substantial Completion. Completed volumes, with Engineer comments, will be returned after Substantial Completion. Revise content of document sets as required prior to final submission.
- D. Submit two sets of revised final volumes within ten days after final inspection.
- E. Submit in PDF composite electronic indexed file of final volumes within ten days after final inspection.
- F. Equipment and Systems: Include description of unit or system and component parts. Identify function, normal operating characteristics, and limiting conditions. Include performance curves,

with engineering data and tests, and complete nomenclature and model number of replaceable parts.

- G. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications.
- H. Include color-coded wiring diagrams as installed.
- I. Operating Procedures: Include startup, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shutdown, and emergency instructions. Include summer, winter, and special operating instructions.
- J. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and troubleshooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- K. Include servicing and lubrication schedule and list of lubricants required.
- L. Include manufacturer's printed operation and maintenance instructions.
- M. Include sequence of operation by controls manufacturer.
- N. Include original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- O. Include control diagrams by controls manufacturer as installed.
- P. Include Contractor's coordination drawings indicating installed color-coded piping diagrams.
- Q. Include charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- R. Include list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- S. Include test and balancing reports as specified in Section 014000 - Quality Requirements.
- T. Additional Requirements: As specified in individual product Specification Sections.
- U. Include listing in table of contents for design data with tabbed dividers and space for insertion of data.

1.14 SPARE PARTS AND MAINTENANCE PRODUCTS

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

1.15 FINAL CLEANING

- A. Execute final cleaning prior to final Project assessment.
- B. Clean equipment and fixtures to sanitary condition with appropriate cleaning materials.
- C. Clean or replace filters of operating equipment.
- D. Clean debris from roofs, travel paths, drainage systems, and maintained surfaces.
- E. Remove waste and surplus materials, rubbish, and construction facilities from Site.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION 01 70 00

SECTION 02 01 00
EXISTING UTILITIES AND STRUCTURES

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Certain information regarding the reputed presence, size, character, and location of existing Underground Facilities such as pipes, drains, sewers, electrical lines, telephone lines, cable TV lines, gas lines, fiberoptics and water lines has been shown on the Contract Drawings and/or provided in the contract documents. This information with respect to Underground Facilities is provided by the Owner in accordance with conditions described in the General Conditions and for information purposes only. Contractor is responsible to determine actual location of all utilities in proximity to the work for the purposes of the preparation of their Bid and during construction using hydroexcavation or other “soft-dig” methods of excavation in order to locate the utility without causing any damage to the utility lines.
- B. Contractor to verify location and depth of 6-inch gravity pipe as indicated on the Drawings.

1.2 NOTIFICATION OF UTILITIES

- A. Notify the applicable Agency with jurisdiction over underground facilities and/or all utility companies that may be affected by construction Work under this Contract. Notify these parties in advance to support the construction Work (minimum 72 hours). All excavation in the vicinity of existing underground utilities shall be performed in accordance with applicable regulations.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Furnish all materials for temporary support, adequate protection, and maintenance of all underground and surface utility structures, supports, drains, sewer and other obstructions encountered in the progress of the Work.

PART 3 - EXECUTION

3.1 OBSTRUCTIONS BY OTHER UTILITY STRUCTURES

- A. Support, relocate, remove, or reconstruct existing utility structures such as conduits, ducts, pipes, electric lines, gas pipes, telephone cable, cable TV lines, fiberoptics, branch connections to main sewers, water mains, or drains. The obstruction shall be permanently supported, relocated, removed or reconstructed where they obstruct the grade or alignment of the pipe. Contractor must do so in cooperation with the owners of such utility structures. Before proceeding, the Contractor must reach an agreement with the Engineer on the method to work around the obstruction.

- B. No deviation shall be made from the required line or depth without the consent of the Engineer.

3.2 REPAIRS

- A. Repair or replace any damage to existing structures, work, materials, or equipment incurred by Contractor's operations.
- B. Repair all damage to streets, roads, trails, curbs sidewalks, highways, shoulders, ditches, embankments, culverts, bridges, trees, shrubs or other public or private property caused by transporting equipment, materials or personnel to or from the Work site. Make satisfactory and acceptable arrangements with the persons or agencies having jurisdiction over the damaged property concerning repair or replacement.
- C. Brace and support existing pipes or conduits crossing the trench, or otherwise exposed to prevent trench settlement from disrupting the line or grade of the pipe or conduit. Before proceeding, the Contractor must reach an agreement with the Engineer on the method of bracing and support. Repair or replace all utility services broken or damaged at once to avoid inconvenience to customers. Storm sewers shall not be interrupted overnight. Use temporary arrangements, as approved by the Engineer, until any damaged items can be permanently repaired. Maintain all items damaged or destroyed by construction and subsequently repaired.
- D. Repair or replacement of storm drains or water mains removed or damaged during installation of the sanitary line or treatment plant shall be repaired immediately. Repairs or replacement of storm drains or water mains shall meet all local, state and federal requirements.

3.3 RELOCATION

- A. Relocate existing utilities or structures, where necessary, and restore to a condition equal to that of the original facility. Obtain approval of the owner of the utility or structure prior to relocating and/or restoring the facility.

END OF SECTION 02 01 00

SECTION 03 10 00
CONCRETE FORMING AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Formwork for cast-in-place concrete.
2. Shoring, bracing, and anchorage.
3. Form accessories.
4. Form stripping.

B. Related Requirements:

1. Section 03 20 00 - Concrete Reinforcing: Reinforcing steel and required supports for cast-in-place concrete.
2. Section 03 30 00 - Cast-in-Place Concrete: Cast-in-place or in-situ concrete for structural building frame, slabs-on-grade, and other concrete components associated with building.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

- A. Formwork Basis of Payment:** Incidental to concrete work, including form materials, placement, placing accessories, and stripping.

1.3 REFERENCE STANDARDS

A. American Concrete Institute:

1. ACI 301 - Specifications for Structural Concrete.
2. ACI 318 - Building Code Requirements for Structural Concrete.
3. ACI 347 - Guide to Formwork for Concrete.

B. American Forest & Paper Association:

1. AF&PA - National Design Specification (NDS) for Wood Construction.

C. ASTM International:

1. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
2. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.

1.4 COORDINATION

- A. Section 01 30 00 - Administrative Requirements:** Requirements for coordination.

- B. Coordinate Work of this Section with other Sections of Work in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other Work.**

1.5 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Shop Drawings:
 - 1. Formwork, shoring, and reshoring.
 - 2. Pertinent dimensions, openings, methods of construction, types of connections, materials, joint arrangement and details, ties and shores, location of framing, studding and bracing, and temporary supports.
 - 3. Means of leakage prevention for concrete exposed to view in finished construction.

1.6 QUALITY ASSURANCE

- A. Perform Work according to ACI 347 and 301.
- B. For wood products furnished for Work of this Section, comply with AF&PA.

PART 2 - PRODUCTS

2.1 PERFORMANCE AND DESIGN CRITERIA

- A. Design, engineer, and construct formwork, shoring, and bracing according to ACI 318 to conform to applicable code requirements to achieve concrete shape, line, and dimension as indicated on Drawings.
- B. Vapor Retarder Permeance: Maximum 1 perm when tested according to ASTM E96, water method.

2.2 WOOD FORM MATERIALS

- A. Form Materials: At discretion of Contractor.

2.3 PREFABRICATED FORMS

- A. Manufacturers:
 - 1. EFCO - Economy Forms Corp.
 - 2. Molded Fiber Glass Construction Products.
 - 3. Sonoco Products Co.
 - 4. Symons by Dayton Superior.
 - 5. Wall-Ties & Forms, Inc.
 - 6. Western Forms.
 - 7. Substitutions: As specified in Section 01 60 00 - Product Requirements.
- B. Preformed Steel Forms:
 - 1. Description: Matched, tightly fitted, and stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.
 - 2. Minimum Thickness: 16 gage.

- C. FRP Forms: Matched, tightly fitted, and stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished concrete surfaces.
- D. Pan:
 - 1. Material: Steel or Glass fiber.
 - 2. Configuration: Size and profile as required.
- E. Void Forms:
 - 1. Moisture-resistant treated paper faces; biodegradable.
 - 2. Structurally sufficient to support weight of wet concrete mix until initial set.
 - 3. Thickness: 2 inches.
 - 4. Manufacturers:
 - a. Molded Fiber Glass Construction Products.
 - b. Sonoco Products Co.
 - c. Symons by Dayton Superior.
 - d. Substitutions: As specified in Section 016000 - Product Requirements.
- F. Steel Forms:
 - 1. Description: Sheet steel, suitably reinforced.
 - 2. Design: For particular use as indicated on Drawings.
- G. Form Liners: Smooth, durable, grainless, and non-staining hardboard unless otherwise indicated on Drawings.
- H. Framing, Studding, and Bracing: Stud or No. 3 structural light-framing grade.

2.4 FORMWORK ACCESSORIES

- A. Spreaders:
 - 1. Description: Standard, non-corrosive metal-form clamp assembly, of type acting as spreaders and leaving no metal within 1 inch of concrete face.
 - 2. Wire ties, wood spreaders, or through bolts are not permitted.
- B. Form Release Agent:
 - 1. Description: Colorless mineral oil that will not stain concrete or absorb moisture.
 - 2. Manufacturers:
 - a. Architectural Concrete Chemicals, LLC.
 - b. Nox-Crete Products Group.
 - c. Substitutions: As specified in Section 01 60 00 - Product Requirements.
- C. Bituminous Joint Filler: Comply with ASTM D1751.
- D. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Size, strength, and character to maintain formwork in place while placing concrete.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.
- B. Verify lines, levels, and centers before proceeding with formwork.
- C. Verify that dimensions agree with Drawings.
- D. If formwork is placed after reinforcement resulting in insufficient concrete cover over reinforcement, request instructions from Engineer before proceeding.

3.2 INSTALLATION

- A. Earth Forms:
 - 1. Trench earth forms neatly, accurately, and at least 2 inches wider than footing widths indicated on Drawings.
 - 2. Trim sides and bottom of earth forms.
 - 3. Construct wood edge strips at top of each side of trench to secure reinforcing and to prevent trench from sloughing.
 - 4. Form sides of footings where earth sloughs.
 - 5. Tamp earth forms firm and clear them of debris and loose material before depositing concrete.
- B. Formwork:
 - 1. Construct forms to correct shape and dimensions, mortar-tight, braced, and of sufficient strength to maintain shape and position under imposed loads from construction operations.
 - 2. Positioning:
 - a. Carefully verify horizontal and vertical positions of forms.
 - b. Correct misaligned or misplaced forms before placing concrete.
 - 3. Complete wedging and bracing before placing concrete.
 - 4. Erect formwork, shoring and bracing to achieve design requirements according to ACI 301.
 - 5. Stripping:
 - a. Arrange and assemble formwork to permit dismantling and stripping.
 - b. Do not damage concrete during stripping.
 - c. Permit removal of remaining principal shores.
 - 6. Install fillet and chamfer strips on external corners of slabs.
 - 7. Install void forms according to manufacturer instructions.
 - 8. Do not patch formwork.
 - 9. Leave forms in place for minimum number of days according to ACI 347.
- C. Form Removal:
 - 1. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads, and removal has been approved by Architect/Engineer.
 - 2. Loosen forms carefully; do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.

3. Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged.
 4. Discard damaged forms.
 5. Form Release Agent:
 - a. Apply according to manufacturer instructions.
 - b. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.
 - c. Do not apply form release agent if concrete surfaces are indicated to receive special finishes or applied coverings that may be affected by agent.
 - d. Soak inside surfaces of untreated forms with clean water, and keep surfaces coated prior to placement of concrete.
 6. Form Cleaning:
 - a. Clean forms as erection proceeds to remove foreign matter within forms.
 - b. Clean formed cavities of debris prior to placing concrete.
 - c. Flush with water or use compressed air to remove remaining foreign matter.
 - d. Ensure that water and debris drain to exterior through cleanout ports..
 - e. Cold Weather:
 - 1) During cold weather, remove ice and snow from within forms.
 - 2) Do not use de-icing salts.
 - 3) Do not use water to clean out forms, unless formwork and concrete construction proceed within heated enclosure; use compressed air or other dry method to remove foreign matter.
 - f. Reuse and Coating of Forms:
 - 1) Thoroughly clean forms and reapply form coating before each reuse.
 - 2) For exposed Work, do not reuse forms with damaged faces or edges.
 - g. Apply form coating to forms according to manufacturer instructions.
 - h. Do not coat forms for concrete indicated to receive "scored finish."
 - i. Apply form coatings before placing reinforcing steel.
- D. Forms for Smooth Finish Concrete:
1. Use steel, plywood, or lined-board forms.
 2. Use clean and smooth plywood and form liners, uniform in size, and free from surface and edge damage capable of affecting resulting concrete finish.
 3. Install form lining with close-fitting square joints between separate sheets without springing into place.
 4. Use full-sized sheets of form liners and plywood wherever possible.
 5. Tape joints to prevent protrusions in concrete.
 6. Apply forming and strip wood forms in a manner to protect corners and edges.
 7. Level and continue horizontal joints.
 8. Keep wood forms wet until stripped.
- E. Framing, Studding, and Bracing:
1. Maximum Spacing of Studs:
 - a. Boards: Maximum 16 inches o.c.
 - b. Plywood: 12 inches o.c.
 2. Size framing, bracing, centering, and supporting members for sufficient strength to maintain shape and position under imposed loads from construction operations.
 3. Construct beam soffits of material minimum 2 inches thick.
 4. Distribute bracing loads over base area on which bracing is erected.
 5. When placed on ground, protect against undermining, settlement, and accidental impact.

- F. Form Ties:
 - 1. Provide sufficient strength and quantity to prevent spreading of forms.
 - 2. Place ties at least 1 inch away from finished surface of concrete.
 - 3. Leave inner rods in concrete when forms are stripped.
 - 4. Space form ties equidistant, symmetrical, and aligned vertically and horizontally unless indicated otherwise on Drawings.
- G. Arrange formwork to allow proper erection sequence and to permit form removal without damage to concrete.
- H. Construction Joints:
 - 1. Install surfaced pouring strip where construction joints intersect on exposed surfaces to provide straight line at joints.
 - 2. Just prior to subsequent concrete placement, remove strip and tighten forms to conceal shrinkage.
 - 3. Appearance:
 - a. Show no overlapping of construction joints.
 - b. Construct joints to present same appearance as butted plywood joints.
 - 4. Arrange joints in continuous line straight, true, and sharp.
- I. Screeds:
 - 1. Set screeds and establish levels for tops of and finish on concrete slabs.
 - 2. Slope slabs to drain where required or as indicated on Drawings.
 - 3. Before depositing concrete, remove debris from space to be occupied by concrete and thoroughly wet forms; remove freestanding water.
- J. Cleanouts and Access Panels:
 - 1. Provide removable cleanout sections or access panels at bottoms of forms to permit inspection and effective cleaning of loose dirt, debris, and waste material.
 - 2. Clean forms and surfaces against which concrete is to be placed.
 - 3. Remove chips, sawdust, and other debris.
 - 4. Thoroughly blow out forms with compressed air just before concrete is placed.

3.3 TOLERANCES

- A. Construct formwork to maintain tolerances according to ACI **301**.

3.4 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Requirements for inspecting and testing.
- B. Inspection:
 - 1. Inspect erected formwork, shoring, and bracing to ensure that Work complies with formwork design and that supports, fastenings, wedges, ties, and items are secure.
 - 2. Schedule concrete placement to permit formwork inspection before placing concrete.

END OF SECTION 03 10 00

**SECTION 032000
CONCRETE REINFORCING**

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Reinforcing bars.
 - 2. Reinforcement accessories.

- B. Related Requirements:
 - 1. Section 031000 - Concrete Forming and Accessories: Form materials and accessories required to form cast-in-place concrete.
 - 2. Section 033000 - Cast-in-Place Concrete: Cast-in-place or in-situ concrete for structural building frame, slabs on grade, and other concrete components associated with building.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

- A. Bar Reinforcement:
 - 1. Basis of Payment: Incidental to concrete work, including reinforcement, placement, and accessories.

1.3 REFERENCE STANDARDS

- A. American Concrete Institute:
 - 1. ACI 301 - Specifications for Structural Concrete.
 - 2. ACI 318 - Building Code Requirements for Structural Concrete.
 - 3. ACI 530/530.1 - Building Code Requirements and Specification for Masonry Structures.
 - 4. ACI SP-66 - ACI Detailing Manual.

- B. American Welding Society:
 - 1. AWS D1.4 - Structural Welding Code - Reinforcing Steel.

- C. ASTM International:
 - 1. ASTM A615 - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
 - 2. ASTM A706 - Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement.
 - 3. ASTM A767 - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.
 - 4. ASTM A884 - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement.
 - 5. ASTM A934 - Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars.

- D. Concrete Reinforcing Steel Institute:
 - 1. CRSI 10-MSP - Manual of Standard Practice.
 - 2. CRSI 10PLACE - Placing Reinforcing Bars.

1.4 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.
- B. Coordinate Work of this Section with placement of formwork, formed openings, and other Work.

1.5 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Shop Drawings:
 - 1. Indicate bar sizes, spacings, locations, splice locations, and quantities of reinforcing steel.
 - 2. Indicate bending and cutting schedules.
 - 3. Indicate supporting and spacing devices.
- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- D. Submit certified copies of mill test report of reinforcement materials analysis.
- E. Welder Certificates: Certify welders and welding procedures employed on Work, verifying AWS qualification within previous 12 months.

1.6 QUALITY ASSURANCE

- A. Perform Work according to ACI 301.
- B. Prepare Shop Drawings according to ACI SP-66.

1.7 QUALIFICATIONS

- A. Welders: AWS qualified within previous 12 months for employed weld types.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- C. Store materials according to manufacturer instructions.
- D. Protection:

1. Protect materials from moisture by storing in clean, dry location remote from construction operations areas.
2. Provide additional protection according to manufacturer instructions.

1.9 EXISTING CONDITIONS

- A. Field Measurements:
1. Verify field measurements prior to fabrication.
 2. Indicate field measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 REINFORCEMENT

- A. Reinforcing Steel:
1. Comply with ASTM A615.
 2. Yield Strength: 60 ksi.
 3. Billet Bars: Deformed.
 4. Finish: Galvanized

2.2 FABRICATION

- A. Fabricate concrete reinforcement according to applicable code.
- B. Form standard hooks as indicated on Drawings.
- C. Form reinforcement bends with minimum diameters according to applicable code.
- D. Fabricate column reinforcement with offset bends at reinforcement splices.
- E. Form spiral column reinforcement from minimum 3/8-inch-diameter continuous deformed bar or wire.
- F. Form ties and stirrups from following:
1. Bars No. 10 and Smaller: No. 3 deformed wire.
 2. Bars No. 11 and Larger: No. 4 deformed wire.
- G. Weld reinforcement according to AWS D1.4.
- H. Galvanized Reinforcement: Clean surfaces, weld, and re-protect welded joint according to CRSI 10PLACE.
- I. Splicing:
1. If not indicated on Drawings, locate reinforcement splices at point of minimum stress.

2.3 SHOP FINISHING

- A. Galvanized Finish for Steel Bars:
 - 1. Comply with ASTM A767 Class II.
 - 2. Hot-dip galvanized after fabrication.
- B. Epoxy-Coated Finish for Steel Bars: Comply with ASTM A934.
- C. Epoxy-Coated Finish for Steel Wire: Comply with ASTM A884, Class A.

2.4 ACCESSORY MATERIALS

- A. Tie Wire:
 - 1. Minimum 16 gage, annealed type.
- B. Chairs, Bolsters, Bar Supports, and Spacers:
 - 1. Size and Shape: To strengthen and support reinforcement during concrete placement conditions.
- C. Special Chairs, Bolsters, Bar Supports, and Spacers Adjacent to Weather-Exposed Concrete Surfaces:
 - 1. Material: Plastic-coated steel.
 - 2. Size and Shape: To meet Project conditions.
- D. Reinforcing Splicing Devices:
 - 1. Type: Exothermic welding type; full **tension and compression**.
- E. Epoxy Coating Patching Material: Type as recommended by coating manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Place, support, and secure reinforcement against displacement.
- B. Do not deviate from required position beyond specified tolerance.
- C. Do not weld crossing reinforcement bars for assembly.
- D. Do not displace or damage vapor retarder.
- E. Accommodate placement of formed openings.
- F. Spacing:

1. Space reinforcement bars with minimum clear spacing equal to one bar diameter but not less than 1 inch.
 2. If bars are indicated in multiple layers, place upper bars directly above lower bars.
- G. Maintain minimum concrete cover around reinforcement according to **ACI 318** as follows:
1. Footings and Concrete Formed against Earth: 3 inches.
 2. Concrete Exposed to Earth or Weather:
 - a. No. 6 Bars and Larger: 2 inches.
 - b. No. 5 Bars and Smaller: 1-1/2 inches.
 3. Supported Slabs, Walls, and Joists:
 - a. No. 14 Bars and Larger: 1-1/2 inches.
 - b. No. 11 Bars and Smaller: 3/4 inch.
 4. Beams and Columns: 1-1/2 inches.
 5. Shell and Folded Plate Members:
 - a. No. 6 Bars and Larger: 3/4 inch.
 - b. No. 5 Bars and Smaller: 1/2 inch.
- H. Splice reinforcing according to manufacturer's instructions.

3.2 TOLERANCES

- A. Section 01 40 00 - Quality Requirements: Requirements for tolerances.
- B. Install reinforcement within following tolerances for flexural members, walls, and compression members:
1. Reinforcement Depth Greater Than 8 Inches:
 - a. Depth Tolerance: Plus or Minus 3/8 inch.
 - b. Concrete Cover Tolerance: Minus 3/8 inch.
 2. Reinforcement Depth Less Than or Equal to 8 Inches:
 - a. Depth Tolerance: Plus or Minus 1/2 inch.
 - b. Concrete Cover Tolerance: Minus 1/2 inch.
- C. Foundation Walls: Install reinforcement within tolerances according to ACI 530/530.1.

3.3 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Requirements for inspecting and testing.
- B. Perform field inspection and testing according to applicable code.

C. Reinforcement Inspection:

1. Placement Acceptance: Inspect specified material requirements and specified placement tolerances.
2. Welding: Inspect welds according to AWS D1.1.
3. Periodic Placement Inspection: Inspect for correct materials, fabrication, sizes, locations, spacing, concrete cover, and splicing.
4. Weldability Inspection: Inspect for reinforcement weldability if formed from steel other than ASTM A706.
5. Continuous Weld Inspection: Inspect reinforcement according to applicable code.
6. Periodic Weld Inspection: Inspect other welded connections.

END OF SECTION 03 20 00

SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Provide concrete for structures such as manholes, wastewater lift stations, wastewater channels, valve or meter vaults, storage tanks, above ground junction boxes, thrust blocking, manhole bases, pipe encasement, anti-seep collar, curbs, sidewalks and pavement in accordance with this Specification Section. This section is not applicable to flowable fill.

1.2 REFERENCE STANDARDS

- A. ASTM International:
 - 1. ASTM C150: Standard Specification for Portland Cement.
 - 2. ASTM C260: Standard Specification for Air-Entraining Admixtures for Concrete.
 - 3. ASTM C33: Standard Specification for Concrete Aggregates.
 - 4. ASTM A615: Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
 - 5. ASTM ADJA0185: Adjunct to A185 Steel Welded Wire Reinforcement, Plain, for Concrete and A497 Steel Wire, Deformed, for Concrete Reinforcement.
 - 6. ASTM D1751: Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Asphalt Types).
 - 7. ASTM C94: Standard Specification for Ready-Mixed Concrete.
- B. American Concrete Institute:
 - 1. ACI 318 - Building Code Requirements for Structural Concrete and Commentary.

1.3 SUBMITTALS

- A. Subcontractor shall submit a certification from the concrete producer, as well as supporting data, stating that the cement concrete conforms to the compressive strength needed for the proposed project.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Portland Cement shall be Type I or Type III and conform to "Specification for Portland Cement" ASTM C150.
- B. Air-Entraining Agent from approved manufacturer shall be added in accordance with manufacturer's directions to the normal Portland cement to entrain 4½ percent air ± 1 percent with

all other ingredients and strength or as specified by Owner. Air-entraining admixtures shall conform to "Specifications for Air-Entraining Admixtures for Concrete" ASTM C260.

- C. Concrete Aggregates shall conform to "Specifications for Concrete Aggregates" ASTM C33. Coarse aggregates shall be a maximum of 1½- inches in size in footings and plain concrete. Pea gravel shall be used for sections 3-inches or less in thickness.
- D. Water used in mixing concrete shall be clean and free from injurious amounts of oils, acids, alkalis, organic materials, or other deleterious substances. In effect, the water used shall be potable water.
- E. Reinforcing Bars shall be billet steel grade (60,000 psi minimum yield) conforming to the requirements of ASTM A615, Grade 60. Reinforcing bars shall be new stock, free from rust, scale, or other coatings that tend to destroy or reduce bonding.
- F. Welded Wire Mesh shall conform to "Specifications for Welded Steel Wire Fabric for Concrete Reinforcements" ASTM ADJA0185.
- G. Pre-molded Expansion Joint Material shall be provided where shown on the Drawings or directed by the Owner. This non-extruding compressible joint material shall conform to the requirements of "Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction", ASTM D1751.
- H. Furnish all materials for temporary support, adequate protection, and maintenance of all underground and surface utility structures, supports, drains, sewer and other obstructions encountered in the progress of the Work.

2.2 CONCRETE MIXES

- A. Ready-mixed concrete shall conform to "Specifications for Ready-Mixed Concrete", ASTM C94.
 - 1. All concrete mixes shall produce a dense durable concrete. The minimum 28-day compressive strength of the concrete shall be:
 - a. 3,000 psi - thrust blocking, sidewalks, curbs and pipe encasement.
 - b. 4,000 psi – manholes, channels, meter vaults and manhole bases, manhole channels, road pavement, walls and slabs for pump stations, meter vaults, foundations for water storage tanks, and the like.
- B. Water/cement ratio for the concrete shall not exceed a maximum as shown in Table 4.4 of the ACI Standard 318 latest edition, Building Code Requirements for Reinforced Concrete, when strength data from field experience or trial mixtures are not available. A workable concrete with minimum slump of 3-inches and a maximum slump of 5-inches shall be produced without exceeding the water/ cement ratio.

PART 3 - EXECUTION

3.1 FORMWORK

- A. Build all forms mortar tight and of sufficient rigidity to prevent distortion due to the pressure of the concrete and other loads incidental to the construction operations. Construct and maintain forms so as to prevent warping and the opening of joints.
- B. The forms shall be substantial and unyielding. Design the forms so that the finished concrete conforms to the proper dimensions and contours. Design the forms to take into account the effect of the vibration of concrete during placement.

3.2 PLACING REINFORCING STEEL

- A. Place all steel reinforcement accurately in the positions shown on the Drawings. Secure the steel reinforcements firmly in place during the placing and setting of concrete. When placed in the work, it shall be free from dirt, detrimental rust, loose scale, paint, oil or other foreign material. When spacing between crossing tiebars is one foot or more, tie all bars at all intersections. When spacing is less than one foot in each direction, tie alternate intersections of bars.
- B. Maintain distances from the forms by means of stays, blocks, ties, hangers or other approved supports. Continuous high chairs will not be permitted. Furnish all reinforcement in full lengths as indicated on the Drawings. Splicing of bars will not be permitted without the approval of the Owner, except where shown on the Drawings. Stagger splices as far apart as possible. Unless otherwise shown on the Drawings, bars shall be lapped 36 diameters to make the splice.
- C. Lap welded wire mesh at least 1½ meshes plus end extension of wires but not less than twelve 12-inches in structural slabs. Lap welded wire mesh at least ½ mesh plus end extension of wires but not less than 6- inches in slabs on the ground.

3.3 CONVEYING AND PLACING CONCRETE

- A. Convey concrete from the mixer to the forms as rapidly as practical by approved methods which will prevent segregation and loss of ingredients.
- B. Clean formwork of dirt and construction debris, drain water, and remove snow and ice. After the forms have been inspected, deposit the concrete in approximately horizontal layers to avoid flowing along the forms. Place all concrete in the dry free from standing water. Deposit all concrete continuously or in layers of a thickness such that no concrete will be deposited on concrete which has hardened sufficiently to cause the formation of seams and planes of weakness within the sections. Place the concrete to create a monolithic structure the component parts of which are securely bonded together. Compact the concrete during placement by suitable means. Work the concrete around the reinforcement and embedded fixtures and into corners and angles of forms, taking care to avoid overworking which may result in segregation.
- C. Do not drop concrete into forms from a height greater than 5 feet. Use a spout to deposit concrete from a greater height; or provide openings in the forms limit the height of drop. Obtain the

approval of Owner before using any other method of placing concrete from a height greater than 5 feet.

- D. Direct concrete through chutes to prevent it from striking reinforcement or sides of the form above the level of placement. Avoid segregation and coating of the surfaces with paste which may dry before concrete reaches its level.
- E. Submit a concrete mix design to Owner for approval prior to placing any concrete by pumping.

3.4 PLACING CONCRETE IN COLD AND WARM WEATHER

- A. Follow the provisions of ACI 306, ACI 308 and Paragraph 3. 8 of USACE, Standard Practice for Concrete for Civil Works Structures, when the ambient temperature is less than 40 °F at time of placement or expected to be less than 40 °F during the curing period.
- B. Control concrete setting time with the use of accelerating admixtures as required to facilitate placing and finishing operations. Do not use calcium chloride in excess of 2% by weight in the concrete free of steel reinforcement. Where steel reinforcement is employed and concrete with calcium chloride is permitted, Contractor must use galvanized or coated steel satisfactory to the Owner.
- C. Exposed subgrade, formwork and reinforcing shall be warmer than 33°F prior to placement of concrete.
- D. The temperature of the concrete during placing shall be between 55 °F and 75 °F. Maintain the temperature of the concrete between 55 °F and 75 °F for a minimum of 5 days by providing insulating blankets, heated enclosures, or other methods of thermal protection. Provide a means of maintaining atmospheric moisture when dry heat is used. Provide proper curing for a minimum of days or as approved by the Owner.
- E. In case of low air temperatures (below 40 °F), submit a plan to comply with this section. Owner may, at their discretion, raise the minimum limiting temperatures for water, aggregates and mixed concrete when temperatures drop below 40 °F.
- F. Protect all earth-supported concrete from damage due to frost heave.

END OF SECTION 03 30 00

SECTION 03 39 00 CONCRETE CURING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Initial and final curing of horizontal and vertical concrete surfaces.
- B. Related Requirements:
 - 1. Section 03 30 00 - Cast-in-Place Concrete

1.2 REFERENCE STANDARDS

- A. American Concrete Institute:
 - 1. ACI 308.1 - Specification for Curing Concrete.
- B. ASTM International:
 - 1. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit manufacturer's information on curing compounds and mats, including compatibilities and limitations.
- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- D. Manufacturer Instructions: Submit detailed instructions on installation requirements, including storage and handling procedures.
- E. Qualifications Statement:
 - 1. Submit qualifications for manufacturer.

1.4 QUALITY ASSURANCE

- A. Perform Work according to ACI 308.1.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

- C. Store materials according to manufacturer instructions.
- D. Protection:
 - 1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
 - 2. Provide additional protection according to manufacturer instructions.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Absorptive Mats: Comply with ASTM C171.
- B. Water: Potable; not detrimental to concrete.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for application examination.
- B. Verify that substrate surfaces are ready to be cured.

3.2 APPLICATION

- A. Horizontal Surfaces:
 - 1. Absorptive Mat:
 - a. Saturate burlap-PE and place burlap-side down over floor slab areas.
 - b. Lap ends and sides.
 - c. Maintain in place for seven days.

3.3 PROTECTION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protecting finished Work.
- B. Do not permit traffic over unprotected floor surfaces.

END OF SECTION 03 39 00

SECTION 03 40 01
PRECAST CONCRETE MANHOLES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Precast concrete manholes and level control structures for sanitary sewers or as indicated on the Drawings.
- B. Precast concrete sanitary sewer manholes with fiberglass liner or sewer gas resistance epoxy coating where corrosion resistant manholes are specifically required to prevent early deterioration of the manhole.
- C. Pile-supported concrete foundation used for unstable subgrade treatment for manhole base.

1.2 RELATED SECTIONS

- A. Section 03 30 00 - Cast-In-Place Concrete
- B. Section 31 05 13 - Soils for Earthwork
- C. Section 31 21 16 - Excavation
- D. Section 31 32 16.13 - Trenching
- E. Section 33 05 05.36 – Vacuum Testing of Manholes

1.3 REFERENCE STANDARDS

- A. American Association of State Highway and Transportation Officials:
 - 1. AASHTO M306: Standard Specification for Drainage, Sewer, Utility, and Related Castings.
 - 2. AASHTO Wheel Loading Specifications.
- B. American Society for Testing and Materials International:
 - 1. ASTM C478: Standard Specification for Circular Precast Reinforced Concrete Manhole Sections
 - 2. ASTM A48: Standard Specification for Gray Iron Castings
 - 3. ASTM C443: Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
 - 4. ASTM C923: Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals.
 - 5. ASTM D1557: Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort.
 - 6. ASTM C1107: Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
- C. American Water Works Association:

1. AWWA C213:Fusion-Bonded Epoxy Coatings and Linings for Steel Water Pipe and Fittings
- D. Missouri Department of Transportation:
 1. Missouri Standard Specifications for Highway Construction

1.4 SUBMITTALS

- A. Conform to requirements of Section - Submittals.
- B. Submit Manufacturer's data and details of following items for approval:
 1. Shop drawings of manhole sections, base units and construction details, including reinforcement, jointing methods, materials and dimensions.
 2. Summary of criteria used in manhole design including, as minimum, material properties, loadings, load combinations, and dimensions assumed. Include certification from manufacturer that precast manhole design is in full accordance with ASTM C478 and design criteria as established in this Specification.
 3. Frames, grates, rings, and covers.
 4. Materials to be used in fabricating drop connections.
 5. Materials to be used for pipe connections at manhole walls.
 6. Materials to be used for stubs and stub plugs, if required.
 7. Materials and procedures for corrosion-resistant liner and coatings, if required.
 8. Plugs to be used for sanitary sewer hydrostatic testing.
 9. Manufacturer's data for pre-mix (bag) concrete, if used for channel inverts and benches.

PART 2 - PRODUCTS

2.1 PRECAST CONCRETE MANHOLES

- A. Provide manhole sections, base sections, and related components conforming to ASTM C478. Provide base riser section with integral floors, unless shown otherwise. Provide adjustment rings which are standard components of manufacturer of manhole sections. Mark date of manufacture and name or trademark of manufacturer on inside of barrel.
- B. Construct barrels for precast manholes from standard reinforced concrete manhole sections of diameter indicated on Drawings. Use various lengths of manhole sections in combination to provide correct height with fewest joints.
- C. Provide tops to support AASHTO HS-20 vehicle loading, and receive cast iron frame covers, as indicated on OWNER Standard Drawings.
- D. Design Loading Criteria: Manhole walls, transition slabs, cone tops, and manhole base slab shall be designed by manufacturer, to requirements of ASTM C478 for depth as shown on Drawings and to resist the following loads.
 1. AASHTO HS-20 vehicle loading applied to manhole cover and transmitted down to transition and base slabs, unless otherwise specified on Drawings.

2. Unit soil weight of 120 lbs/ft³ located above portions of manhole, including base slab projections.
 3. Lateral soil pressure based on saturated soil conditions producing an at- rest equivalent fluid pressure of 100 lbs/ft³.
 4. Internal liquid pressure based on unit weight of 63 lbs/ft³.
 5. Dead load of manhole sections fully supported by transition and base slabs.
- E. When base is cast monolithic with portion of vertical section, extend reinforcing in vertical section into base.
- F. Precast Concrete Base: Suitable cutouts or holes to receive pipe and connections. Lowest edge of holes or cutouts: For water line manhole, no less than 6-inches above inside surface of floor of base.

2.2 CONCRETE

- A. Conform to requirements of Section 03 30 00 - Cast-In-Place Concrete.
- B. Channel Inverts: Use concrete for inverts not integrally formed with manhole base, with minimum compressive strength of 4,000 psi.
- C. Concrete Foundation: Provide concrete with minimum compressive strength of 4,000 psi for concrete foundation slab under manhole base section as indicated on Drawing.

2.3 REINFORCING BARS

- A. Conform to the requirements of Section 03 30 00 - Cast-In-Place Concrete.

2.4 FRAMES AND COVERS

- A. Use castings for frames, grates, rings and covers conforming to ASTM A48, Class 35B.
- B. Use clean castings capable of withstanding application of AASHTO M306 - 40,000 pound proof loading without detrimental permanent deformation.
- C. Fabricate castings to conform to shapes and dimensions as required by Specifications.
- D. Castings shall be smooth, clean, and free from blowholes and other surface imperfections. Use clean and symmetrical cast holes in covers, free of plugs.
- E. Provide watertight manhole frames and covers when the top of the frame and cover is below the 100-year flood elevation or when subjected to ponding, unless otherwise shown on the Drawings. Watertight manhole frames and covers shall be provided with minimum of four bolts and gasket designed to seal cover to frame. Supply approved watertight manhole covers and frames.

2.5 DROP CONNECTIONS AND STUBS

- A. All manhole drop connections shall be inside drop unless prior written approval from Owner. Inside drops shall be provided when the invert elevation into the manhole is 24-inches higher than the manhole invert.

1. Pipe material used for inside drops shall be same pipe material as sewer main, unless otherwise shown on Drawings.

2.6 PIPE CONNECTIONS TO MANHOLE

A. Sanitary Sewers.

1. Provide resilient connectors conforming to requirements of ASTM C923. Use the following materials for metallic mechanical devices as defined in ASTM C923:
 - a. A-Lok or approved equivalent.
 - b. External clamps: Type 304 stainless steel.
 - c. Internal, expandable clamps on standard manholes: Type 304 stainless steel, 11-gauge minimum.
 - d. Internal, expandable clamps on corrosion-resistant manholes: Type 316 stainless steel, 11 gauge minimum coated with minimum 16 mil fusion bonded epoxy conforming to AWWA C213.

2.7 SEALANT MATERIALS

- A. Provide sealing materials between precast concrete adjustment ring and manhole cover frame in accordance with ASTM C443.

2.8 CORROSION RESISTANT MANHOLE MATERIALS

- A. Where corrosion-resistant manholes are required, such as a manhole receiving a forcemain or manholes located within a 1,000 feet downstream of a forcemain discharge, provide a fiberglass liner or sewer gas resistant epoxy coating for precast cylindrical manhole section, base sections, and cone sections. Liners relying on mechanically fastened batten strips as primary means of anchorage are unacceptable. All manholes with a corrosion resistant interior coating shall be provided with an exterior bituminous coating in locations where ground water table can reach above the base of the manhole.

2.9 NON-SHRINK GROUT

- A. Provide prepackaged, inorganic, flowable, non-gas-liberating, non-metallic, cement-based grout requiring only addition of water.
- B. Meet requirements of ASTM C1107 and have a minimum 28-day compressive strength of 7,000 psi.

2.10 MANHOLE LADDER FOR MANHOLES

- A. Manhole Ladder: Fiberglass with 300-lbs. rating at appropriate length; conform to requirements of OSHA.
 1. Use components, including rungs, made of fiberglass, fabricated with nylon or aluminum rivets and/or epoxy. Apply non-skid coating to ladder rungs. Mount ladder using manufacturer's recommended hardware.

2. Fiberglass: Premium type polyester resin, reinforced with fiberglass; constructed to provide complete wetting of glass by resin; resistant to rot, fungi, bacterial growth and adverse effects of acids, alkalis and residential and industrial waste; yellow in color.
- B. Provide approved petroleum-based tape encapsulating bolts in access manhole.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.
- B. Verify that items provided by other Sections of Work are properly sized and located.
- C. Verify that built-in items are in proper location and are ready for roughing into Work.
- D. Verify that excavation base is ready to receive Work and excavations and that dimensions and elevations are as indicated on Drawings.
- E. Verify that lines and grades are correct.
- F. Determine if subgrade, when scarified and re-compacted, can be compacted to 95 percent of maximum Modified Proctor Density according to ASTM D1557 prior to placement of foundation material and base section. When proper density is not reached, moisture condition subgrade until that density is reached or treat as unstable subgrade.

3.2 PREPARATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation preparation.
- B. Mark each precast structure by indentation or waterproof paint showing date of manufacture, manufacturer, and identifying symbols and numbers as indicated on Drawings to indicate its intended use.
- C. Coordinate placement of inlet and outlet pipe or duct sleeves as required by other Sections.
- D. Do not install manholes and structures where Site conditions induce loads exceeding structural capacity of manholes or structures.
- E. Inspect precast concrete manholes and structures immediately prior to placement in excavation to verify that they are internally clean and free from damage; remove and replace damaged units.

3.3 INSTALLATION

- A. Conduct operations not to interfere with, interrupt, damage, destroy, or endanger integrity of surface structures or utilities in immediate or adjacent areas.
- B. Type of correcting materials (fine aggregate, coarse aggregate, or lean concrete) depends on type of subsoil, percolation characteristics, and compaction requirements.
- C. Correct over-excavation with coarse aggregate.
- D. Remove large stones or other hard matter impeding consistent backfilling or compaction.
- E. Protect manhole from damage or displacement while backfilling operation is in progress.
- F. Excavating:
 - 1. As specified in Section 31 23 16 - Excavation and in indicated locations and depths.
 - 2. Provide clearance around sidewalls of manhole or structure for construction operations and granular backfill.
 - 3. If ground water is encountered, prevent accumulation of water in excavations; place manhole or structure in dry trench.
 - 4. Where possibility exists of watertight manhole or structure becoming buoyant in flooded excavation, anchor manhole or structure to avoid flotation as approved by Engineer.
- G. Backfilling: As specified in Section 31 05 13 - Soils for Earthwork.

3.4 MANHOLE BASE SECTIONS

- A. Place precast base on 6-inch thick (minimum) foundation of MoDOT Type 5 fill or as approved by Engineer.
- B. Unstable Subgrade Treatment: Notify Engineer immediately when unsatisfactory material is encountered in the manhole subgrade. With Engineer approval, up to 12-inches of additional undercut may be permitted to achieve suitable foundation. If the additional undercut does not result in a satisfactory foundation, the Contractor shall obtain a bedding design prepared by a Geotechnical Engineer licensed in the state in which the project is being constructed.

3.5 PRECAST MANHOLE SECTIONS

- A. Install sections, joints, and gaskets in accordance with manufacturer's printed recommendations.
- B. Lift precast components at lifting points designated by manufacturer.
- C. When lowering manholes and structures into excavations and joining pipe to units, take precautions to ensure that interior of pipeline and structure remains clean.

- D. Assembly:
 1. Assemble multisection manholes and structures by lowering each section into excavation.
 2. Install rubber gasket joints between precast sections according to manufacturer recommendations.
 3. Lower, set level, and firmly position base section before placing additional sections.
- E. Remove foreign materials from joint surfaces and verify that sealing materials are placed properly.
- F. Maintain alignment between sections by using guide devices affixed to lower section.
- G. Joint sealing materials may be installed on Site or at manufacturer's plant.
- H. Verify that installed manholes and structures meet required alignment and grade.
- I. Remove knockouts or cut structure to receive piping without creating openings larger than required to receive pipe; fill annular spaces with mortar.
- J. Cut pipe flush with interior of structure.
- K. Shape inverts through manhole and structures as indicated on Drawings.
- L. Install precast adjustment rings above tops of cones or flat-top sections as required to adjust finished elevation and to support manhole frame.
- M. Precast concrete grade rings shall be permitted to achieve the required grade. Grade rings shall not be permitted to more than 12-inches.
- N. Seal any lifting holes with non-shrink grout.
- O. External joint-wrap all riser joints to ensure seal. No grout is permitted on the interior of manhole riser joints prior to testing.
- P. Concrete base must be dry prior to setting any sections above it.

3.6 PIPE CONNECTIONS AT MANHOLES

- A. Install approved resilient connectors at each pipe entering and exiting manholes in accordance with manufacturer's instructions.
 1. Where smooth exterior pipes, i.e. steel, ductile iron or PVC pipes are connected to manhole base or barrel, space between pipe and manhole wall shall be sealed with an assembly consisting of rubber gaskets or links mechanically compressed to form watertight barrier.
 2. When connecting concrete or cement mortar coated steel pipes, or as an option for connecting smooth exterior pipes to manhole base or barrel, space between pipe and manhole wall may be sealed with an assembly consisting of stainless steel power sleeve, stainless steel take-up clamp and rubber gasket. Take-up clamp: Minimum of 9/16-inch wide.
- B. Ensure no concrete, fill, or other rigid material is allowed to enter space between pipe and edge of wall opening at and around resilient connector on either interior or exterior of manhole. If necessary, fill space with compressible material to ensure full flexibility provided by resilient connector.

- C. Where new manhole is constructed on existing sewer, rigid joint pipe may be used. Install water stop gasket around existing pipe at center of precast wall. Join ends of split water stop material at pipe spring line using an adhesive recommended and supplied by water stop manufacturer.
- D. Test connection for watertight seal before backfilling, or at direction of Engineer.

3.7 INVERTS FOR SANITARY SEWERS

- A. Construct invert channels to provide smooth flow transition waterway with no disruption of flow at pipe-manhole connections. Conform to following criteria:
 - 1. Slope of invert bench: 1-inch per foot minimum; 1-1/2-inches per foot maximum
 - 2. Depth of bench to invert:
 - a. Pipes smaller than 15-inches: one-half of largest pipe diameter
 - b. Pipes 15 to 24-inches: three-fourths of largest pipe diameter
 - c. Pipes larger than 24-inches: equal to largest pipe diameter
 - 3. Invert slope through manhole: 0.17 foot (2-inches) drop across manhole with smooth transition of invert through manhole, unless otherwise indicated on Drawing.
- B. Form invert channels with concrete if not integral with manhole base section. For direction changes of mains, construct channels tangent to mains with maximum possible radius of curvature. Provide curves for side inlets and smooth invert fillets for flow transition between pipe inverts.

3.8 BACKFILL

- A. Place and compact backfill materials in area of excavation surrounding manholes in accordance with requirements of Section 31 23 16.13 - Trenching.
- B. Where rigid joints are used for connecting existing sewers to manhole, backfill existing sewer up to spring line of pipe with flowable fill.
- C. In unpaved areas, provide positive drainage away from all manhole frames to natural grade. Provide restoration of disturbed areas in accordance with Section 32 92 19 – Seeding.

3.9 DOGHOUSE MANHOLE - Will not be allowed.

3.10 FIELD QUALITY CONTROL

- A. Conduct testing of manholes in accordance with requirements of Section 33 05 05.36 – Vacuum Testing of Manholes.

3.11 PROTECTION

- A. Protect manholes from damage until Work has been accepted. Repair damage to manholes at no additional cost to Owner.

END OF SECTION 03 40 01

SECTION 03 60 00 GROUTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Portland cement grout.
2. Rapid-curing epoxy grout.
3. Nonshrink cementitious grout.

B. Related Requirements:

1. Section 03 10 00 - Concrete Forming and Accessories: Form materials and accessories as required to form cast-in-place concrete and maintain structural integrity until stripping.
2. Section 03 30 00 - Cast-in-Place Concrete: Cast-in-place or in-situ concrete for structural building frames, slabs on fill or grade, and other concrete components.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

- A. Basis of Payment:** Incidental to construction, including preparation of substrate and grout, placement, consolidation, troweling, and curing.

1.3 REFERENCE STANDARDS

A. American Concrete Institute:

1. ACI 301 - Specifications for Structural Concrete for Buildings.
2. ACI 318 - Building Code Requirements for Structural Concrete.

B. ASTM International:

1. ASTM C33 - Standard Specification for Concrete Aggregates.
2. ASTM C40 - Standard Test Method for Organic Impurities in Fine Aggregates for Concrete.
3. ASTM C150 - Standard Specification for Portland Cement.
4. ASTM C191 - Standard Test Methods for Time of Setting of Hydraulic Cement by Vicat Needle.
5. ASTM C307 - Standard Test Method for Tensile Strength of Chemical-Resistant Mortar, Grouts, and Monolithic Surfacing.
6. ASTM C531 - Standard Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes.
7. ASTM C579 - Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes.
8. ASTM C827 - Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures.

- C. U. S. Army Corps of Engineers Concrete Research Division (CRD):
 - 1. CRD-C621 - Non-Shrink Grout.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit manufacturer information regarding grout.
- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- D. Manufacturer Instructions: Submit instructions for mixing, handling, surface preparation, and placing epoxy-type and nonshrink grouts.
- E. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

1.5 QUALITY ASSURANCE

- A. Perform Work according to applicable standards.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years' experience.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- C. Store materials according to manufacturer instructions.
- D. Protection:
 - 1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
 - 2. Provide additional protection according to manufacturer instructions.

1.8 AMBIENT CONDITIONS

- A. Section 01 50 00 - Temporary Facilities and Controls: Requirements for ambient condition control facilities for product storage and installation.
- B. Maximum Conditions: Do not perform grouting if temperatures exceed manufacturer's recommendations.

- C. Minimum Conditions: Maintain minimum temperature per manufacturer's recommendations before, during, and after grouting, until grout has set.

PART 2 - PRODUCTS

2.1 PORTLAND CEMENT GROUT

- A. Portland Cement: Comply with ASTM C150, Type I and II.
- B. Water:
 - 1. Potable.
 - 2. No impurities, suspended particles, algae, or dissolved natural salts in quantities capable of causing:
 - a. Corrosion of steel.
 - b. Volume change increasing shrinkage cracking.
 - c. Efflorescence.
 - d. Excess air entraining.
- C. Fine Aggregate:
 - 1. Washed natural sand.
 - 2. Gradation:
 - a. Comply with ASTM C33.
 - b. Represented by smooth granulometric curve within required limits.
 - 3. Free from injurious amounts of organic impurities according to ASTM C40.
- D. Mix:
 - 1. Portland cement, sand, and water.
 - 2. Do not use ferrous aggregate or staining ingredients in grout mixes.

2.2 RAPID-CURING EPOXY GROUT

- A. Manufacturers:
 - 1. Laticrete International, Inc.
 - 2. Sika Corporation.
 - 3. W.R. Meadows, Inc.
 - 4. Substitutions: As specified in Section 01 60 00 - Product Requirements.
- B. Description:
 - 1. High-strength, three-component epoxy grout formulated with thermosetting resins and inert fillers.
 - 2. Rapid-curing, high adhesion, and resistant to ordinary chemicals, acids, and alkalis.
- C. Performance and Design Criteria:
 - 1. Compressive Strength:
 - a. 12,000 psi at seven days.
 - b. Comply with ASTM C579.
 - 2. Minimum Tensile Strength:
 - a. 2,000 psi.

- b. Comply with ASTM C307.
- 3. Coefficient of Expansion:
 - a. 30×10^{-6} inch per degree F.
 - b. Comply with ASTM C531.
- 4. Shrinkage:
 - a. None.
 - b. Comply with ASTM C827.

2.3 NONSHRINK CEMENTITIOUS GROUT

- A. Manufacturers:
 - 1. CGM, Incorporated.
 - 2. Euclid Chemical Company (The); an RPM company.
 - 3. Laticrete International, Inc.
 - 4. QUIKRETE.
 - 5. Sika Corporation.
 - 6. Substitutions: As specified in Section 01 60 00 - Product Requirements.
- B. Description:
 - 1. Pre-mixed and ready-for-use formulation requiring only addition of water.
 - 2. Nonshrink, non-corrosive, nonmetallic, non-gas forming, and no chlorides.
- C. Performance and Design Criteria:
 - 1. Certified to maintain initial placement volume or expand after set, and to meet following minimum properties when tested according to CRD-C621 for Type D nonshrink grout:
 - a. Setting Time:
 - 1) Initial: Approximately two hours.
 - 2) Final: Approximately three hours.
 - 3) Comply with ASTM C191.
 - b. Maximum Expansion: 0.10 to 0.40 percent.
 - c. Compressive Strength:
 - 1) One-Day: 4,000 psi.
 - 2) Seven-Day: 7,000 psi.
 - 3) 28-Day: 10,000 to 10,800 psi.
 - 4) Comply with CRD-C621.

2.4 FORMWORK

- A. As specified in Section 03 10 00 - Concrete Forming and Accessories.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.

- B. Verify areas to receive grout.

3.2 PREPARATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation preparation.
- B. Remove defective concrete, laitance, dirt, oil, grease, and other foreign material from concrete surfaces by brushing, hammering, chipping, or other similar means until sound and clean concrete surface is achieved.
- C. Roughen concrete lightly, but not to interfere with placement of grout.
- D. Remove foreign materials from metal surfaces in contact with grout.
- E. Align, level, and maintain final positioning of components to be grouted.
- F. Saturate concrete surfaces with clean water, and then remove excess water.

3.3 INSTALLATION

- A. Formwork:
 - 1. Construct leakproof forms anchored and shored to withstand grout pressures.
 - 2. Install formwork with clearances to permit proper placement of grout.
 - 3. As specified in Section 03 10 00 - Concrete Forming and Accessories.
- B. Mixing:
 - 1. Portland Cement Grout:
 - a. Use proportions of two parts sand and one part cement, measured by volume.
 - b. Prepare grout with water to obtain consistency to permit placing and packing.
 - c. Mix water and grout in two steps:
 - 1) Premix using approximately 2/3 of water.
 - 2) After partial mixing, add remaining water to bring mix to desired placement consistency and continue mixing two to three minutes.
 - d. Mix only quantities of grout capable of being placed within 30 minutes after mixing.
 - e. Do not add additional water after grout has been mixed.
 - f. Minimum Compressive Strength: 2,400 psi in 48 hours and 7,000 psi in 28 days.
 - 2. Rapid-Curing Epoxy Grout:
 - a. Mix and prepare according to manufacturer instructions.
 - b. Minimum Compressive Strength: 2,400 psi in 48 hours and 7,000 psi in 28 days.
 - 3. Nonshrink Cementitious Grout:
 - a. Mix and prepare according to manufacturer instructions.
 - b. Minimum Compressive Strength: 2,400 psi in 48 hours and 7,000 psi in 28 days.
 - 4. Mix grout components in proximity to Work area and transport mixture quickly and in manner not permitting segregation of materials.
- C. Placing of Grout:
 - 1. Place grout material quickly and continuously.
 - 2. Do not use pneumatic-pressure or dry-packing methods.

3. Apply grout from one side only to avoid entrapping air.
4. Do not vibrate placed grout mixture or permit placement if area is being vibrated by nearby equipment.
5. Thoroughly compact final installation and eliminate air pockets.
6. Do not remove leveling shims for at least 48 hours after grout has been placed.

D. Curing:

1. Prevent rapid loss of water from grout during first 48 hours by use of approved membrane curing compound or by using wet burlap method.
2. Immediately after placement, protect grout from premature drying, excessively hot or cold temperatures, and mechanical injury.
3. After grout has attained its initial set, keep damp for minimum three days.

3.4 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for inspecting and testing.

B. Inspection and Testing:

1. Comply with ACI 318 and as specified in Section 01 40 00 - Quality Requirements.
2. Submit proposed mix design of each class of grout to Engineer of Record for review prior to commencement of Work.
3. Tests of grout components may be performed to ensure compliance with specified requirements.

END OF SECTION 03 60 00

SECTION 061000
ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Structural floor, wall, and roof framing.
 - 2. Floor, wall, and roof sheathing.
 - 3. Miscellaneous framing and sheathing.
- B. Related Requirements:
 - 1. Section 46 61 23 - Gravity Filters.

1.2 REFERENCE STANDARDS

- A. APA - The Engineered Wood Association:
 - 1. APA - Plywood Design Specification, including supplements.
 - 2. APA PS 1 - Voluntary Product Standard - Structural Plywood.
- B. ASTM International:
 - 1. ASTM D2559 - Standard Specification for Adhesives for Bonded Structural Wood Products for Use Under Exterior Exposure Conditions.
 - 2. ASTM D5456 - Standard Specification for Evaluation of Structural Composite Lumber Products.
 - 3. ASTM F1667 - Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.
- C. National Lumber Grades Authority:
 - 1. NLGA - Standard Grading Rules for Canadian Lumber.
- D. Northeastern Lumber Manufacturers Association:
 - 1. NELMA - Standard Grading Rules for Northeastern Lumber.
- E. Southern Pine Inspection Bureau:
 - 1. SPIB - Standard Grading Rules for Southern Pine Lumber.
- F. U.S. Department of Commerce National Institute of Standards and Technology:
 - 1. DOC PS 1 - Structural Plywood.
 - 2. DOC PS 2 - Performance Standard for Wood-Based Structural-Use Panels.
 - 3. DOC PS 20 - American Softwood Lumber Standard.
- G. West Coast Lumber Inspection Bureau:
 - 1. WCLIB Standard 17 - Grading Rules for West Coast Lumber.

- H. Western Wood Products Association:
 - 1. WWPA - Western Lumber Grading Rules.

1.3 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.
- B. Coordinate Work of this Section with installation of the gravity filter.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Shop Drawings for Site-Fabricated Truss Frame: Indicate dimensions, component profiles and erection details.

1.5 QUALITY ASSURANCE

- A. Perform Work according to:
 - 1. Lumber Grading Agency: Certified by DOC PS 20.
 - 2. Lumber: DOC PS 20.
 - 3. Wood Structural Panels: DOC PS 1 or PS 2.
- B. Perform Work according to industry standards.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- C. Store materials according to manufacturer instructions.
- D. Protection:
 - 1. Protect trusses from warping or other distortion by stacking in vertical position and bracing to resist movement.
 - 2. Provide additional protection according to manufacturer instructions.

PART 2 - PRODUCTS

2.1 ENGINEERED WOOD PRODUCTS

- A. Manufacturers:
 - 1. Boise Cascade Company.
 - 2. Louisiana-Pacific Corporation.

3. Weyerhaeuser Company.
 4. Substitutions: As specified in Section 01 60 00 - Product Requirements.
- B. Engineered Wood Products:
1. Manufactured with an exterior-type adhesive according to ASTM D2559.
 2. Evaluated and monitored according to ASTM D5456.
- C. Types:
1. Parallel-Strand Lumber: Structural composite lumber made from wood strand elements with grain primarily parallel to member lengths.
 2. Laminated-Veneer Lumber: Structural composite lumber made from wood veneers with grain primarily parallel to member lengths.

2.2 MATERIALS

- A. Lumber:
1. Lumber Grading Rules: Comply with APA and the regional grading agency for the source region.
 2. Non-structural Light Framing:
 - a. Stress Group: A, B, C, D or E.
 - b. Species: Spruce, pine, or fir species.
 - c. Grade: Construction.
 - d. Maximum Moisture Content: 19 percent.
 3. Studding:
 - a. Stress Group: A, B, C, D or E.
 - b. Species: Spruce, pine, or fir species.
 - c. Grade: Construction.
 - d. Maximum Moisture Content: 19 percent.
 4. Miscellaneous Framing:
 - a. Stress Group: D.
 - b. Species: Spruce, pine, or fir species.
 - c. Maximum Moisture Content: 19 percent.
- B. Sheathing:
1. Wood Structural Panel Wall Sheathing:
 - a. Description: APA-rated, single floor.
 - b. Material: plywood or oriented strand board (OSB).
 - c. Exposure Durability: 1.
 - d. Facing: Unsanded.

2.3 SHEATHING LOCATIONS

- A. Below-Grade Wall Sheathing:
1. Thickness: $\frac{3}{4}$ inch thick.
 2. Sheet Size: 48 by 96 inch.
 3. Span Rating: Match stud spacing.
 4. Edges: Square.

2.4 ACCESSORIES

- A. Fasteners and Anchors:
 - 1. Fasteners: Unfinished steel.
 - 2. Nails and Staples: Comply with ASTM F1667.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Framing:
 - 1. Select individual pieces such that knots and defects will not interfere with placement of bolts when nailing or making connections.
 - 2. Discard defective pieces.
 - 3. Set structural members level, plumb, and in correct position.
 - 4. Fasten framing according to applicable code.
 - 5. Make provisions for erection loads and for sufficient temporary bracing to maintain that structure is safe, plumb, and in alignment until completion of erection and installation of permanent bracing.
 - 6. Place horizontal members crown side up.
 - 7. Construct load-bearing framing and curb members full length without splices.
- B. Sheathing:
 - 1. Fasten sheathing according to applicable code.
 - 2. Secure wall sheathing with long dimension perpendicular to wall studs, with ends over firm bearing and staggered.
 - 3. Install plywood in combination single and two-span continuous.

3.2 TOLERANCES

- A. Section 01 40 00 - Quality Requirements: Requirements for tolerances.
- B. Framing Members: Maximum ¼ inch from indicated position.

END OF SECTION 06 10 00

**SECTION 09 90 00
PAINTING AND COATING**

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Surface preparation and field application of paints and other coatings.
- B. Related Requirements:
 - 1. Section 40 05 51 - Common Requirements for Process Valves.

1.2 DEFINITIONS

- A. Refer to ASTM D16 for definitions of terms used in this Section.

1.3 REFERENCE STANDARDS

- A. ASTM International:
 - 1. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications.
- B. Master Painters Institute:
 - 1. MPI - Approved Products List.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data:
 - 1. Submit manufacturer data on special coatings.
 - 2. Include MPI - Approved Products Lists with proposed products highlighted.
- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- D. Manufacturer Instructions: Submit special surface preparation procedures, substrate conditions requiring special attention.

1.5 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.

1.6 QUALITY ASSURANCE

A. MPI Standards:

1. Comply with indicated MPI standards.
2. Products: Listed in MPI - Approved Products List.

B. Perform Work according to industry standards.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years' experience.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Container Labeling: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Inspection:

1. Accept materials on Site in manufacturer's sealed and labeled containers.
2. Inspect for damage and to verify acceptability.

D. Store materials in ventilated area and otherwise according to manufacturer instructions.

E. Protection:

1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
2. Provide additional protection according to manufacturer instructions.

1.9 AMBIENT CONDITIONS

A. Section 01 50 00 - Temporary Facilities and Controls: Requirements for ambient condition control facilities for product storage and installation.

B. Storage Conditions:

1. Minimum Ambient Temperature: 45 degrees F.
2. Maximum Ambient Temperature: 90 degrees F.

C. Application Conditions:

1. Do not apply materials when surface and ambient temperatures are outside temperature ranges required by paint manufacturer.
2. Do not apply exterior coatings during rain or snow, when relative humidity is outside humidity ranges, or when moisture content of surfaces exceeds those required by paint manufacturer.

PART 2 - PRODUCTS

2.1 PAINTS AND COATINGS

1. Furnish materials according to industry standards and per manufacturer's recommendations for the product to be coated.

B. Materials:

1. Coatings:
 - a. Ready mixed, except field-catalyzed coatings.
 - b. Capable of drying or curing free of streaks or sags.
2. Accessories:
 - a. Grade: Commercial.
 - b. Turpentine.
 - c. Paint thinners.
 - d. Other materials not specifically indicated but required to achieve specified finishes.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for application examination.
- B. Verify that surfaces are ready to receive Work as recommended by product manufacturer.
- C. Test shop-applied primer for compatibility with subsequent cover materials.

3.2 PREPARATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for application preparation.
- B. Prepare coatings as follows:
 1. To soft paste consistency, capable of being readily and uniformly dispersed to homogeneous coating.
 2. For smooth flow and brushing properties.
- C. Defects:
 1. Correct defects and clean surfaces capable of affecting Work of this Section.
 2. Remove or repair existing coatings exhibiting surface defects.
- D. Impervious Surfaces:
 1. Remove mildew by scrubbing with solution of tetra-sodium or tri-sodium phosphate and bleach.
 2. Rinse with clean water and allow surface to dry.
- E. Previously Coated Ductile Iron Piping, Valves or Fittings:
 1. Remove all existing paint, rust, grease and other surface contaminants.

2. Remove by wire brushing or sanding.
3. Clean by washing with solvent.
4. Prime prior to painting, both per manufacturer's recommendations.

F. Existing Work:

1. Extend existing paint and coatings installations using materials and methods compatible with existing installations and as specified.

3.3 APPLICATION

- A. Comply with MPI - Architectural Painting Manual.
- B. Do not apply finishes to surfaces that are not dry.
- C. Apply each coat to uniform appearance.
- D. Sand metal surfaces lightly between coats to achieve required finish.
- E. Cleaning:
 1. Vacuum surfaces to remove loose particles.
 2. Use tack cloth to remove dust and particles just prior to applying next coat.
- F. Installation Standards: Install Work according to industry standards.

3.4 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Requirements for inspecting and testing.
- B. Inspecting and Testing: Comply with MPI - Architectural Painting Manual.

3.5 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.
- B. Collect waste material that may constitute fire hazards, place in closed metal containers, and remove daily from Site.

END OF SECTION 09 90 00

SECTION 22 15 13
GENERAL SERVICE COMPRESSED-AIR PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Compressed air piping.
2. Unions and flanges.
3. Pressure relief valves.

B. Related Requirements:

1. Section 09 90 00 - Painting and Coating: Requirements for coatings as specified by this Section.
2. Section 31 23 16.13 - Trenching: Requirements for trenching as required by this Section.
3. Section 31 23 13 - Soils for Earthwork: Requirements for backfill.
4. Section 40 05 06 - Couplings, Adapters, and Specials for Process Piping.
5. Section 40 05 07 - Hangers and Supports for Process Piping.
6. Section 40 05 51 - Common Requirements for Process Valves.

1.2 REFERENCE STANDARDS

A. ASME International:

1. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300.
2. ASME B31.1 - Power Piping.
3. ASME B31.9 - Building Services Piping.
4. ASME Boiler and Pressure Vessel Code (BPVC).

B. ASTM International:

1. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
2. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
3. ASTM A536 - Standard Specification for Ductile Iron Castings.
4. ASTM B32 - Standard Specification for Solder Metal.
5. ASTM D2513 - Standard Specification for Polyethylene (PE) Gas Pressure Pipe, Tubing, and Fittings.
6. ASTM F1281 - Standard Specification for Crosslinked Polyethylene/Aluminum/Crosslinked Polyethylene (PEX-AL-PEX) Pressure Pipe.
7. ASTM F1282 - Standard Specification for Polyethylene/Aluminum/Polyethylene (PE-AL-PE) Composite Pressure Pipe.
8. ASTM F1476 - Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications.

C. American Welding Society:

1. AWS A5.8/A5.8M - Specification for Filler Metals for Brazing and Braze Welding.

2. AWS D1.1/D1.1M - Structural Welding Code - Steel.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data:
 1. Piping: Submit manufacturer information on pipe materials, fittings, and accessories.
 2. System Components: Submit manufacturer catalog information including capacity, component sizes, rough-in requirements, and service sizes.
- C. Shop Drawings: Indicate piping system schematic with general assembly of components and mounting and installation details.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Manufacturer Instructions: Submit hoisting and setting requirements.
- F. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.
- G. Welder Certificates: Certify welders and welding procedures employed on Work, verifying AWS qualification within previous 12 months.
- H. Manufacturer Instructions: Submit hoisting and setting requirements.
- I. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

1.4 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.
- B. Project Record Documents: Record actual locations of equipment piping, outlets, and components.

1.5 QUALITY ASSURANCE

- A. Perform Work according to ASME B31.9 code for installation of piping systems.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years' experience.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

- B. Inspection: Accept materials on Site in factory-fabricated containers with shipping skids and plastic pipe end protectors in place and inspect for damage.
- C. Storage:
 - 1. Store materials according to manufacturer instructions.
 - 2. Keep plugged or capped ends sealed until installation.
 - 3. Keep containers sealed until installation.
- D. Protection:
 - 1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
 - 2. Provide additional protection according to manufacturer instructions.

1.8 EXISTING CONDITIONS

- A. Field Measurements:
 - 1. Verify field measurements prior to fabrication.
 - 2. Indicate field measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 COMPRESSED AIR PIPING

- A. Steel Piping:
 - 1. Pipe:
 - a. Black.
 - b. Schedule 40.
 - c. Comply with ASTM A53/A53M.
 - 2. Fittings:
 - a. Malleable iron; ASME B16.3.
 - 3. Joints:
 - a. Pipe 2 Inches and Smaller: Threaded.
 - b. Pipe 2-1/2 Inches and Larger: Welded.
- B. Polyethylene (PE) Pipe:
 - 1. Comply with ASTM D2513, SDR 11.5.
 - 2. Fittings:
 - a. Type: Socket.
 - b. Comply with ASTM D2513.
 - 3. Joints: Fusion welded.

2.2 UNIONS AND FLANGES

- A. Flanges for Pipe 2-1/2 Inches and Larger:
 - 1. Ferrous Piping:
 - a. Material: Forged steel.
 - b. Class 150.

- c. Type: Slip-on.
- 2. Gaskets:
 - a. Material: Preformed neoprene.
 - b. Thickness: 1/16 inch.

2.3 PRESSURE RELIEF VALVES

- A. Manufacturers:
 - 1. Flomatic Corporation.
 - 2. Hayward Flow Control.
 - 3. Kunkle Valve.
 - 4. WATTS.
 - 5. Zurn Industries, LLC.
 - 6. Substitutions: As specified in Section 01 60 00 - Product Requirements.
- B. Description:
 - 1. Body: Bronze.
 - 2. Seat: PTFE.
 - 3. Stem and Springs: Stainless steel.
 - 4. Actuated Capacities: Automatic; direct pressure.
 - 5. ASME certified and labeled according to BPVC.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.
- B. Verify that excavations are to required grade, dry, and not over-excavated.
- C. Verify that connections to existing piping system, size, location, and centerline are as indicated on Drawings.

3.2 PREPARATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation preparation.
- B. Ream pipe and tube ends and remove burrs; bevel plain-end ferrous pipe.
- C. Remove scale and dirt from inside and outside of pipe and fittings before assembly.
- D. Prepare piping connections to equipment with flanges or unions.
- E. Keep open ends of pipe free from scale and dirt.

3.3 INSTALLATION

A. Buried Piping:

1. Establish elevations with not less than two feet of cover.
2. Establish minimum separation of four feet from other services, according to applicable code.
3. Excavate pipe trench as specified in 31 23 16.13 - Trenching.
4. Install pipe to elevation as indicated on Drawings.
5. Bedding Material:
 - a. Install pipe on prepared bedding.
 - b. Place at trench bottom to provide uniform bedding for piping.
 - c. Level in one continuous layer not exceeding 4 inches compacted depth.
 - d. Compact to 95 percent maximum density.
6. Route pipe in straight line.
7. Install pipe to allow for expansion and contraction without stressing pipe or joints.
8. Pipe Cover and Backfilling:
 - a. Backfill trench as specified in Section 31 23 13 - Soils for Earthwork.
 - b. Maintain optimum moisture content of fill material to attain required compaction density.
 - c. After pressure testing, evenly backfill entire trench width by hand placing backfill material and hand tamping in 6-inch compacted layers to 6 inches minimum cover over top of pipe.
 - d. Compact to 95 percent maximum density.
 - e. Evenly and continuously backfill remaining trench depth in uniform layers with backfill material.
 - f. Do not use wheeled or tracked vehicles for tamping.

B. Aboveground Piping:

1. Cut pipe and tubing accurately and install without springing or forcing.
2. Slope buried piping in direction of flow.
3. Pipe Sleeves:
 - a. Install pipe sleeves where pipes and tubing pass through walls, floors, roofs, and partitions.
As specified in Section 40 05 07 Hangers and Supports for Process Piping.
4. Except where indicated, install manual shutoff valves accessible for operation and maintenance.
5. Install insulation as specified in Section 40 05 06 - Couplings, Adapters, and Specials for Process Piping.

C. Valves:

1. Install valves and accessories according to manufacturer instructions.
2. Firmly support valves to avoid undue stresses on piping.
3. Coat studs, bolts, and nuts with anti-seizing lubricant.
4. Install valves with stems upright or horizontal, not inverted.
5. Install brass male adapter on each side of valves in copper piped system, and solder adapters to pipe.

3.4 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Requirements for inspecting and testing.
- B. Inspection: Verify atmospheric pressure in piping systems, other than system under test.
- C. Testing:
 - 1. Test system with dry compressed air or dry nitrogen.
 - 2. Test Pressure: 50 psig.
- D. Equipment Acceptance: Adjust, repair, modify, or replace components failing to perform as specified and rerun tests.

3.5 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.
- B. Blow systems clear of moisture and foreign matter.

END OF SECTION 22 15 13

**SECTION 260505
SELECTIVE DEMOLITION FOR ELECTRICAL**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electrical demolition.

PART 3 EXECUTION

2.01 EXAMINATION

- A. Verify that abandoned wiring and equipment serve only abandoned facilities.
- B. Report discrepancies to Engineer before disturbing existing installation.
- C. Beginning of demolition means installer accepts existing conditions.

2.02 PREPARATION

- A. Disconnect electrical systems in walls, floors, and ceilings to be removed.
- B. Coordinate utility service outages with utility company.
- C. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.
- D. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.

2.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

- A. Remove, relocate, and extend existing installations to accommodate new construction.
- B. Remove abandoned wiring to source of supply.
- C. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.
- D. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets that are not removed.
- E. Repair adjacent construction and finishes damaged during demolition and extension work.
- F. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.

END OF SECTION

SECTION 260519
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Single conductor building wire.
- B. Service entrance cable.
- C. Variable-frequency drive cable.
- D. Wiring connectors.
- E. Electrical tape.
- F. Wire pulling lubricant.
- G. Cable ties.

1.02 RELATED REQUIREMENTS

- A. Section 078400 - Firestopping.

1.03 REFERENCE STANDARDS

- A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013 (Reapproved 2024).
- B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2023.
- C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010, with Editorial Revision (2020).
- D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2020).
- E. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2024.
- F. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- G. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; 2021.
- H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. NFPA 79 - Electrical Standard for Industrial Machinery; 2021.
- J. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.
- K. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.
- L. UL 267 - Outline of Investigation for Wire-Pulling Compounds; Current Edition, Including All Revisions.
- M. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.
- N. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.
- O. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.
- P. UL 854 - Service-Entrance Cables; Current Edition, Including All Revisions.
- Q. UL 2277 - Outline of Investigation for Flexible Motor Supply Cable and Wind Turbine Tray Cable; Current Edition, Including All Revisions.

PART 2 PRODUCTS

2.01 CONDUCTOR AND CABLE APPLICATIONS

- A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.
- B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.

2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.
- D. Comply with NEMA WC 70.
- E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.
- F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.
- G. Conductor Material:
 - 1. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
 - 2. Tinned Copper Conductors: Comply with ASTM B33.
- H. Conductor Color Coding:
 - 1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
 - 2. Color Coding Method: Integrally colored insulation.
 - 3. Color Code:
 - a. 240/120 V, 1 Phase, 3 Wire System:
 - 1) Phase A: Black.
 - 2) Phase B: Red.
 - 3) Neutral/Grounded: White.
 - b. Equipment Ground, All Systems: Green.

2.03 SINGLE CONDUCTOR BUILDING WIRE

- A. Description: Single conductor insulated wire.
- B. Conductor Stranding:
 - 1. Feeders and Branch Circuits:
 - a. Size 10 AWG and Smaller: Solid.
 - b. Size 8 AWG and Larger: Stranded.
- C. Insulation Voltage Rating: 600 V.
- D. Insulation:
 - 1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.

2.04 SERVICE ENTRANCE CABLE

- A. Service Entrance Cable for Above-Ground Use: NFPA 70, Type SE multiple-conductor cable listed and labeled as complying with UL 854, Style R.
- B. Service Entrance Cable for Underground Use: NFPA 70, Type USE single-conductor cable listed and labeled as complying with UL 854, Type USE-2, and with UL 44 Type RHH/RHW-2.
- C. Conductor Stranding: Stranded.
- D. Insulation Voltage Rating: 600 V.

2.05 VARIABLE-FREQUENCY DRIVE CABLE

- A. Description: Flexible motor supply cable listed and labeled as complying with UL 2277 in accordance with NFPA 79; specifically designed for use with variable frequency drives and associated nonlinear power distortions.
- B. Conductor Stranding: Stranded.
- C. Insulation Voltage Rating: 1000 V.
- D. Insulation: Use only thermoset insulation types; thermoplastic insulation types are not permitted.
- E. Grounding: Full-size integral equipment grounding conductor or symmetrical arrangement of multiple conductors of equivalent size.
- F. Provide metallic shielding.
- G. Jacket: PVC or Chlorinated Polyethylene (CPE).

2.06 WIRING CONNECTORS

- A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.

2.07 ACCESSORIES

- A. Electrical Tape:
 - 1. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F (-18 degrees C) and suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
- B. Wire Pulling Lubricant:
 - 1. Listed and labeled as complying with UL 267.
 - 2. Suitable for use with conductors/cables and associated insulation/jackets to be installed.
 - 3. Suitable for use at installation temperature.
- C. Cable Ties: Material and tensile strength rating suitable for application.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that interior of building has been protected from weather.
- B. Verify that work likely to damage wire and cable has been completed.
- C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.
- D. Verify that field measurements are as indicated.
- E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Installation in Raceway:
 - 1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
 - 2. Pull all conductors and cables together into raceway at same time.
 - 3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
 - 4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.

- D. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.
- E. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
- F. Variable-Frequency Drive Cable: Terminate shielding at both variable-frequency motor controller and associated motor using glands or termination kits recommended by manufacturer.
- G. Install conductors with a minimum of 12 inches (300 mm) of slack at each outlet.
- H. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.
- I. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.
- J. Make wiring connections using specified wiring connectors.
 - 1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
 - 2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
 - 3. Do not remove conductor strands to facilitate insertion into connector.
 - 4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminants. Do not use wire brush on plated connector surfaces.
- K. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.
- L. Insulate ends of spare conductors using vinyl insulating electrical tape.
- M. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.
- N. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

END OF SECTION

**SECTION 260526
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Grounding and bonding requirements.
- B. Conductors for grounding and bonding.
- C. Connectors for grounding and bonding.
- D. Ground bars.
- E. Ground rod electrodes.

1.02 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- B. NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings; 2022.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

PART 2 PRODUCTS

2.01 GROUNDING AND BONDING REQUIREMENTS

- A. Do not use products for applications other than as permitted by NFPA 70 and product listing.
- B. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.
- C. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- D. Grounding Electrode System:
 - 1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
 - a. Provide continuous grounding electrode conductors without splice or joint.
 - b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.
 - 2. Ground Rod Electrode(s):
 - a. Provide three electrodes in an equilateral triangle configuration unless otherwise indicated or required.
 - b. Space electrodes not less than 10 feet (3.0 m) from each other and any other ground electrode.

2.02 GROUNDING AND BONDING COMPONENTS

- A. General Requirements:
 - 1. Provide products listed, classified, and labeled as suitable for the purpose intended.
 - 2. Provide products listed and labeled as complying with UL 467 where applicable.
- B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 260526:
 - 1. Use insulated copper conductors unless otherwise indicated.
 - a. Exceptions:
 - 1) Use bare copper conductors where installed underground in direct contact with earth.
 - 2) Use bare copper conductors where directly encased in concrete (not in raceway).

- C. Connectors for Grounding and Bonding:
 - 1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
 - 2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
 - 3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.
- D. Ground Bars:
 - 1. Description: Copper rectangular ground bars with mounting brackets and insulators.
 - 2. Size: As indicated.
 - 3. Holes for Connections: As indicated or as required for connections to be made.
- E. Ground Rod Electrodes:
 - 1. Comply with NEMA GR 1.
 - 2. Material: Copper-bonded (copper-clad) steel.
 - 3. Size: 3/4 inch (19 mm) diameter by 10 feet (3.0 m) length, unless otherwise indicated.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that work likely to damage grounding and bonding system components has been completed.
- B. Verify that field measurements are as indicated.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or provide ground plates.
- D. Make grounding and bonding connections using specified connectors.
 - 1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
 - 2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
 - 3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
 - 4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
 - 5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- E. Identify grounding and bonding system components in accordance with Section 260553.

END OF SECTION

**SECTION 260529
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

1.02 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.
- D. MFMA-4 - Metal Framing Standards Publication; 2004.
- E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

- A. General Requirements:
 - 1. Comply with the following. Where requirements differ, comply with most stringent.
 - a. NFPA 70.
 - b. Requirements of authorities having jurisdiction.
 - 2. Provide required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for complete installation of electrical work.
 - 3. Provide products listed, classified, and labeled as suitable for purpose intended, where applicable.
 - 4. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for load to be supported with minimum safety factor of _____. Include consideration for vibration, equipment operation, and shock loads where applicable.
 - 5. Do not use products for applications other than as permitted by NFPA 70 and product listing.
 - 6. Steel Components: Use corrosion-resistant materials suitable for environment where installed.
 - a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
 - b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Conduit and Cable Supports: Straps and clamps suitable for conduit or cable to be supported.
 - 1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
 - 2. Conduit Clamps: Bolted type unless otherwise indicated.
- C. Outlet Box Supports: Hangers and brackets suitable for boxes to be supported.
- D. Metal Channel/Strut Framing Systems:
 - 1. Description: Factory-fabricated, continuous-slot, metal channel/strut and associated fittings, accessories, and hardware required for field assembly of supports.
 - 2. Comply with MFMA-4.
- E. Hanger Rods: Threaded, zinc-plated steel unless otherwise indicated.
- F. Anchors and Fasteners:

1. Unless otherwise indicated and where not otherwise restricted, use anchor and fastener types indicated for specified applications.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive support and attachment components.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install hangers and supports in accordance with NECA 1.
- C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- D. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.
- E. Unless specifically indicated or approved by Architect, do not provide support from roof deck.
- F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- G. Equipment Support and Attachment:
 1. Use metal, fabricated supports or supports assembled from metal channel/strut to support equipment as required.
 2. Use metal channel/strut secured to studs to support equipment surface mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
 3. Use metal channel/strut to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
 4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- H. Secure fasteners in accordance with manufacturer's recommended torque settings.
- I. Remove temporary supports.

END OF SECTION

SECTION 260533.13
CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Galvanized steel rigid metal conduit (RMC).
- B. Stainless steel rigid metal conduit (RMC).
- C. Galvanized steel intermediate metal conduit (IMC).
- D. Stainless steel intermediate metal conduit (IMC).
- E. PVC-coated galvanized steel rigid metal conduit (RMC).
- F. Galvanized steel electrical metallic tubing (EMT).
- G. Stainless steel electrical metallic tubing (EMT).
- H. Rigid polyvinyl chloride (PVC) conduit.
- I. Reinforced thermosetting resin conduit (RTRC).

1.02 RELATED REQUIREMENTS

- A. Section 078400 - Firestopping.
- B. Section 260526 - Grounding and Bonding for Electrical Systems.
- C. Section 260529 - Hangers and Supports for Electrical Systems.

1.03 REFERENCE STANDARDS

- A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2020.
- B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S); 2020.
- C. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit; 2018.
- D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- E. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2020.
- F. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC); 2025.
- G. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
- H. NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Metal Conduit and Intermediate Metal Conduit; 2018.
- I. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2020.
- J. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2021.
- K. NEMA TC 14 (SERIES) - Reinforced Thermosetting Resin Conduit and Fittings Series; 2015.
- L. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- M. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.
- N. UL 6A - Electrical Rigid Metal Conduit-Aluminum, Red Brass, and Stainless Steel; Current Edition, Including All Revisions.
- O. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.
- P. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.
- Q. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.
- R. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.

- S. UL 797A - Electrical Metallic Tubing - Aluminum and Stainless Steel; Current Edition, Including All Revisions.
- T. UL 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.

PART 2 PRODUCTS

2.01 CONDUIT APPLICATIONS

- A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70, manufacturer's instructions, and product listing.
- B. Unless otherwise indicated and where not otherwise restricted, use conduit types indicated for specified applications. Where more than one listed application applies, comply with most restrictive requirements. Where conduit type for particular application is not specified, use galvanized steel rigid metal conduit.
- C. Underground:
 - 1. Exterior, Direct-Buried: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit, galvanized steel electrical metallic tubing (EMT), stainless steel electrical metallic tubing (EMT), rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).

2.02 CONDUIT - GENERAL REQUIREMENTS

- A. Comply with NFPA 70.
- B. Provide conduit, fittings, supports, and accessories required for complete raceway system.
- C. Provide products listed, classified, and labeled as suitable for purpose intended.
- D. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

- A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.
- B. Fittings:
 - 1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6.
 - 2. Material: Use steel or malleable iron.
 - 3. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

2.04 STAINLESS STEEL RIGID METAL CONDUIT (RMC)

- A. Description: NFPA 70, Type RMC stainless steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6A.
- B. Fittings:
 - 1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6A.
 - 2. Material: Use stainless steel with corrosion resistance equivalent to conduit.
 - 3. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

2.05 GALVANIZED STEEL INTERMEDIATE METAL CONDUIT (IMC)

- A. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.
- B. Fittings:
 - 1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 1242.
 - 2. Material: Use steel or malleable iron.

3. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

2.06 STAINLESS STEEL INTERMEDIATE METAL CONDUIT (IMC)

- A. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.
- B. Fittings:
 1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 1242.

2.07 PVC-COATED GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

- A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit with external polyvinyl chloride (PVC) coating complying with NEMA RN 1 and listed and labeled as complying with UL 6.
- B. Exterior Coating: Polyvinyl chloride (PVC), nominal thickness of 40 mil, 0.040 inch (1.02 mm).
- C. PVC-Coated Boxes and Fittings:
 1. Manufacturer: Same as manufacturer of PVC-coated conduit to be installed.
 2. Nonhazardous Locations: Use boxes and fittings listed and labeled as complying with UL 514A, UL 514B, or UL 6.
 3. Material: Use steel or malleable iron.
 4. Exterior Coating: Polyvinyl chloride (PVC), minimum thickness of 40 mil, 0.040 inch (1.02 mm).
- D. PVC-Coated Supports: Furnish with exterior coating of polyvinyl chloride (PVC), minimum thickness of 15 mil, 0.015 inch (0.38 mm).

2.08 GALVANIZED STEEL ELECTRICAL METALLIC TUBING (EMT)

- A. Description: NFPA 70, Type EMT galvanized steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.
- B. Fittings:
 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 2. Material: Use steel or malleable iron.
 3. Connectors and Couplings: Use compression/gland or set-screw type.
 - a. Do not use indenter type connectors and couplings.

2.09 STAINLESS STEEL ELECTRICAL METALLIC TUBING (EMT)

- A. Description: NFPA 70, Type EMT stainless steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797A.
- B. Fittings:
 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 2. Connectors and Couplings: Use compression/gland or set-screw type.

2.10 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

- A. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.
- B. Fittings:
 1. Manufacturer: Same as manufacturer of conduit to be connected.
 2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

2.11 REINFORCED THERMOSETTING RESIN CONDUIT (RTRC)

- A. Description: NFPA 70, Type RTRC reinforced thermosetting resin conduit complying with NEMA TC 14 (SERIES).
- B. Supports: As recommended by manufacturer.
- C. Fittings: Same type and manufacturer as conduit to be connected.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive conduits.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install conduit in accordance with NECA 1.
- C. Galvanized Steel Rigid Metal Conduit (RMC): Install in accordance with NECA 101.
- D. Intermediate Metal Conduit (IMC): Install in accordance with NECA 101.
- E. PVC-Coated Galvanized Steel Rigid Metal Conduit (RMC): Install using only tools approved by manufacturer.
- F. Rigid Polyvinyl Chloride (PVC) Conduit: Install in accordance with NECA 111.
- G. Conduit Support:
 - 1. Secure and support conduits in accordance with NFPA 70 using suitable supports and methods approved by authorities having jurisdiction; see Section 260529.
 - 2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- H. Connections and Terminations:
 - 1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
 - 2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
 - 3. Use suitable adapters where required to transition from one type of conduit to another.
 - 4. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
 - 5. Provide insulating bushings, insulated throats, or listed metal fittings with smooth, rounded edges at conduit terminations to protect conductors.
 - 6. Secure joints and connections to provide mechanical strength and electrical continuity.
- I. Penetrations:
 - 1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
 - 2. Make penetrations perpendicular to surfaces unless otherwise indicated.
 - 3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
 - 4. Conceal bends for conduit risers emerging above ground.
 - 5. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
 - 6. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty.

7. Install firestopping to preserve fire resistance rating of partitions and other elements; see Section 078400.
- J. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
 1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
 2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
 3. Where calculated in accordance with NFPA 70 for reinforced thermosetting resin conduit (RTRC) conduit installed above ground to compensate for thermal expansion and contraction.
 4. Where conduits are subject to earth movement by settlement or frost.
- K. Conduit Sealing:
 1. Use foam conduit sealant to prevent entry of moisture and gases. This includes, but is not limited to:
 - a. Where conduits enter building from outside.
 - b. Where service conduits enter building from underground distribution system.
 - c. Where conduits enter building from underground.
 - d. Where conduits may transport moisture to contact live parts.
 2. Where conduits cross barriers between areas of potential substantial temperature differential, use foam conduit sealant at accessible point near penetration to prevent condensation. This includes, but is not limited to:
 - a. Where conduits pass from outdoors into conditioned interior spaces.
 - b. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.
- L. Provide grounding and bonding; see Section 260526.

END OF SECTION

SECTION 260553
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electrical identification requirements.
- B. Identification nameplates and labels.
- C. Wire and cable markers.
- D. Voltage markers.
- E. Warning signs and labels.

1.02 REFERENCE STANDARDS

- A. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- B. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

PART 2 PRODUCTS

2.01 IDENTIFICATION REQUIREMENTS

- A. Identification for Equipment:
 - 1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
 - a. Panelboards:
 - 1) Identify ampere rating.
 - 2) Identify voltage and phase.
 - 3) Identify power source and circuit number. Include location when not within sight of equipment.
 - 4) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.
 - 5) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
 - 2. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70 including but not limited to the following.
 - a. Service equipment.
 - b. Industrial control panels.
 - c. Motor control centers.
 - d. Elevator control panels.
 - e. Industrial machinery.
- B. Identification for Conductors and Cables:
 - 1. Color Coding for Power Conductors 600 V and Less: Comply with Section 260519.
 - 2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.

2.02 IDENTIFICATION NAMEPLATES AND LABELS

- A. Identification Nameplates:
 - 1. Materials:
 - a. Indoor Clean, Dry Locations: Use plastic nameplates.
 - b. Outdoor Locations: Use stainless steel or aluminum nameplates suitable for exterior use.

2. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch (1.6 mm); engraved text.
 3. Stainless Steel Nameplates: Minimum thickness of 1/32 inch (0.8 mm); engraved or laser-etched text.
 4. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch (0.8 mm); engraved or laser-etched text.
 5. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch (25 mm) high; Four, located at corners for larger sizes.
- B. Identification Labels:
1. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
 2. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

2.03 WIRE AND CABLE MARKERS

- A. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.
- B. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.
- C. Legend: Power source and circuit number or other designation indicated.
- D. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.
- E. Minimum Text Height: 1/8 inch (3 mm).
- F. Color: Black text on white background unless otherwise indicated.

2.04 VOLTAGE MARKERS

- A. Markers for Conduits: Use factory pre-printed self-adhesive vinyl, self-adhesive vinyl cloth, or vinyl snap-around type markers.
- B. Markers for Boxes and Equipment Enclosures: Use factory pre-printed self-adhesive vinyl or self-adhesive vinyl cloth type markers.
- C. Minimum Size:
 1. Markers for Equipment: 1 1/8 by 4 1/2 inches (29 by 110 mm).
- D. Legend:
 1. Markers for Voltage Identification: Highest voltage present.
- E. Color: Black text on orange background unless otherwise indicated.

2.05 WARNING SIGNS AND LABELS

- A. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.
- B. Warning Signs:
 1. Materials:
 2. Minimum Size: 7 by 10 inches (178 by 254 mm) unless otherwise indicated.
- C. Warning Labels:
 1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
 2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
 3. Minimum Size: 2 by 4 inches (51 mm by 102 mm) unless otherwise indicated.

PART 3 EXECUTION

3.01 PREPARATION

- A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
 - 1. Surface-Mounted Equipment: Enclosure front.
 - 2. Flush-Mounted Equipment: Inside of equipment door.
 - 3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
 - 4. Elevated Equipment: Legible from the floor or working platform.
 - 5. Branch Devices: Adjacent to device.
 - 6. Interior Components: Legible from the point of access.
 - 7. Conductors and Cables: Legible from the point of access.
- C. Install identification products centered, level, and parallel with lines of item being identified.
- D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.
- E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.
- F. Mark all handwritten text, where permitted, to be neat and legible.

END OF SECTION

SECTION 262416 PANELBOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Power distribution panelboards.
- B. Overcurrent protective devices for panelboards.

1.02 RELATED REQUIREMENTS

- A. Section 260526 - Grounding and Bonding for Electrical Systems.
- B. Section 260529 - Hangers and Supports for Electrical Systems.

1.03 REFERENCE STANDARDS

- A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e, with Amendments (2022).
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- C. NECA 407 - Standard for Installing and Maintaining Panelboards; 2015.
- D. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.
- E. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 1000V or Less; 2023.
- F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- H. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- I. UL 67 - Panelboards; Current Edition, Including All Revisions.
- J. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Schneider Electric: www.se.com/#sle.
- B. Source Limitations: Provide panelboards and associated components produced by same manufacturer as other electrical distribution equipment used for project and obtained from a single supplier.

2.02 PANELBOARDS - GENERAL REQUIREMENTS

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
 - 1. Altitude: Less than 6,600 feet (2,000 m).
 - 2. Ambient Temperature:
- C. Short Circuit Current Rating:

- D. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.
- E. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.
- F. Bussing: Sized in accordance with UL 67 temperature rise requirements.
 - 1. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
- G. Conductor Terminations: Suitable for use with the conductors to be installed.
- H. Enclosures: Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E.
 - 1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
 - 2. Boxes: Galvanized steel unless otherwise indicated.
 - a. Provide wiring gutters sized to accommodate the conductors to be installed.
 - 3. Fronts:
 - 4. Lockable Doors: All locks keyed alike unless otherwise indicated.
- I. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

2.03 OVERCURRENT PROTECTIVE DEVICES

- A. Molded Case Circuit Breakers:
 - 1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
 - 2. Interrupting Capacity:
 - a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
 - 1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
 - b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
 - 3. Conductor Terminations:
 - a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
 - 4. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive panelboards.
- D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship).
- B. Install products in accordance with manufacturer's instructions.
- C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.
- D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- E. Provide required support and attachment in accordance with Section 260529.
- F. Install panelboards plumb.

- G. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches (2000 mm) above the floor or working platform.
- H. Provide grounding and bonding in accordance with Section 260526.
- I. Install all field-installed branch devices, components, and accessories.
- J. Provide filler plates to cover unused spaces in panelboards.

END OF SECTION

**SECTION 31 05 13
SOILS FOR EARTHWORK**

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Topsoil materials.
 2. Subsoil materials.

1.2 Related Requirements:

1. Section 31 05 16 - Aggregates for Earthwork: Coarse and fine aggregate materials.
2. Section 31 23 16.13 - Trenching
3. Section 31 22 13 - Rough Grading

1.3 REFERENCES

- A. American Association of State Highway and Transportation Officials:

1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

- B. ASTM International:

1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³).
2. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³).
3. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).

1.4 QUALITY ASSURANCE

- A. Furnish each subsoil and topsoil material from single source throughout the Work.
- B. Perform Work in accordance with MoDOT Specifications (latest version).

PART 2 - PRODUCTS

2.1 TOPSOIL MATERIALS

- A. Topsoil Type S3:
1. Excavated reused material is acceptable if it otherwise meets the requirements of this Section.
 2. Topsoil shall consist of loose friable soil, graded and single or double screened, free of stumps, roots, rocks over 1/2 inches in diameter, brush, weeds, subsoil, foreign matter or other material which would be detrimental to the proper development of vegetative growth.
 3. Soil shall be capable of supporting normal vegetation as demonstrated by the growth of healthy vegetation on it and shall not be taken from a source known to contain noxious weeds.
 4. Topsoil shall have a pH value of 6.2 to 7.4. Testing for pH value shall be performed in accordance with AASHTO T289. Agricultural limestone may be added to topsoil in order to raise the pH to meet specification requirements. The addition of agriculture limestone shall be determined based on tests performed by a State approved laboratory. Topsoil shall not be incorporated into the work until it is approved.
 5. Conform to ASTM D2487 Group Symbol OH or PT.

2.2 SUBSOIL MATERIALS

- A. Subsoil Type S2.
1. Subsoil shall be graded excavated reused material or imported borrow.
 2. Soil shall be grades and free of lumps larger than 3 inches, rocks larger than 2 inches, stumps, large roots and debris.
 3. Conform to ASTM D2487 Group Symbol CL or OL.

2.3 SOURCE QUALITY CONTROL

- A. Testing and Analysis of Subsoil Material: Perform in accordance with ASTM D698 and ASTM D1557.
- B. Testing and Analysis of Topsoil Material: Perform in accordance with ASTM D698 and ASTM D1557.
- C. When tests indicate materials do not meet specified requirements, change material and retest.
- D. Furnish materials of each type from same source throughout the Work.

PART 3 - EXECUTION

3.1 EXCAVATION

- A. Excavate subsoil and topsoil from areas designated. Strip topsoil to full depth of topsoil in designated areas.

- B. Stockpile excavated material meeting requirements for subsoil materials and topsoil materials.
- C. Remove excess excavated subsoil and topsoil not intended for reuse, from site.
- D. Remove excavated materials not meeting requirements for subsoil materials and topsoil materials from site.

3.2 STOCKPILING

- A. Stockpile materials on site at locations approved by Owner or Owners Representative.
- B. Stockpile in sufficient quantities to meet Project schedule and requirements.
- C. Separate differing materials with dividers or stockpile apart to prevent mixing.
- D. Stockpile topsoil 8 feet high maximum.
- E. Prevent intermixing of soil types or contamination.
- F. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.
- G. Stockpile unsuitable materials on impervious material and cover to prevent erosion and leaching, until disposed of.

3.3 CLEANUP

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.
- B. Remove stockpile, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.
- C. When borrow area is indicated, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

END OF SECTION 31 05 13

SECTION 31 05 16
AGGREGATES FOR EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Coarse aggregate materials.
 2. Fine aggregate materials.

1.2 REFERENCES

- A. American Association of State Highway and Transportation Officials:
1. AASHTO M147 - Standard Specification for Materials for Aggregate and Soil-Aggregate Subbase, Base and Surface Courses.
 2. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.
- B. ASTM International:
1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³).
 3. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³).
 4. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).
 5. ASTM D4318 - Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- C. Missouri Department of Transportation Specifications - Latest Edition.

PART 2 - PRODUCTS

2.1 COARSE AGGREGATE MATERIALS

- A. Aggregate Type A1 (No. 8 Stone/Gravel): AASHTO M147, Grade; passing No. sieve with liquid limit of not more than 25; plasticity index of not more than five in accordance with ASTM D4318.
- B. Aggregate Type A2 (No. 53 Stone/Gravel): Coarse Stone Crushed Gravel: Pit run Angular crushed natural washed stone; free of shale, clay, friable material and debris; graded in accordance with ASTM C136 Group Symbol GW; within the following limits:

Sieve Size	Percent Passing
2 inches	100
1 inch	95
3/4 inch	95 to 100
5/8 inch	75 to 100
3/8 inch	55 to 85
No.4	35 to 60
No. 16	15 to 35
No. 40	10 to 25
No. 200	5 to 10

- C. Aggregate Type A3 (B-Borrow/Pea Gravel): Natural stone; washed, free of clay, shale, organic matter; graded in accordance with ASTM C136 ASTM D2487 Group Symbol GM; to the following limits:
1. Minimum Size: 1/4 inch.
 2. Maximum Size: 5/8 inch.

2.2 FINE AGGREGATE MATERIALS

- A. Fine Aggregate Type A4 (Sand): Natural river or bank sand; washed; free of silt, clay, loam, friable or soluble materials, and organic matter; graded in accordance with ASTM C136 Group Symbol SW; within the following limits:

Sieve Size	Percent Passing
No. 4	100
No. 14	10 to 100
No. 50	5 to 90
No. 100	4 to 30
No. 200	0

2.3 SOURCE QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Testing and inspection services.
- B. Coarse Aggregate Material - Testing and Analysis: Perform in accordance with ASTM D698.
- C. Fine Aggregate Material - Testing and Analysis: Perform in accordance with ASTM D698.
- D. When tests indicate materials do not meet specified requirements, change material and retest.

PART 3 - EXECUTION

3.1 EXCAVATION

- A. Stockpile excavated material meeting requirements for coarse aggregate materials and fine aggregate materials.
- B. Remove excess excavated coarse aggregate materials and fine aggregate materials not intended for reuse from site.

- C. Remove excavated materials not meeting requirements for coarse aggregate materials and fine aggregate materials from site.

3.2 STOCKPILING

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

3.3 STOCKPILE CLEANUP

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

END OF SECTION 31 05 16

SECTION 31 05 19.13
GEOTEXTILES FOR EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Nonwoven geotextile material.
- B. Related Requirements:
 - 1. Section 46 61 23 - Gravity Filters.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

- A. Section 01 20 00 - Price and Payment Procedures: Contract Sum/Price modification procedures.
- B. Geotextiles:
 - 1. Basis of Measurement: By square foot in place.
 - 2. Basis of Payment:
 - a. Includes materials, equipment, installation, and testing of geotextile material.
 - b. No allowance will be made for overlaps.

1.3 REFERENCE STANDARDS

- A. ASTM International:
 - 1. ASTM D4355/D4355M - Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus.
 - 2. ASTM D4491/D4491M - Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
 - 3. ASTM D4533/D4533M - Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
 - 4. ASTM D4632/D4632M - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
 - 5. ASTM D4751 - Standard Test Method for Determining Apparent Opening Size of a Geotextile.
 - 6. ASTM D4833/D4833M - Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products.
 - 7. ASTM D4873 - Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples.
 - 8. ASTM D4886 - Standard Test Method for Abrasion Resistance of Geotextiles (Sand Paper/Sliding Block Method).

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

- B. Product Data: Submit manufacturer information including tensile strength, elongation, thickness, UV resistance, and other material specifications.
- C. Shop Drawings: Indicate fabric layout, seam locations, and overlap details in installation drawings.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Manufacturer Instructions: Submit detailed instructions on installation requirements, including storage and handling procedures.
- F. Source Quality-Control Submittals: Indicate results of factory tests and inspections.
- G. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

1.5 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.
- B. Project Record Documents: Record actual locations of geotextile material, including placement depth.

1.6 QUALITY ASSURANCE

- A. Perform Work according to industry standards.

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years' experience.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- C. Comply with ASTM D4873.
- D. Store materials according to manufacturer instructions.
- E. Protection:
 - 1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
 - 2. Provide additional protection according to manufacturer instructions.

PART 2 - PRODUCTS

2.1 NONWOVEN GEOTEXTILE MATERIALS

- A. Manufacturers:
 - 1. GSE Lining Technology, Inc.
 - 2. IWT/Cargo-Guard.
 - 3. Propex Operating Company, LLC.
- B. Substitutions: As specified in Section 01 60 00 - Product Requirements.
- C. Furnish materials according to industry standards.
- D. Description:
 - 1. Non-biodegradable, UV-resistant, needle punched, non-woven geotextile fabric.
 - 2. Material: Polypropylene.
 - 3. Edges: Selvaged or finished to prevent separation of outer material.
 - 4. Calendar such that yarns will retain relative positions.
- E. Performance and Design Criteria:
 - 1. Nominal Weight: 7 oz./sq. yd.
 - 2. Minimal Sheet Thickness: 15 mils.
 - 3. Apparent Opening Size:
 - a. No. 100 to No. 140 U.S. standard sieve size.
 - b. Comply with ASTM D4751.
 - 4. Vertical Water Flow Rate:
 - a. Comply with ASTM D4491/D4491M.
 - 5. Minimum Grab Tensile Strength:
 - a. 180 lbf, minimum average roll value.
 - b. Comply with ASTM D4632/D4632M.
 - 6. Elongation at Break:
 - a. 64 percent, minimum average roll value.
 - b. Comply with ASTM D4632/D4632M.
 - 7. Trapezoidal Tear Strength:
 - a. 70 lbs, minimum average roll value.
 - b. Comply with ASTM D4533/D4533M.
 - 8. Puncture Strength:
 - a. Comply with ASTM D4833/D4833M.
 - 9. UV Resistance at 500 Hours:
 - a. Comply with ASTM D4355/D4355M.

2.2 ACCESSORIES

- A. Sewing Thread:
 - 1. Material: Polypropylene.
 - 2. Durability: Equal to or greater than durability of geotextile.
- B. Securing Pins:
 - 1. Material: Steel rods or bars.

2. Diameter: 3/16 inch.
3. Minimum Length: 12 inches.
4. Washers:
 - a. Material: Steel.
 - b. Outside Diameter: Minimum 1-1/2 inches.
 - c. Inside Diameter: 1/4 inch.
 - d. Thickness: 1/8 inch.

C. Wire Staples:

1. Material: Steel.
2. Minimum Size: 10 gage.
3. Minimum Length: 6 inches.

2.3 SOURCE QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Requirements for testing, inspection, and analysis.
- B. Provide shop inspection and testing of completed assembly.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.
- B. Verify that underlying surface is smooth and free of ruts or protrusions that could damage geotextile material.

3.2 PREPARATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation preparation.
- B. Subgrade Material and Requirements: As specified in Section 46 61 23 - Gravity Filters.

3.3 INSTALLATION

A. Geotextile Material:

1. Lay and maintain smooth and free of tensile stresses, folds, wrinkles, or creases.
2. Ensure that material is in direct contact with subgrade.
3. Orientate with long dimension of each sheet transverse to direction of slope.
4. Minimum Unseamed Joints Overlap: 18 inches.

B. Securement Pins:

1. Insert through geotextile midway between edges of overlaps and minimum 6 inches from free edges.

2. Minimum Spacing:
 - a. Slopes Steeper than 3 Horizontal on 1 Vertical: 24 inches o.c.
 - b. Slopes 3 Horizontal on 1 Vertical to 4 Horizontal on 1 Vertical: 3 feet o.c.
 - c. Slopes Flatter than 4 Horizontal on 1 Vertical: 5 feet o.c.
 3. Ensure that washer bears against geotextile.
- C. Seams:
1. Minimum Seamed Joints Overlap: 12 at longitudinal and transverse joints.
 2. Seams across Slope: Lap upper panel over lower panel.
 3. Sewn Seams:
 - a. Continuously sew seams.
 - b. Stitch Type: As recommended by geotextile manufacturer.
 - c. Tie off thread at the end of each seam to prevent unraveling.
 4. Thermal Seams:
 - a. As recommended by geotextile manufacturer.
 - b. Comply with ASTM D4886.
- D. Penetrations: As recommended by geotextile manufacturer.
- E. Repairing Damaged Geotextiles:
1. Repair torn or damaged geotextile by placing patch of same type of geotextile over damaged area minimum of 12 beyond edge of damaged area, and fasten as recommended by geotextile manufacturer.
 2. Remove and replace geotextile rolls which cannot be repaired.
- F. Fill and Cover:
1. Place fill to prevent tensile stress or wrinkles in geotextile.
 2. Place fill from bottom of side-slopes upward.
 3. Do not drop fill from height greater than 3 feet.

3.4 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Requirements for inspecting and testing.
- B. Testing: Per EPA/600/R-93/182.
- C. Equipment Acceptance:
 1. Adjust, repair, modify, or replace components failing to perform as specified.
 2. Make final adjustments per manufacturer's recommendations.

3.5 PROTECTION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protecting finished Work.
- B. Ballast: Adequate to prevent uplift of material by wind.
- C. UV Exposure: Do not leave material uncovered for more than 14 days after installation.

- D. Do not use staples or pins to hold geotextiles in place where located adjacent to other geosynthetic layers that could be damaged.
- E. Do not operate equipment directly on top of geotextile.

END OF SECTION 31 05 19.13

SECTION 31 10 00
SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Removing surface debris.
 - 2. Removing abandoned utilities.
 - 3. Excavating topsoil.

- B. Related Sections:
 - 1. Section 31 22 13 - Rough Grading.

1.2 SUBMITTALS

- A. Section 01 00 04 - Submittals: Requirements for submittals.

1.3 QUALITY ASSURANCE

- A. Conform to applicable code for environmental requirements, disposal of debris, and use of herbicides.

PART 2 - PRODUCTS - Not Used.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

- B. Identify waste area for placing removed materials.

3.2 PREPARATION

- A. Call Local Utility Line Information service at 811 not less than three working days before performing Work.
 - 1. Request underground utilities to be located and marked within and surrounding construction areas.

3.3 PROTECTION

- A. Locate, identify and protect utilities indicated to remain from damage.
- B. Protect benchmarks, survey control points and existing structures from damage or displacement.

3.4 CLEARING

- A. Clear areas required for access to site and execution of Work to minimum depth of 24 inches.
- B. Remove surface rock.

3.5 REMOVAL

- A. Remove debris, rock, and extracted plant life from site.
- B. Remove abandoned utilities. Indicated removal termination point for underground utilities on Record Documents.
- C. Continuously clean up and remove waste materials from site. Do not allow materials to accumulate on site.
- D. Do not burn or bury materials on site. Leave site in clean condition.

3.6 TOPSOIL EXCAVATION

- A. Excavate topsoil from areas to be further excavated, relandscaped, or regraded without mixing with foreign materials for use in finish grading.
- B. Do not excavate wet topsoil.
- C. Stockpile in area designated on site to depth not exceeding 8 feet and protect from erosion. Stockpile material on impervious material and cover over with same material until reuse or disposal.
- D. Remove excess topsoil not intended for reuse from Site or stockpile on Site per Owner's instructions.

END OF SECTION 31 10 00

SECTION 31 22 13 ROUGH GRADING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Excavating topsoil.
2. Excavating subsoil.
3. Cutting, grading, filling, rough contouring and compacting site for site structures and concrete building pads.

B. Related Sections:

1. Section 31 05 13 - Soils for Earthwork: Soils for fill.
2. Section 31 05 16 - Aggregates for Earthwork: Aggregates for fill.
3. Section 31 23 16 - Excavation.
4. Section 31 23 16.13 - Trenching: Trenching and backfilling for utilities.
5. Section 31 80 00 - Lagoon Earthwork

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

1. Basis of Payment: Incidental to related construction and site restoration, including excavating existing soil, supplying soil materials, stockpiling, scarifying substrate surface, placing where required, and compacting.

1.3 REFERENCES

A. ASTM International:

1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
3. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
4. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)).
5. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
6. ASTM D2419 - Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.
7. ASTM D2434 - Standard Test Method for Permeability of Granular Soils (Constant Head).
8. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
9. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

1.5 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.
- B. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with ASTM C136, ASTM D2419 and ASTM D2434.
- B. Perform Work in accordance with industry standards.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Topsoil: Type S3 as specified in Section 31 05 13 - Soils of Earthwork.
- B. Subsoil Fill: Type S2 as specified in Section 31 05 13 - Soils for Earthwork
- C. Structural Fill: Type A2 as specified in Section 31 05 16 - Aggregate for Earthwork.
- D. Granular Fill: Type A1, as specified in Section 31 05 16 - Aggregate for Earthwork.
- E. Lagoon Embankment Soil: Per Section 31 80 00 - Lagoon Earthwork

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify survey benchmark and intended elevations for the Work are as indicated on Drawings.

3.2 PREPARATION

Call Local Utility Line Information service at 811 not less than three working days before performing Work. Request underground utilities to be located and marked within and surrounding construction areas.

- A. Identify required lines, levels, contours, and datum.

- B. In case of conflict, notify utility company to temporarily relocate affected utilities.
- C. Protect utilities indicated to remain from damage.
- D. Protect plant life, lawns, rock outcropping and other features remaining as portion of final landscaping.
- E. Protect benchmarks, survey control point, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

3.3 TOPSOIL EXCAVATION

- A. Excavate topsoil from areas to be further excavated or regraded without mixing with foreign materials for use in finish grading.
- B. Do not excavate wet topsoil.
- C. Stockpile in area designated on site to depth not exceeding 8 feet and protect from erosion. Stockpile material on impervious material and cover over with same material, until disposal.
- D. Do not remove topsoil from site.

3.4 SUBSOIL EXCAVATION

- A. Excavate subsoil from areas to be further excavated or regraded.
- B. Do not excavate wet subsoil or excavate and process wet material to obtain optimum moisture content.
- C. When excavating through roots, perform Work by hand and cut roots with sharp axe.
- D. Stockpile subsoil in area designated on site to depth not exceeding 8 feet and protect from erosion.
- E. Benching Slopes: Horizontally bench existing slopes greater than 1: 4 to key placed fill material to slope to provide firm bearing.
- F. Stability: Replace damaged or displaced subsoil as specified for fill.

3.5 FILLING

- A. Fill areas to contours and elevations with unfrozen materials.
- B. Place material in continuous layers as follows:
 1. Subsoil Fill: Maximum 8 inches compacted depth.
 2. Structural Fill: Maximum 6 inches compacted depth.
 3. Granular Fill: Maximum 6 inches compacted depth.
- C. Maintain optimum moisture content of fill materials to attain required compaction density.

- D. Slope grade away from building minimum 2 percent slope for minimum distance of 10 ft, unless noted otherwise.
- E. Make grade changes gradual. Blend slope into level areas.
- F. Repair or replace items indicated to remain, which are damaged by excavation or filling.

3.6 TOLERANCES

- A. Section 01 40 00 - Quality Requirements: Tolerances.
- B. Top Surface of Subgrade: Plus or minus 1/10 foot from required elevation.

3.7 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements.
- B. Perform laboratory material tests in accordance with ASTM D1557 or ASTM D698.
- C. Perform in place compaction tests in accordance with the following:
 - 1. Density Tests: ASTM D1556, ASTM D2167 or ASTM D2922.
 - 2. Moisture Tests: ASTM D3017.
- D. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.
- E. Frequency of Tests: Once per area to be graded.

3.8 SCHEDULES

- A. Topsoil Fill:
 - 1. Fill Type: Site excavated soil meeting the requirements herein, minimum 6 inches thick.
 - 2. Compact uniformly to minimum 90 percent of maximum density.
- B. Subsoil Fill:
 - 1. Fill Type: Site excavated soil meeting the requirements herein, to subgrade elevation.
 - 2. Compact uniformly to minimum 95 percent of maximum density.
- C. Structural Fill:
 - 1. Fill Type A2: To subgrade elevation
 - 2. Compact uniformly to minimum 95 percent of maximum density.

END OF SECTION 31 22 13

SECTION 31 23 16 EXCAVATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Soil densification.
 - 2. Excavating for building foundations.
 - 3. Excavating for paving, roads, and parking areas.
 - 4. Excavating for slabs-on-grade.
 - 5. Excavating for site structures.
 - 6. Excavating for landscaping.

- B. Related Sections:
 - 1. Section 31 23 16.13 - Trenching

1.2 REFERENCES

- A. Local utility standards when working within 24 inches of utility lines.

1.3 SUBMITTALS

- A. Section 01 00 04 - Submittals.

- B. Excavation Protection Plan: Describe sheeting, shoring, and bracing materials and installation required to protect excavations and adjacent structures and property.

- C. Shop Drawings: Indicate soil densification grid for each size and configuration footing requiring soils densification.

PART 2 - PRODUCTS - Not Used.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Call Local Utility Line Information service at 811 not less than three working days before performing Work.
 - 1. Request underground utilities to be located and marked within and surrounding construction areas.

- B. Identify required lines, levels, contours, and datum.
- C. Protect utilities indicated to remain from damage.
- D. Protect plant life, lawns, and other features remaining as portion of final landscaping.
- E. Protect benchmarks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.
- F. No Work should be performed within the floodway or floodplain without necessary permits authorizing specified work.

3.2 EXCAVATION

- A. Excavate subsoil to accommodate building foundations, slabs-on-grade paving and site structures, and construction operations.
- B. Slope banks with machine to angle of repose or less until shored.
- C. Do not interfere with 45 degree bearing splay of foundations.
- D. Grade top perimeter of excavation to prevent surface water from draining into excavation.
- E. Trim excavation. Remove loose matter.
- F. Correct areas over excavated.
- G. Repair or replace items indicated to remain damaged by excavation.

3.3 PROTECTION

- A. Prevent displacement or loose soil from falling into excavation; maintain soil stability.
- B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.
- C. Protect structures, utilities and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth operations.

END OF SECTION 31 23 16

SECTION 31 23 16.13 TRENCHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Excavating trenches for utilities outside of building
2. Compacted fill from top of utility bedding to subgrade elevations.
3. Backfilling and compaction.

B. Related Sections:

1. Section 03 30 00 - Cast-In-Place Concrete: Concrete materials.
2. Section 31 05 13 - Soils for Earthwork
3. Section 31 05 16 - Aggregates for Earthwork: Aggregates for fill.
4. Section 31 05 19.13 - Geotextiles for Earthwork.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

- A. Basis of Payment: Trenching and fill are incidental to installation of pipe, including excavating to required elevations, protecting excavation, stockpiling excavated materials, and removing excavated materials from site. Over Excavating: Payment is not made for over excavated work nor for replacement materials.

1.3 REFERENCES

A. ASTM International:

1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
2. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
3. ASTM D1557 -Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)).
4. ASTM D2487 - Standard Method for Classification of Soils for Engineering Purposes.
5. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.4 DEFINITIONS

- A. Utility: Any buried pipe, duct, conduit, or cable.

1.5 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with Missouri Department of Natural Resources standards.

1.7 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.8 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

PART 2 - PRODUCTS

2.1 FILL MATERIALS

A. Common Fill:

1. Common Fill shall be earth materials entirely free of: vegetation; trash; lumber; and frozen, soft or organic materials. No stones or rocks larger than the sizes listed below will be permitted in the Common Fill:
 - a. Common Fill-Type A: No stones or rocks larger than 1-inch.
 - b. Common Fill-Type B: No stones or rocks larger than 4-inches in the longest dimension.
2. Common fill material may be obtained from the trench excavation provided it complies with the requirements of this Section. Furnish the necessary approved common fill materials from an off-site source whenever approved material obtained from the trench excavation is insufficient to complete the backfill.

B. Haunching Fill:

1. Materials used for haunching around the pipe shall be coarse to fine, sandy natural soil material with maximum stone size of 1-inch or $\frac{3}{4}$ " Minus Granular Fill.
2. The material shall conform to ASTM D 2487 using the "Unified Soil Classification System", except where a higher standard is required elsewhere in the Contract Documents or by rules or regulations of Federal, State or local governmental bodies having jurisdiction over the site of the Work.
3. The haunching material shall meet the Class II soil type designation. Class II soil types include GW, GP, SW and SP that are described as non-cohesive, well graded and containing some fines. Voids, finer grained soils or movement can allow undesirable migration of haunching material or migration of the trench sidewall material into the haunching material. In such instances place filter fabric, as directed by the Owner, in the trench bottom and sides before placing the haunching material.
4. Haunching material may be obtained from the trench excavation provided it has been approved by the Owner who may, at his discretion, require testing in accordance with the requirements of this Section. Furnish the necessary approved haunching materials from an off-site source whenever approved material obtained from the trench excavation is insufficient to complete the haunching.

- C. Bedding Fill:
 - 1. ¾ inch minus granular fill material contains additional fine material and may be used as noted in specific pipe specifications. Material shall meet the sieve analysis requirements of AASHTO as follows
 - a. 1" sieve passing: 100%,
 - b. ¾" sieve passing: 80-90%,
 - c. No 4 sieve passing: 25-50%,
 - d. No 10 sieve passing: 0-20%
 - e. No 200 passing sieve: 0-5%
 - f. or approved equal as approved by the Engineer.
- D. Subsoil Fill: Type S2 as specified in Section 31 05 13 - Soils for Earthwork.
- E. Structural Fill: Type S2 as specified in Section 31 05 13 - Soils for Earthwork.
- F. Granular Fill: Type A1 as specified in Section 31 05 16 - Aggregates for Earthwork.
- G. Concrete: Lean concrete.
- H. Filter Fabric: Per Section 31 05 19.13 - Geotextiles for Earthwork.

2.2 ACCESSORIES

- A. Manufacturers:
 - 1. Bonar Inc.; a Low & Bonar company.
 - 2. Huesker Inc.
 - 3. Propex Fabrics Inc.
 - 4. Tenax Corporation - USA.
 - 5. TenCate Geosynthetics.
 - 6. Tensar Earth Technologies, Inc.
 - 7. Substitutions: Section 01 60 00 - Product Requirements.

PART 3 - EXECUTION

3.1 CONSTRUCTION EQUIPMENT

- A. All backfilling and materials handling equipment shall have rubber tires when mains are located in or adjacent to pavements. Crawler equipment shall be permitted when there is no danger of damaging pavement. It is the Contractor's responsibility, to repair, at their expense, any damages due to the use of any equipment to complete the work.

3.2 LINES AND GRADES

- A. Lay pipes to lines and grades indicated on Drawings.
 - 1. Engineer reserves right to make changes in lines, grades, and depths of utilities when changes are required for Project conditions.

- B. Options:
1. Use laser-beam instrument with qualified operator to establish lines and grades.
 2. Maintain grade alignment of pipe using string line parallel with grade line and vertically above centerline of pipe.
 - a. Establish string line on level batter boards at intervals of not more than 25 feet.
 - b. Install batter boards spanning trench, rigidly anchored to posts driven into ground on both sides of trench.
 - c. Set three adjacent batter boards before laying pipe to verify grades and line.
 - d. Determine elevation and position of string line from elevation and position of offset points or stakes located along pipe route.
 - e. Do not locate pipe using side lines for line or grade.

3.3 PREPARATION

- A. Call Local Utility Line Information service at 811 not less than three working days before performing Work.
 1. Request underground utilities to be located and marked within and surrounding construction areas.
- B. Identify required lines, levels, contours, and datum locations.
- C. Protect plant life, lawns, and other features remaining as portion of final landscaping.
- D. Protect benchmarks, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.
- E. Maintain and protect above and below grade utilities indicated to remain.
- F. Establish temporary traffic control when trenching is performed in public right-of-way. Relocate controls as required during progress of Work.

3.4 TRENCHING

- A. Excavate subsoil required for utilities to aerated filter.
- B. Remove lumped subsoil, boulders, and rock up of 1/6 cu. yd., measured by volume. Remove and dispose of larger material as directed by Owner.
- C. Perform excavation within 24 inches of existing utility service in accordance with utility's requirements.
- D. Open Trench Length
 1. Do not advance open trench more than 200 feet ahead of installed pipe.
 2. Do not leave more than 50 feet of trench open at end of working day.
 3. The length or size of excavation shall be controlled by the particular surrounding conditions, but shall always be confined to the limits prescribed by Owner. If the excavation becomes a hazard, or if it excessively restricts traffic at any point, Owner may require special construction procedures such as limiting the length of the open trench or prohibiting stacking excavated material in the street. Take precautions to prevent injury

to the public or Owner due to open trenches. All trenches, excavated material, equipment, or other obstacles which could be dangerous to the public, shall be well lighted.

E. Trench Width:

1. Cut trenches to width indicated on Drawings, sufficiently wide to enable installation and allow inspection. Remove water or materials that interfere with Work.
2. In Earth: Excavate bottom of trenches a minimum of the pipe barrel plus 8 inches, i.e., 4 inches each side, maximum 2 feet wider than outside diameter of pipe.
3. In Rock: Excavate minimum outside diameter of the pipe barrel plus 24 inches, i.e., 12 inches each side.
4. Maximum in Earth or Rock: Nominal pipe diameter plus 30 inches.
5. Excessive Trench Width
 - a. Provide additional backfill, haunching, and bedding material, as specified in this Sections and as approved by the Engineer to fill any trench excavation that exceeds the maximum trench width. Dispose of excess excavated materials off site at no cost to the Owner. Furnish the Owner with satisfactory evidence that an appropriate disposal site was used.
 - b. Contractor will only be compensated for the minimum described above.

F. Trench Depth:

1. Excavate trenches to depth indicated on Drawings. Provide uniform and continuous bearing and support for bedding material and pipe or other utilities.
2. When Project conditions permit, slope side walls of excavation starting 2 feet above top of pipe. When side walls cannot be sloped, provide sheeting and shoring to protect excavation as specified in this section.
3. Do not interfere with 45 degree bearing splay of foundations.
4. Provide 48 inches of cover from the top of the pipe barrel to the top of the finished grade of a roadway, unless otherwise authorized by the Owner, or as shown on the Drawings.
5. Earth: Excavate to the depth required, so as to provide a uniform and continuous bearing and support for the pipe barrel on solid and undisturbed ground at every point between joints. It will be permissible to disturb the finished trench bottom over a maximum length of 18 inches near the middle of each length of pipe by the withdrawal of pipe slings or other lifting tackle. Provide bell holes and prepare the finished trench bottom accurately using hand tools.
6. Rock: Excavate trenches in rock or boulders 6-inches below the pipe barrel for pipe 24-inches or less in diameter. Remove all loose material from the trench bottom. Prepare a pipe bed using bedding material (3/4" Minus Granular Fill).
7. Unsuitable Bottom: Notify the Engineer whenever unsuitable material is found below subgrade. Remove the material over the area and to the depth determined by the Engineer until suitable material is encountered. Provide compacted bedding material (3/4" Minus Granular Fill) to restore the trench bottom to the required grade in these areas.
8. Cut out soft areas of subgrade not capable of compaction in place. Backfill with Fill Type A1 as specified in Section 31 05 16 - Aggregates for Earthwork and compact to density equal to or greater than requirements for subsequent backfill material.
9. Trim excavation. Hand trim for bell and spigot pipe joints. Remove loose matter.
10. Correct areas over excavated areas with compacted backfill as specified for authorized excavation or replace with fill concrete as directed by Engineer.

G. Option for Excess Subsoil:

1. Remove excess subsoil not intended for reuse, from site.

2. Stockpile subsoil in area designated on site to depth not exceeding 8 feet and protect from erosion.

3.5 SHEETING AND SHORING

- A. Support open cut excavation for mains where trenching may cause danger to life, unnecessary damage to street pavement, trees, structures, poles, utilities, or other private or public property. Support the sides of the excavation by adequate and suitable sheeting, shoring, bracing or other approved means in accordance with all applicable Federal, State, County, Municipal and OSHA rules and regulations during the progress of the work, whenever and wherever it is necessary. Maintain the trench support materials and equipment in place until backfilling operations have progressed to the point where the supports may be withdrawn without endangering life or property.
- B. Sheet, shore, and brace excavations to prevent danger to persons, structures and adjacent properties and to prevent caving, erosion, and loss of surrounding subsoil.
- C. Support trenches more than 5 feet deep excavated through unstable, loose, or soft material. Provide sheeting, shoring, bracing, or other protection to maintain stability of excavation.
- D. Design sheeting and shoring to be removed at completion of excavation work.
- E. Repair damage caused by failure of the sheeting, shoring, or bracing and for settlement of filled excavations or adjacent soil.
- F. Repair damage to new and existing Work from settlement, water or earth pressure or other causes resulting from inadequate sheeting, shoring, or bracing.

3.6 BACKFILLING - OPEN TERRAIN

- A. All trench backfilling shall be compacted so that no settlement occurs and is stable with surrounding soil that also shall not have settled.
- B. Backfill trenches to contours and elevations with unfrozen fill materials.
- C. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.
- D. Employ placement method that does not disturb or damage, utilities in trench.
- E. Maintain optimum moisture content of fill materials to attain required compaction density.
- F. Protect open trench to prevent danger to Owner.
- G. Unless otherwise specified below, place material in continuous layers as follows:
 1. Subsoil Fill: Maximum 8 inches compacted depth.
 2. Structural Fill: Maximum 6 inches compacted depth.
 3. Granular Fill: Maximum 6 inches compacted depth.

H. Ductile Iron Pipe

1. Bedding:
 - a. In Suitable Soil: See this Section, above.
 - b. In Rock or Unsuitable Soil: When encountering rock or unsuitable material, prepare pipe bedding immediately before pipe is laid. In this instance, compact ¾" Minus Granular Fill as described in from 6" below the pipe to the bottom of the pipe.
 - c. Bedding material shall be compacted in a maximum of 6" layers.
2. Haunching:
 - a. Place haunching from the bottom of the pipe barrel to the centerline (springline) of the pipe barrel with Haunching Fill.
 - b. Take care to avoid damaging or moving the pipe.
 - c. Place the material in uniform 6 to 12 inch layers and compact each layer so as to eliminate the possibility of settlement, pipe misalignment, or damage of joints.
3. Initial Trench Backfill:
 - a. Backfill from the centerline (springline) of the pipe barrel to 12 inches above the pipe with Common Fill-Type A or ¾" Minus Granular Fill
 - b. Mechanical equipment may be used to place the backfill. Do not compact the backfill with mechanical equipment unless sufficient cover of at least 6" is provided over the pipe to prevent damage to the pipe.
 - c. Place the material in such a manner that the material does not free fall, but rather flows onto the previously placed material.
 - d. Place the material in uniform 6 to 12 inch layers and compact each layer so as to eliminate the possibility of settlement, pipe misalignment, or damage of joints.
4. Final Trench Backfill:
 - a. Backfill from 12 inches above the pipe to final grade with Common Fill - Type B.
 - b. Mechanical equipment may be used to place the backfill.
 - c. Place the material in such a manner that the material does not free fall, but rather flows onto the previously placed material.
 - d. Place the material in uniform 6 to 12 inch layers and compact each layer so as to eliminate the possibility of settlement, pipe misalignment, or damage of joints.
5. Surface Conditions:
 - a. Attend to the trench surface regularly during the course of the Contract.
 - b. Take prompt corrective measures to correct any settlement or wash-out.
 - c. Maintain the trench surface in a safe condition that does not interfere with natural drainage.
6. Deficiency of Backfill:
 - a. Any material required for backfilling the trenches or for filling depressions caused by settlement or wash-out shall be supplied and placed by the Contractor at his expense.

I. PVC and HDPE Pipe

1. Bedding:
 - a. Prepare pipe bedding immediately before pipe is laid. Compact ¾" Minus Granular Fill from 6" below the pipe to the bottom of the pipe. Bedding material shall be compacted in a maximum of 6" layers.
2. Haunching and Initial Backfill:
 - a. Place haunching and initial backfill from the bottom of the pipe barrel to 12 inches above the top of the pipe barrel with ¾" Minus Granular Fill.
 - b. Mechanical equipment may be used to place the backfill.

- c. Place the material in such a manner that the material does not free fall, but rather flows onto the previously placed material.
 - d. Place the material in uniform 6 to 12 inch layers and compact each layer so as to eliminate the possibility of settlement, pipe misalignment, or damage of joints.
- 3. Remaining Trench Backfill:
 - a. Backfill from 12 inches above the pipe to finished grade with Common Fill-Type B.
 - b. Mechanical equipment may be used to place the backfill.
 - c. Place the material in such a manner that the material does not free fall, but rather flows onto the previously placed material.
 - d. Place the material in uniform 6 to 12 inch layers and compact each layer so as to eliminate the possibility of settlement, pipe misalignment, or damage of joints.
- 4. Surface Conditions:
 - a. Attend to the trench surface regularly during the course of the Contract.
 - b. Take prompt corrective measures to correct any settlement or wash-out.
 - c. Maintain the trench surface in a safe condition that does not interfere with natural drainage.
- 5. Deficiency of Backfill
 - a. Any material required for backfilling the trenches or for filling depressions caused by settlement or wash-out shall be supplied and placed by the Contractor at his expense.

3.7 TRENCH BACKFILLING UNDER PAVEMENT AND WITHIN 3 FEET OF PAVEMENT OR GRAVEL ROADWAY

- A. Bedding: Install bedding for selected pipe material in accordance with this Section.
- B. Haunching and Initial Backfill: Install Haunching and Initial Backfill for selected pipe material in accordance with this Section.
- C. Final Backfill:
 - 1. Fill the remainder of the excavation using $\frac{3}{4}$ inches Minus Granular Fill, as described in this Section.
 - 2. Place the material in uniform 6 to 12 inch layers and compact each layer so as to eliminate the possibility of settlement, pipe misalignment, or damage of joints, unless where a higher standard is required by rules or regulations of Federal, State or local governmental bodies having jurisdiction over the site of the Work.
 - 3. Take care to avoid injuring or moving the pipe.
- D. Surface Conditions:
 - 1. Attend to the trench surface regularly during the course of the Contract.
 - 2. Take prompt corrective measures to correct any settlement or washout.
 - 3. Maintain the trench surface in a safe condition that does not interfere with natural drainage.
- E. Deficiency of Backfill:
 - 1. Any material required for backfilling the trenches or for filling depressions caused by settlement or wash-out shall be supplied and placed by the Contractor at his expense.

3.8 JETTING OF BACKFILL

- A. Jetting of backfill is not allowed for this project.

3.9 DEWATERING

- B. If dewatering is determined to be necessary, the Contractor shall design, furnish, install, operate, maintain and remove a complete temporary dewatering system as necessary to lower and control water levels below sub-grades of excavation to permit construction in-the-dry.

3.10 TOLERANCES

- A. Section 01 40 00 - Quality Requirements: Tolerances.
- B. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

3.11 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Perform laboratory material tests in accordance with ASTM D1557.
- C. Perform in place compaction tests in accordance with the following:
 - 1. Density Tests: ASTM D1556.
 - 2. Moisture Tests: ASTM D3017.
- D. When tests indicate Work does not meet specified requirements, remove Work, replace, compact, and retest.
- E. Frequency of Tests: One per line section.

3.12 PROTECTION OF FINISHED WORK

- A. Section 01 70 00 - Execution and Closeout Requirements: Protecting finished work.
- B. Reshape and re-compact fills subjected to vehicular traffic during construction.

END OF SECTION 31 23 16.13

SECTION 31 25 00
EROSION AND SEDIMENTATION CONTROL

PART 1 - GENERAL

1.1. SUMMARY

- A. Section Includes:
 - 1. Temporary and permanent vegetation covers,
 - 2. Mulching and baling at the construction site and all areas disturbed during construction, including borrow areas.

- B. Related Sections:
 - 1. Section 31 10 00 - Site Clearing
 - 2. Section 32 92 19 - Seeding

1.2. REFERENCES

- A. In addition to the requirements of these Specifications, comply with the highest of Federal, State, County and local requirements for erosion and sedimentation control. If in doubt as to the applicable standard, notify the Owner and comply with the Owner directions concerning the prevailing jurisdiction.

PART 2 - PRODUCTS

2.1. MATERIALS - GENERAL

- A. All materials such as seeds, mulch, silt fencing and straw bales shall conform to the Specifications of the local county and all other applicable Federal, State, County, and local requirements.

PART 3 - EXECUTION

3.1. GENERAL

- A. Permanent vegetation cover, mulching, and baling shall be in accordance with the applicable Federal, State, and local requirements.

3.2. SITE STABILIZATION

- A. Incorporate erosion control devices indicated on the Drawings into the Project at the earliest practicable time.

- B. Construct, stabilize and activate erosion controls before site disturbance within tributary areas of those controls.
- C. Stockpile and waste pile heights shall not exceed 8 feet. Slope stockpile sides at 2: 1 or flatter.
- D. Stabilize any disturbed area of affected erosion control devices on which activity has ceased and which will remain exposed for more than 20 days.
 - 1. During non-germinating periods, apply mulch at recommended rates.
 - 2. Stabilize disturbed areas which are not at finished grade and which will be disturbed within one year in accordance with Section 32 92 19 - Seeding at 50 percent of permanent application rate with no topsoil.
 - 3. Stabilize disturbed areas which are either at finished grade or will not be disturbed within one year in accordance with Section 32 92 19 - Seeding permanent seeding specifications.
 - 4. Stabilize diversion channels, sediment traps, and stockpiles immediately.

1.1 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements.
- B. Inspect erosion control devices on a weekly basis and after each runoff event. Make necessary repairs to ensure erosion and sediment controls are in good working order.

1.2 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.
- B. When sediment accumulation in sedimentation structures has reached a point one-third depth of sediment structure or device, remove and dispose of sediment.
- C. Do not damage structure or device during cleaning operations.
- D. Do not permit sediment to erode into construction or site areas or natural waterways.
- E. Clean channels when depth of sediment reaches approximately one half channel depth.

END OF SECTION 31 25 00

SECTION 31 80 00
LAGOON EARTHWORK

PART 1 - GENERAL

1.1. SUMMARY

- A. Section Includes:
 - 1. Earthwork and construction of lagoon embankment.
- B. Related Sections:
 - 1. Section 31 22 13 - Rough Grading

1.2. MEASUREMENT AND PAYMENT

- A. Basis of Payment: Incidental to construction.

1.3. REFERENCES

- A. ASTM International:
 - 1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).

1.4. SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Soil information and test results.
- C. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

1.5. QUALITY ASSURANCE

- A. Perform Work according to the Missouri Department of Natural Resources standards.

PART 2 - PRODUCTS

2.1. FILL MATERIALS

- A. Embankment Soil: Suitable fill material excavated on site shall contain no muck, frozen material, organic material, topsoil or rubbish and less than 10 percent rock or gravel. The maximum accepted rock diameter will be 3 inches.

- B. Gradation:
 - 1. Particle Size Distribution: Poorly graded sand-clay mixtures.
 - 2. Minimum Clay Content: 10 percent.
 - 3. Minimum Silt and Clay Content: 20%.
 - 2. Maximum Particle Size Content larger than 3/8 inches: 10%
 - 3. Compacted Permeability: 1×10^{-7} cm/s.

PART 3 - EXECUTION

3.1. PREPARATION

- A. Contractor is to verify that required lines, levels, contours and datum are as shown in the Drawings.
- B. Contractor shall verify the location and depth of all utilities. Call 811 a minimum of three (3) working days prior to construction. Prior to commencement of Work the Contractor shall notify all those companies which have facilities in the vicinity of the construction.
- C. Contractor is to coordinate removal or relocation of existing utilities with their Owner.
- D. Contractor shall maintain the site and conduct earthwork operations to ensure that the property is well drained at all times.
- E. Contractor is to cut out soft areas of subgrade not capable of in situ compaction per Section 31 22 13 - Rough Grading. Backfill and compact to density equal to or greater than the requirements for subsequent fill material.
- F. Grading, excavation and backfilling shall be made to the lines, grades and cross sections indicated in the Drawings.

3.2. PROTECTION

- A. Contractor is to locate, identify and protect utilities that remain from damage. The Contractor shall make every reasonable effort to protect all existing utilities from damage. If any utility is damaged through the carelessness or negligent actions of the Contractor, the utility shall be repaired by its owner at the Contractor's expense.
- B. Protect benchmarks, control points and existing structures from excavation equipment and vehicular traffic. If necessary, relocate benchmarks and control points under the guidance of a surveyor licensed in the State of Missouri.
- C. Protect the berm and portions of embankment not designated for Work on the Drawings from damage, including damage from construction vehicles or activities, erosion, and other factors.

3.3. EXCAVATION

- A. Existing berm soil in good condition shall be removed and stockpiled separately for later reuse.

- B. Grade top perimeter of excavation to prevent surface water from draining into excavation.
- C. When materials are encountered during excavation which the Engineer deems unsuitable for use, the material shall be removed to the depth and limits ordered by the Engineer and backfilled with suitable fill material.
- D. If water occurs once the maximum excavation depth has been reached, then proper dewatering procedures shall be followed. If the area does not naturally dewater in a reasonable amount of time, then the basin shall be emptied via pumping.
- E. The subgrade of the lagoon embankment shall be properly stabilized before commencing construction within the footprint of the berm. This shall include achieving the proper soil moisture content outlined in the following sections.
- F. All suitable material removed by excavation shall be used as far as practical for backfill and embankment, as required to complete the Work. The Contractor shall sort all excavated material and stockpile suitable material as necessary. Stockpile excavated material to be used as fill and backfill in area designated on site and remove excess material or unsuitable material not being reused from site.
- G. Notify the Engineer of unexpected subsurface conditions and discontinue affected Work in area until notified to resume Work.
- H. Correct areas over-excavated with suitable fill material compacted to 95 percent standard proctor density unless Engineer indicates otherwise.

3.4. SOIL TESTING:

- A. The Contractor shall provide for sampling and testing of all embankment fill.
 - 1. Laboratory Tests:
 - a. At least one gradation tests and initial moisture-density (Proctor) tests shall be made for the embankment for each, job excavated and imported material. Permeability and optimum moisture content shall thus be determined.
 - b. Only soil showing sufficient quality, as specified herein, shall be used for the Work under this Section.
 - 2. Field Tests:
 - a. During the progress of the Work of filling and backfilling, in-place density tests shall be performed.
 - b. The number of tests to be taken and the locations thereof shall be determined by random sampling of the material, with a minimum of 2 samples or as directed by the Engineer.
 - c. If the tests indicate the compaction is not sufficient, the Contractor shall increase the compactive effort on all such inadequately compacted areas until specified compaction is achieved.

3.5. FILL AND COMPACTION

- A. All unstable or unsuitable material shall be removed from the existing surface to receive fill material prior to commencing Work.

- B. Before placing any fill the existing surface shall be scarified, moisture conditioned as required and the top 12 inches compacted to 95 percent of the maximum density for that material in accordance with ASTM D-698.
- C. Embankment fill shall be brought up in lifts not exceeding 6 inches loose thickness. The material shall be bladed out and the bottom area cut to form benches and the embankment material being placed shall be compacted to the specified density. Formation and compaction of benches shall not be measured and paid for directly, but will be considered incidental work. Fill slopes shall be overfilled and then cut back to develop an adequate slope face.
- D. Do not place fill or backfill material over porous, wet, frozen or spongy surfaces. Embankment construction shall not be performed when fill material is frozen or contains frost or snow.

3.6. FINISHING

- A. In areas to be seeded or sodded, the upper 6 inches shall be topsoil material suitable for sustaining grass.
- B. The graded surface shall be left free of rock, concrete, brick, fragments, or rubbish and shall be finished to the lines, grades and cross-sections indicated on the plans.
- C. Protect finished Work from damage or displacement. Contractor shall reshape and recompact any damaged areas and shall leave the surface unmarred.

3.7. CLEANUP

- A. Contractor shall clean the site as the Work progresses. Final cleanup shall follow immediately behind the finishing. Contractor shall remove from the site all equipment, tools, unused materials and other construction items. The entire site shall be left in a neat, finished condition. Cleanup shall be considered incidental to grading operations.
- B. Remove all excess excavated and unsuitable materials from the site or store on-site per Owner's instructions.

3.8 TOLERANCES

- A. Top Surface of General Backfilling: Plus or minus 0.1 foot from specified elevations.

END OF SECTION 318000

SECTION 32 15 00
AGGREGATE SURFACE COURSE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. This work shall consist of furnishing and placing chat, gravel or crushed stone surfacing in the quantity shown in the contract document or as directed by the Engineer.
- B. Related Section:
 - 1. Section 31 22 13 - Rough Grading

1.2 REFERENCES

- A. American Association of State Highway and Transportation Officials:
 - 1. AASHTO T 96
- B. Missouri Department of Transportation Standard Specifications

1.3 QUALITY ASSURANCE

- A. Furnish each aggregate material from single source throughout the Work.
- B. Perform Work according to MoDOT Specifications (latest version).

PART 2 - PRODUCTS

2.1 AGGREGATE MATERIALS

- A. All material shall be in accordance with Division 1000, Material Details, and specifically Sec 1006 of the MoDOT Specifications.
- B. Aggregate: Crushed Stone or Reclaimed Concrete:
 - 1. Percent Passing per Sieve Size:
 - a. 1 Inch: 100.
 - b. 3/8 Inch: 65.
 - c. No. 4: 5-25.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify compacted substrate is dry and ready to support paving and imposed loads.
 - 1. Proof roll substrate with in minimum two perpendicular passes to identify soft spots.
 - 2. Remove soft substrate and replace with compacted fill as specified in Section 31 22 13 - Rough Grading.
- B. Verify substrate has been inspected, gradients and elevations are correct.

3.2 PREPARATION

- A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.
- B. Do not place fill on soft, muddy, or frozen surfaces.

3.3 AGGREGATE PLACEMENT

- A. Place aggregate equal thickness layers to total compacted thickness.
 - 1. Minimum Layer Compacted Thickness: 4 inches.
 - 2. Maximum Layer Compacted Thickness: 6 inches.
- B. Roller compact aggregate to 95 percent maximum density.
- C. Level and contour surfaces to elevations, profiles, and gradients indicated.
- D. Maintain optimum moisture content of fill materials to attain specified compaction density.
- E. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

3.4 TOLERANCES

- A. Maximum Variation from Flat Surface: 1/4 inch measured with 10-foot straight edge.
- B. Maximum Variation from Thickness: 1/4 inch.
- C. Maximum Variation from Elevation: 1/2 inch.

3.5 FIELD QUALITY CONTROL

- A. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.
- B. Frequency of Tests: One test for every 1,000 square yards of each layer compacted aggregate.

END OF SECTION 32 15 00

SECTION 32 31 13.10
WOVEN WIRE FENCES AND GATES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Two-strand barbed wire topped woven wire fence with wood posts and accessories.
2. Excavation for post bases.
3. Concrete foundation for posts.
4. Manual 6-bar gates and related hardware.

B. Related Sections:

1. Section 03 30 00 - Concrete.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Fencing:

1. Basis of Measurement: By linear foot to fence height specified.
2. Basis of Payment: Includes posts, footing, rails, tension wire, fabric, accessories, attachments and hardware and all labor, equipment, tools and incidentals

B. Gates:

1. Basis of Measurement: Each gate.
2. Basis of Payment: Includes furnishing all materials and preparation, erection, and installation, equipment, tools, and incidentals.

1.3 REFERENCES

A. ASTM International:

1. ASTM A116-22 - Standard Specification for Metallic-Coated, Steel-Woven Wire Fence Fabric
2. ASTM A121 - Standard Specification for Metallic-Coated Carbon Steel Barbed Wire.
3. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
4. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
5. A1011/A1011M-07 Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength
6. ASTM F626 - Standard Specification for Fence Fittings.
7. ASTM F900 - Standard Specification for Industrial and Commercial Swing Gates.
8. ASTM F1083 - Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures.

- B. American Wood Protection Association (AWPA):
 - 1. AWPA C8 - Preservative Treatment of Western Redcedar and Alaska Yellow Cedar Poles
 - 2. AWPA C1: Standard for the preservative treatment of timber products by pressure processes.
 - 3. AWPA P8: A standard for oil-borne preservatives.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Shop Drawings: Indicate layout, spacing of components, post foundation dimensions, hardware anchorage, gates, and schedule of components.
- C. Product Data: Submit data on fabric, posts, accessories, fittings and hardware.
- D. Manufacturer's Installation Instructions: Submit installation requirements.

1.5 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
- B. Project Record Documents: Accurately record actual locations of corner and gate posts,
- C. Operation and Maintenance Data: Procedures for submittals.

1.6 QUALITY ASSURANCE

- A. Perform Work according to industry standards.

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years' experience.
- B. Installer: Company specializing in performing work of this section with minimum three years' experience.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Deliver fence fabric and accessories in packed cartons or firmly tied rolls.
- C. Identify each package with manufacturer's name.

- D. Store fence fabric and accessories in secure and dry place.

PART 2 - PRODUCTS

2.1 WIRE.

- A. Woven Wire (Zinc-coated):
 - 1. Conform to ASTM A116-22.
 - 2. Use a woven wire fence that is 7-bar, 26-inch field fence with top and bottom wires No. 10 ASW gauge, and filler and stay wires No. 12-1/2 ASW gauge.
 - 3. Stay wires shall be spaced 6 inches apart.
 - 4. All wires shall be smooth two-dip galvanized steel wire and spaced as shown on the Drawings.
- B. Barbed Wire (Zinc-coated):
 - 1. Conform to ASTM A121 Coating Type Z.
 - 2. Use a zinc-coated barbed wire that is 2-strand twisted No. 12 ASW gage galvanized steel wire with 4-point barbs of No. 14 ASW gauge galvanized steel wire.
 - 3. The barbs shall be spaced approximately 4 inches apart.
- C. Barbed Wire (Copper-covered).
 - 1. Conform to ASTM A121.
- D. Barbed Wire (Aluminum-coated):
 - 1. Conform to ASTM A121 Coating Type A.
 - 2. Aluminum-coated steel-barbed wire shall be 2-strand twisted No. 12 ASW gage.
 - 3. The 4-point barbs of No. 14 ASW gauge aluminum-coated steel wire shall be spaced approximately 5 inches (125 mm) apart.
 - 4. The steel wire shall have a tensile strength of between 60,000 and 80,000 pounds per square inch.
 - 5. The aluminum coating shall have a minimum weight of 0.30 ounce per square foot of wire surface on the No. 12-1/2 ASW gauge line wires and 0.25 ounce per square foot of wire surface on the No. 14 ASW gauge barbs.
- E. Bracing Wire (Zinc-coated):
 - 1. Use No. 9 smooth galvanized soft wire when using cable for bracing.

2.2 POSTS.

- A. Species: Use one of the following species of wood for all posts, unless otherwise shown on the Plans.
 - 1. Northern White Cedar
 - 2. Southern Yellow Pine
 - 3. Tamarack
 - 4. Red (Norway) Pine
 - 5. Jack Pine

- B. Posts shall be given a preservative treatment in accordance with the method specified as full length treatment.
 - 1. Condition posts by air seasoning, steaming, or heating in oil in a manner that prevents injurious checking, splitting, or warping before treating. The treatment, care, and preservative shall be in accordance with AWP standard applicable to the type of wood.
- C. Quality:
 - 1. Posts shall be peeled, sound, straight-grained, free from decay, cracks, and splits; shakes must not be in excess of ¼ inch wide and 3 feet long. Checks (lengthwise separations of the wood in a generally radial direction) are permitted, provided they are not injurious.
 - 2. Outer bark should be completely removed from all posts including depressions. Inner bark should be removed from all post surfaces to be treated, except inner bark may remain in depressions. The amount of wood shaved off in the removal of inner bark should be held to a minimum.
- D. Dimensions: Posts shall be of the length shown on the Drawings. Posts shall have the diameter shown on the Drawings or minimum top diameters not less than 4-1/2 inches for line posts and not less than 6 inches for gate, corner, bracer, or vertical angle posts, whichever is more.
- E. Sawed and split posts are acceptable instead of round posts provided their dimensions are such that round posts of required diameter could be turned therefrom.

2.3 CONCRETE: Per Section 03 30 00 - Concrete.

2.4 BRACES.

- A. Use cleats, gate stops, and braces in the sizes shown on the Drawings.
- B. Use the same species and quality specified for the posts or approved by the Engineer that are free from knots larger than one-third the width of the piece.
- C. Make gate stops of posts of suitable length.
- D. Braces may be made of posts of suitable length or of sawed lumber.
- E. Treat all cleats, gate stops, and any braces in contact with the ground and for a distance of at least 6 inches above the ground as specified herein for posts.

2.5 STAPLES:

- A. Use staples that are No. 9 galvanized steel wire, 1 inch long for hardwood posts and 1-1/2 inches long for use in softwood posts.

2.6 GATES AND HARDWARE:

- A. 6-Bar Swing Gate.
 - 1. Comply with ASTM F900.
 - 2. Factory assembled for 180 degree swing operation by one person.

3. Opening Widths, Height and Directions of Operation: As indicated on Drawings.
4. Provide vertical Z braces for gates wider than 8 feet.
5. Construct gates of 1.75-inch galvanized steel tubing.
6. Furnish heavily galvanized hinges, chain latch, snap chain and hinge pins.

PART 3 - EXECUTION

3.1 GENERAL

- A. Construct the fence in accordance with the Details on the Drawings and as specified herein using new materials.
- B. Prior to the beginning of the Work the Contractor shall locate the position of the Work by establishing and marking the fence line.
- C. When directed, span the opening below the fence with barbed wire fastened to posts of extra length at locations of small natural or drainage ditches where it is not practical to conform the fence to the general contour of the ground surface.
- D. Plumb the finished fence taut, true to line and ground contour, and complete in every detail.
- E. When directed, stake down the woven wire fence at several points between posts.

3.2 CLEARING FENCE LINE

- A. Clear the site of the fence of obstructions, and grade surface irregularities so that the fence will conform to the general contour of the ground.
- B. Clear the fence line to a minimum width of 2 feet on each side of the centerline of the fence.
- C. This clearing consists of the removal of all stumps, brush, rocks, trees, or other obstructions that will interfere with proper construction of the fence. Grub and excavate stumps within the cleared area of the fence line.
 1. After post and stump removal refill remaining holes with suitable soil, gravel, or other material acceptable to the Engineer and compact these areas properly with tampers.
- D. Place the bottom of the fence a uniform distance above ground as specified on the Drawings.
- E. When shown on the Drawings or as directed by the Engineer, remove as part of the construction Work, the existing fences which coincide with, or are in a position to interfere with, the new fence location unless the removal is listed as a separate item in the Schedule of Prices.
- F. The Work shall include the handling and disposal of all material cleared, of excess excavation, and the removal of spoiled material regardless of the type, character, composition, or condition of such material encountered.

3.3 SETTING POSTS

- A. Spacing:
 - 1. Line Post Spacing: Not exceeding 12 feet.
 - 2. Gate and Corner Posts: 5 feet.
- B. Excavate holes for posts to diameter and spacing indicated on Drawings without disturbing underlying materials, unless required for rock removal.
 - 1. Remove rock where it is encountered, even if blasting is necessary, to provide full-depth and full-size holes. No extra compensation shall be made for rock excavation. Rock excavation may not be grounds for extension of time.
- C. The diameter of the holes must be at least 6 inches larger than the diameter of the posts. When cleats are used on posts, dig the holes large enough to accommodate them.
- D. Cut off square the bottoms of all posts.
- E. Set posts with large ends down, plumb, and in good line on the side on which the wire is to be fastened.
 - 1. Set posts full depth and do not cut posts off to eliminate rock or other excavation.
- F. Footing Depth: Set intermediate, terminal and gate posts plumb, in concrete footings with top of footing 2 inches above finish grade. Slope top of concrete for water runoff.
- G. Allow footings to cure minimum 7 days before installing fabric and other materials attached to posts. Do not stretch fabric until concrete foundation has cured 28 days.
- H. After posts are placed and lined, backfill the holes with suitable material and properly compacted by the use of tampers.

3.4 ANCHORING

- A. Anchor corner, end, gate, and adjacent intermediate posts by gaining and spiking cleats to the sides of the posts, as indicated on the Drawings. No cleats will be required on other intermediate posts or on anchor posts.

3.5 BRACING

- A. Brace end, corner, anchor, and gate posts by using a post of sufficient length or a piece of sawed lumber of the proper size, together with a wire cable. Slope outward to match existing fence.
- B. Gain and securely spike the wooden brace into the end, corner, anchor, or gate posts and into the next intermediate posts about 6 inches from the top of the respective posts.
- C. Loop a cable made of a double strand of galvanized soft wire around the end, corner, anchor, or gate post near the ground and around the next intermediate post about 12 inches from the top.
- D. After the cable has been stapled in this position, twist it until tight.
- E. The staples used to hold the cable shall be not less than 1-1/2 inches long.

- F. Leave the tool used for twisting the cable in place to permit later adjustment of bracing if found necessary.
- G. Set anchor posts at maximum 500-foot intervals and braced to the adjacent posts.
- H. Brace posts before the wire fencing is placed.

3.6 INSTALLING WIRE

- A. Place the wires on the side of the posts away from the Site or as directed.
- B. Place the wire fence on the posts at the height indicated on the Drawings.
- C. Install longitudinal wires parallel and draw them uniformly taut.
- D. The vertical stay wires of the woven wire fencing should be straight and vertical.
- E. Wrap the woven wire once around the post and wrap barbed wire at the end and gate posts.
- F. Staple each longitudinal wire at least three times and tie these wire ends with a snug, tight twist.
- G. Staple each longitudinal wire to each intermediate post with one steel wire staple. At the corner and anchor posts, use two or more staples.
- H. Staple the top barbed wire strand of all fences with two staples in each post.
- I. Set diagonally with the grain of the wood and drive up tight all staples.
- J. After the fence has been erected, saw off the tops of the wood posts with a 1-to-3 pitch.
- K. The bottom wire of the wire fencing must clear the ground by not more than 4 inches or less than 1 inch at all locations.

3.7 SPLICING WIRE

- A. Wire splices in longitudinal wires will be permitted if made with an approved galvanized bolt-clamp splice or a wire splice made as follows:
 1. Carry the end of the wires 3 inches past the splice tool and wrap around the other wire away from the tool for at least six turns in opposite directions.
 2. After the tool is removed, close the space occupied by it by pulling the ends together.
 3. Cut close the unused ends of the wires.
 4. Splice woven wire only at posts.

3.8 INSTALLING GATES

- A. Erect gates at locations shown on the Drawings.
- B. Hang the gates on gate fittings supported on gate posts, as shown on the Drawings.

- C. Clamp, screw or bolt fittings on the gate posts to prevent slipping.
- D. Erect gates to swing in the direction indicated and provide gate stops, as specified or as shown on the Drawings.

3.9 EXISTING FENCE CONNECTIONS:

- A. Connections between existing and new fences shall be made at all locations where new fence is shown on the Drawings to terminate adjacent to existing fence.
- B. Wherever the new fence joins an existing fence, either at a corner or at the intersection of straight fence lines, set a corner or anchor post at the junction, braced and anchored the same as herein described for corner posts.
- C. If the connection is made at other than the corner of the new fence, the last span of the old fence shall contain a brace span. Connect to existing fence at existing terminal post or new terminal post or an existing line post converted to terminal post by installation of brace rails and brace rods.

3.10 ELECTRICAL GROUNDS

- A. Construct electrical grounds where a power line passes over the fence and at 500-foot intervals.
- B. Install the ground directly below the point of crossing.
- C. Accomplish the ground with a copperclad rod 8 feet long and a minimum of 5/8 inch in diameter driven vertically until the top is 6 inches below the ground surface.
- D. Clamp a No. 6 solid copper conductor to the rod and to the fence so that each element of the fence is grounded.
- E. Installation of ground rods shall not constitute a separate Pay Item and shall be considered incidental to fence construction.

3.11 CLEANING UP

- A. Remove all tools, buildings, equipment, debris, and excess material used during construction.

3.12 ERECTION TOLERANCES

- A. Section 01 40 00 - Quality Requirements: Tolerances.
- B. Maximum Variation from Plumb: 1/4 inch.
- C. Maximum Offset from Indicated Position: 1 inch.

END OF SECTION 32 31 13.10

SECTION 32 92 19
SEEDING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Fertilizing.
 - 2. Seeding.
 - 3. Mulching.
 - 4. Maintenance.

- B. Related Sections:
 - 1. Section 31 23 16.13 - Trenching: Rough grading over cut.
 - 2. Section 31 25 00 - Erosion and Sedimentation Control.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

- A. Basis of Payment: Incidental to Site Restoration, including seeding, watering and maintenance.

1.3 REFERENCES

- A. Association of Official Seed Analysts (AOSA)
 - 1. Journal of Seed Technology: Rules for Testing Seeds

- B. ASTM International:
 - 1. ASTM C602 - Standard Specification for Agricultural Liming Materials.

1.4 DEFINITIONS

- A. Weeds: Vegetative species other than specified species to be established in given area.

1.5 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

- B. Product Data: Submit data for seed mix, fertilizer and other accessories.

- C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.6 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.

1.7 QUALITY ASSURANCE

- A. Provide seed mixture in containers showing percentage of seed mix, germination percentage, inert matter percentage, weed percentage, year of production, net weight, date of packaging, and location of packaging.
- B. Perform Work according to County standards.

1.8 QUALIFICATIONS

- A. Seed Supplier: Company specializing in manufacturing Products specified in this section with minimum three years' experience.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.
- B. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable.
- C. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

1.10 MAINTENANCE SERVICE

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for maintenance service.
- B. Maintain seeded areas immediately after placement until grass is well established and exhibits vigorous growing condition for at least one cutting.

PART 2 - PRODUCTS

2.1 SEED MIXTURE

- A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Journal of Seed Technology; Rules for Testing Seeds" for purity and germination tolerances.
- B. Seed Species: Seed of grass species as follows, with not less than 85 percent germination, not less than 98 percent pure seed, and not more than 0.8 percent weed seed:
 - 1. Turf Type Fescue.

2.2 ACCESSORIES

- A. Mulching Material: Oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry. Hay or chopped cornstalks are **not** acceptable.

- B. Fertilizer: Uniform in composition and free flowing commercial grade; recommended for grass; of proportion necessary to eliminate deficiencies of topsoil 12-12-12 or as indicated in analysis.
 - 1. Application Rate: 500 pounds per acre.
- C. Lime: ASTM C602, Class T or Class O, as indicated by site conditions, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent.
- D. Water: Clean, fresh and free of substances or matter capable of inhibiting vigorous growth of grass.
- E. Erosion Fabric: Jute matting, open weave.
- F. Stakes: Softwood lumber, chisel pointed.
- G. String: Organic fiber.

2.3 SOURCE QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Testing, inspection and analysis requirements.
- B. For imported topsoil provide recommendation for fertilizer and lime application rates for specified seed mix based on percentage of nitrogen, phosphorus, potash, soluble salt content, organic matter content, and pH value result.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify prepared soil base is ready to receive the Work of this section.

3.2 FERTILIZING

- A. Apply lime at application rate recommended by soil analysis. Work lime into top 6 inches of soil.
- B. Apply fertilizer at application rate recommended by soil analysis.
- C. Apply after smooth raking of topsoil and prior to roller compaction.
- D. Do not apply fertilizer at same time or with same machine used to apply seed.
- E. Mix fertilizer thoroughly into upper 2 inches of topsoil.
- F. Lightly water soil to aid dissipation of fertilizer. Irrigate top level of soil uniformly.

3.3 SEEDING

- A. Apply seed at rate of 100 lbs per 1,000 sq ft evenly in two intersecting directions. Rake in lightly.
- B. Do not seed areas in excess of that which can be mulched on same day.
- C. Plant during one of the following periods. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.
 - 1. Spring Planting: March 15 – May 15.
 - 2. Fall Planting: August 15 – September 30.
- D. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit.
- E. Do not sow immediately following rain, when ground is too dry, or when winds are over 12 mph.
- F. Roll seeded area with roller not exceeding 112 lbs/linear foot.
- G. Immediately following seeding and compacting, apply mulch to thickness of 1/8 inches. Maintain clear of shrubs and trees.
- H. Apply water with fine spray immediately after each area has been mulched. Saturate to 4 inches of soil.

3.4 SEED PROTECTION

- A. Cover seeded slopes where grade is 4 inches per foot or greater with biodegradable erosion fabric. Roll fabric onto slopes without stretching or pulling.
- B. Lay fabric smoothly on surface, bury top end of each section in 6 inch deep excavated topsoil trench. Overlap edges and ends of adjacent rolls minimum 12 inches. Backfill trench and rake smooth, level with adjacent soil.
- C. Secure outside edges and overlaps at 36 inch intervals with stakes.
- D. Lightly dress slopes with topsoil to ensure close contact between fabric and soil.
- E. At sides of ditches, lay fabric laps in direction of water flow. Lap ends and edges minimum 6 inches.

3.5 MAINTENANCE

- A. Mow grass at regular intervals to maintain at maximum height of 2-1/2 inches. Do not cut more than 1/3 of grass blade at each mowing. Perform first mowing when seedlings are 40 percent higher than desired height.
- B. Neatly trim edges and hand clip where necessary.
- C. Immediately remove clippings after mowing and trimming. Do not let clippings lay in clumps.

- D. Water to prevent grass and soil from drying out.
- E. Control growth of weeds. Apply herbicides. Remedy damage resulting from improper use of herbicides.
- F. Immediately reseed areas showing bare spots.
- G. Repair washouts or gullies.
- H. Protect seeded areas with warning signs during maintenance period.

END OF SECTION 32 92 19

SECTION 33 05 05
PIPING – GENERAL PROVISIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. General piping provisions.
- B. Related Work
 - 1. Section 33 34 10 - Ductile Iron pipe and Fittings.

1.2 REFERENCE STANDARDS

- A. AWWA and ANSI Standards:
 - 1. ANSI/AWWA C600: Installation of Ductile-Iron Water Mains and their Appurtenances.

1.3 DRAWINGS

- A. Dimensions shown on Drawings are approximate only. Verify all piping geometry in the field and to ensure proper alignment and fit of all piping consistent with the intent of the Drawings. Submit field layout drawings, as required for approval.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S RESPONSIBILITY FOR MATERIAL

- B. Examine all material carefully for defects. Do not install material which is known, or thought to be, defective.
- C. Owner reserves the right to inspect all material and to reject all defective material shipped to the job site or stored on the site. Failure of Owner to detect damaged material shall not relieve the Contractor from his total responsibility for the completed work if it leaks or breaks after installation.
- D. Lay all defective material aside for final inspection by Owner. Owner will determine if corrective repairs may be made, or if the material is rejected. Owner shall determine the extent of the repairs.
- E. Classify defective pipe prior to Owner's inspection as follows:
 - 1. Damage to interior and/or exterior paint seal coatings.
 - 2. Damage to interior cement-mortar or epoxy lining.
 - 3. Insufficient interior cement-mortar lining or epoxy thickness.
 - 4. Excessive pitting of pipe.
 - 5. Poor quality exterior paint seal coat.

6. Pipe out of round.
 7. Pipe barrel area damaged to a point where pipe class thickness is reduced (all pipe).
 8. Denting or gouges in plain end of pipe (all pipe).
 9. Excessive slag on pipe affecting gasket seal (DIP).
 10. Any visible cracks, holes.
 11. Embedded foreign materials.
 12. Non-uniform color, density, and other physical properties along the length of the pipe.
- F. The Contractor shall be responsible for all material, equipment, fixtures, and devices furnished. These materials, equipment, fixtures, and devices shall comply with the requirements and standards of all Federal, State, and local laws, ordinances, codes, rules, and regulations governing safety and health.
- G. The Contractor shall take full responsibility for the storage and handling of all material furnished until the material is incorporated in the completed project and accepted by Owner. Contractor shall be solely responsible for the safe storage of all material furnished to or by him until incorporated in the completed project and accepted by Owner.
- H. Load and unload pipe, fittings, valves, and accessories by lifting with hoists or skidding to avoid shock or damage. Do not drop these materials. Pipe handled on skidways shall not be skidded or rolled against other pipe. Handle this material in accordance with AWWA C600 whichever is applicable.
- I. Drain and store fittings and valves prior to installation in such a manner as to protect them from damage due to freezing of trapped water.

2.2 PETROLATUM TAPE COATING

- A. The tape coating shall be a cold applied, saturant tape made from either petrolatum or petroleum wax with a noncellulosic synthetic fiber fabric. The fabric shall be encapsulated and coated on both sides with the petrolatum or petroleum wax. The thickness of the tape shall be no less than 40 mil. The petrolatum or petroleum wax shall be at least 50% of the product by weight.
- B. The tape coating shall be supplied in sheets, pads or rolls. Pads and sheets shall be sized to fit the area that is to be covered, allowing for an overlap per AWWA Standards.

2.3 RUBBERIZED-BITUMEN BASED SPRAY-ON UNDERCOATING

- A. Subject to approval by Owner, an alternative corrosion protection for exposed buried metal is an aerosol applied rubberized coating. The material shall be rapid dry and specifically designed for corrosion protection. 3M Rubberized Underseal Undercoating 08883 or any equivalent rubberized-bitumen based spray-on undercoating may be used. Follow manufacturer's recommendations for storage and application.

PART 3 - EXECUTION

2.4 INSTALLATION - GENERAL REQUIREMENTS

- A. Lay and maintain all pipe to the required lines and depths on the plans. Provide 42 inches of cover from the top of the pipe barrel to the top of the finished grade unless otherwise authorized by Owner. Install fittings and valves in strict accordance with the Specifications at the required locations with joints centered, spigots home, and all valve stems plumb. Do not deviate from the required alignment, depth, or grade without the written consent of Owner.
- B. Lay all pipe to the depth specified. Measure the depth from the final surface grade to the top of the pipe barrel. The minimum pipe cover shall be as shown on the Drawings or as specified in the Specifications.
- C. Do not lay pipe in a wet trench, on subgrade containing frost, or when trench conditions are unsuitable for such work. If all efforts fail to obtain a stable dry trench bottom and Owner determines that the trench bottom is unsuitable for such work, Owner will order the kind of stabilization to be constructed, in writing. In all cases, water levels must be at least 6" below the bottom of the pipe.
- D. Thoroughly clean the pipes and fittings before they are installed. Keep these materials clean until the acceptance of the completed Work. Lay pipe with the bell ends facing in the direction of laying, unless otherwise shown on the Drawings, or directed by Owner. Exercise care to ensure that each length abuts the next in such a manner that no shoulder or unevenness of any kind occurs in the pipeline.
- E. Do not wedge or block the pipe during laying unless by written order of Owner.
- F. Before joints are made, bed each section of pipe the full length of the barrel, at the required grade, and at the invert matching the previously laid pipe. Dig bell holes sufficiently large to permit proper joint making. Do not bring succeeding pipe into position until the preceding length is embedded and secure in place.
- G. Take up and relay pipe that is out of alignment or grade, or pipe having disturbed joints after laying. Take up such in-place pipe sections found to be defective and replace them with new pipe. Take up, relaying, and replacement will be at the Contractor's expense.
- H. Place enough backfill over the center sections of the pipe to prevent floating. Take all other necessary precautions to prevent the floating of the pipeline by the accumulation of water in the trench, or the collapse of the pipeline from any cause. Should floating or collapse occur, restoration will be at the Contractor's expense.
- I. Contractor shall install tracer wire along all pipelines. Tracer wire may be installed in trench below both the pipe and pipe bedding to prevent the tracer wire from being disturbed during repairs.
- J. Bedding materials and concrete work for the pipe bedding and thrust restraint shall be as specified.
- K. Prevent foreign material from entering the pipe while it is being placed. Do not place debris, tools, clothing, or other materials in the pipe during laying operations. Close all openings in

the pipeline with watertight plugs when pipe laying is stopped at the close of the day's work, or for other reasons such as rest breaks or meal periods.

- L. Only cut pipe with equipment specifically designed for cutting pipe such as an abrasive wheel, a rotary wheel cutter, a guillotine pipe saw, or a milling wheel saw. Do not use chisels or hand saws. Grind cut ends and rough edges smooth. Bevel the cut end slightly for push-on connections as per manufacturer recommendations.
- M. In distributing material at the site of the Work, unload each piece opposite or near the place where it is to be laid in the trench. If the pipe is to be strung out, do so in a straight line or in a line conforming to the curvature of the street. Block each length of pipe adequately to prevent movement. Block stockpiled pipe adequately to prevent movement. Do not place pipe, material, or any other object on private property, obstructing walkways or driveways, or in any manner that interferes with the normal flow of traffic.
- N. Exercise special care to avoid damage to the bells, spigots or flanged ends of pipe during handling, temporary storage, and construction. Replace damaged pipe that cannot be repaired to Owner's satisfaction, at the Contractor's expense.
- O. Remove all existing pipe, fittings, valves, pipe supports, blocking, and all other items necessary to provide space for making connections to existing pipe and installing all piping required under this Contract.
- P. Maintain the minimum required distance between water and sewer lines and other utility lines in strict accordance with all Federal, State, and local requirements and all right-of-way limitations.
- Q. Marking tape to be provided along all mains and service lines installed. Marking tape to be installed 12" below grade. Foil backing is not required on marking tape. Tape shall be colored blue for water mains and green for sewer. Marking tape along pressurized force mains shall be labeled "Pressurized Wastewater".

END OF SECTION 33 05 05

SECTION 33 05 05.36
VACUUM TESTING OF MANHOLES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Vacuum testing of manholes.
 - 1. Test all manholes and similar structures installed under this Contract.
 - 2. For the purpose of this section control structures are treated as manholes.
- B. Related Requirements:
 - 1. Section 03 40 01 - Precast Concrete Manholes

1.2 REFERENCE STANDARDS

- A. ASTM International:
 - 1. ASTM C1244 - Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Submit following items prior to start of testing:
 - 1. Testing procedures.
 - 2. List of test equipment.
 - 3. Testing sequence schedule.
 - 4. Provisions for disposal of flushing and test water.
 - 5. Certification of test gage calibration.
- C. Submit schedules and procedures to Engineer at least seven days prior to any testing.
- D. Test and Evaluation Reports: Provide results of manhole tests.

PART 2 - PRODUCTS

2.1 EQUIPMENT

- A. Furnish the pump, pipe connections, and all necessary apparatus for the vacuum tests, including gauges and metering devices.
 - 1. Vacuum pump.
 - 2. Vacuum line.
 - 3. Vacuum Tester Base:

- a. Compression band seal.
- b. Outlet port.
- 4. Shutoff valve.
- 5. Stopwatch.
- 6. Plugs.
- 7. Vacuum Gage: Calibrated to 0.1 in. Hg.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Section 017000 - Execution and Closeout Requirements: Requirements for installation examination.
- B. Verify that manholes are ready for testing.
- C. Verify that manholes are backfilled.

3.2 FIELD QUALITY CONTROL

- A. Section 014000 - Quality Requirements: Requirements for inspecting and testing.
- B. Manhole Testing:
 - 1. Prepare both outside and inside of joints to ensure permanent seal.
 - 2. Test manholes with manhole frame set in place.
 - 3. Vacuum Testing:
 - a. Comply with ASTM C1244.
 - b. Plug pipe openings; securely brace plugs and pipe.
 - c. Inflate compression band to create seal between vacuum base and structure.
 - d. Connect vacuum pump to outlet port with valve open, then draw vacuum to 10 in. Hg.
 - e. Close valve.
 - f. Manhole Test Duration in Seconds:
 - 1) Manhole Diameter of 4 Feet: 60.
 - 2) Manhole Diameter of 5 Feet: 75.
 - 3) Manhole Diameter of 6 Feet: 90.
 - g. Record vacuum drop during test period.
 - h. If vacuum drop is greater than 1 in. Hg during testing period, repair and retest manhole.
 - i. If vacuum drop of 1 in. Hg does not occur during test period, manhole is acceptable; discontinue testing.
 - j. If vacuum test fails to meet 1-in. Hg drop in specified time after repair, repair and retest manhole.
 - 4. If unsatisfactory testing results are achieved, repair manhole and retest until result meets criteria.
 - 5. Repair visible leaks regardless of quantity of leakage.

END OF SECTION 33 05 05.36

SECTION 33 05 05.41
AIR TESTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Low-pressure air testing of gravity sewer piping.
- B. Related Requirements:
 - 1. Section 33 34 10 - Ductile Iron Pipe & Fittings

1.2 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Submit following items prior to start of testing:
 - 1. Testing procedures.
 - 2. List of test equipment.
 - 3. Testing sequence schedule.
 - 4. Provisions for disposal of flushing and test water.
 - 5. Certification of test gage calibration.
- C. Submit schedules and procedures to Engineer at least seven days prior to any testing.
- D. Test and Evaluation Reports: Indicate results of piping tests.

PART 2 - PRODUCTS

2.1 EQUIPMENT

- A. Furnish the pump, pipe connections, and all necessary apparatus for the air tests, including gauges and metering devices.
 - 1. Air compressor.
 - 2. Air supply line.
 - 3. Shutoff valves.
 - 4. Pressure regulator.
 - 5. Pressure relief valve.
 - 6. Stopwatch.
 - 7. Plugs.
 - 8. Pressure Gage: Calibrated to 0.1 psi.
- B. Owner reserves the option to furnish the gauges and metering devices for the tests.
- C. Excavate, backfill, and furnish all necessary assistance for conducting the tests.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Section 017000 - Execution and Closeout Requirements: Requirements for installation examination.
- B. Verify that piping is ready for testing.
- C. Verify that trenches are backfilled.

3.2 PREPARATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for preparation.
- B. Lamping:
 - 1. Lamp gravity piping after flushing and cleaning.
 - 2. Perform lamping operation by shining light at one end of each pipe section between manholes or similar access points.
 - 3. Observe light at other end.
 - 4. Pipe not installed with uniform line and grade will be rejected.
 - 5. Remove and reinstall rejected pipe sections.
 - 6. Clean and lamp until pipe section is installed to uniform line and grade.
- C. Plugs:
 - 1. Plug outlets, wye branches, and laterals.
 - 2. Brace plugs to resist test pressures.

3.3 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Requirements for inspecting and testing.
- B. Low-Pressure Air Testing for gravity sewers:
 - 1. Test each reach of gravity sewer piping between manholes.
 - 2. Introduce air pressure slowly to approximately 4 psig.
 - 3. Determine ground water elevation above spring line of piping.
 - 4. For every foot of ground water above spring line of piping, increase starting air test pressure by 0.43 psi.
 - 5. Do not increase pressure above 10 psig.
 - 6. Allow pressure to stabilize for at least five minutes.
 - 7. Adjust pressure to 3.5 psig or to increased test pressure as determined above when ground water is present.
 - 8. Do not make allowance for laterals.
 - 9. Minimum Testing Duration in Minutes Per 100 Feet, but in no case less than 1 minute per section tested:

- a. Pipe Size 3 Inches: 0.2.
 - b. Pipe Size 4 Inches: 0.3.
 - c. Pipe Size 6 Inches: 0.7.
 - d. Pipe Size 8 Inches: 1.2.
 - e. Pipe Size 10 Inches: 1.5.
 - f. Pipe Size 12 Inches: 1.8.
 - g. Pipe Size 15 Inches: 2.1.
 - h. Pipe Size 18 Inches: 2.4.
 - i. Pipe Size 21 Inches: 3.0.
 - j. Pipe Size 24 Inches: 3.6.
 - k. Pipe Size 27 Inches: 4.2.
 - l. Pipe Size 30 Inches: 4.8.
 - m. Pipe Size 33 Inches: 5.4.
 - n. Pipe Size 36 Inches: 6.0.
- 10. Low-Pressure Air Testing for compressed air piping: Test with 50 psig.
 - 11. Record drop in pressure during testing period.
 - 12. If air pressure drops more than 1.0 psi during testing period, piping has failed.
 - 13. If 1.0-psi air pressure drop has not occurred during testing period, piping is acceptable; discontinue testing.
 - 14. If piping fails, test reach of piping in incremental stages until leaks are isolated, repair leaks, and retest entire reach between manholes.
 - 15. If unsatisfactory testing results are achieved, make necessary repairs and retest until result meets criteria.
 - 16. Repair visible leaks regardless of quantity of leakage.

END OF SECTION 33 05 05.41

SECTION 33 34 10
DUCTILE IRON PIPE AND FITTINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Ductile-iron pipe and fittings general provisions.

- B. Related Work
 - 1. Section 31 05 13 - Soils for Earthwork.
 - 2. Section 31 05 16 - Aggregates for Earthwork.
 - 3. Section 31 23 16.13 - Trenching.
 - 4. Section 33 05 05 - Piping - General Provisions.
 - 5. Section 40 05 19 - Ductile Iron Process Piping.

1.2 REFERENCE STANDARDS

- A. ASME International:
 - 1. ASME B16.5: Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24, Metric/Inch Standard
 - 2. ASME B16.21: Nonmetallic Flat Gaskets for Pipe Flanges

- B. AWWA and ANSI Standards:
 - 1. ANSI/AWWA C104/A21.4 Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
 - 2. ANSI/AWWA C110/A21.10 Ductile-Iron and Gray-Iron Fittings, 3-in through 48-in for Water and Other Liquids
 - 3. ANSI/AWWA C111/A21.11 Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
 - 4. ANSI/AWWA C115/A21.15 Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges
 - 5. AWWA C116 Protective Fusion-Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings.
 - 6. ANSI/AWWA C150/A21.50 Thickness Design of Ductile-Iron Pipe
 - 7. ANSI/AWWA C151/A21.51 Ductile-Iron Pipe, Centrifugally Cast for Water
 - 8. ANSI/AWWA C153/A21.53 Ductile-Iron Compact Fittings, 3-in through 24-in and 54-in through 64-in for Water Service
 - 9. ANSI/AWWA C600 Installation of Ductile-Iron Water Mains and their Appurtenances
 - 10. ANSI/AWWA C606 Grooved and Shouldered Joints

1.3 SUBMITTALS

- A. Submit shop drawings and manufacturer's literature for all Contractor supplied materials promptly to the Owner for approval in accordance with Section 01 33 00 - Submittals.

1.4 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.
- B. Project Record Documents: Record invert elevations and actual locations of pipe runs and connections.
- C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- B. Storage:
 - 1. Store materials according to manufacturer instructions.
 - 2. Do not place materials on private property without written permission of property owner.
 - 3. Do not stack pipe higher than recommended by pipe manufacturer.
- C. Protection:
 - 1. Store gaskets for mechanical and push-on joints in cool and dry location, out of direct sunlight, and not in contact with petroleum products.
 - 2. Provide additional protection according to manufacturer instructions.

1.6 EXISTING CONDITIONS

- A. Field Measurements:
 - 1. Verify field measurements prior to fabrication.
 - 2. Indicate field measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 PRESSURE PIPING

- A. Ductile-Iron Pipe:
 - 1. Comply with AWWA C150.
 - 2. Standard cement-mortar lining, according to AWWA C104, and outside coating.
 - a. Lining Thickness: The minimum lining thickness shall be as follows:

Nominal Pipe Dia. (in)	Minimum Lining Thickness (in)
3-12	1/16
14-24	3/32

- 3. Pressure Class: 150 psig.

4. Exterior Coating
 - a. The fittings shall be coated on the outside with a petroleum asphaltic coating in accordance with AWWA Standard C110 or fusion-bonded epoxy in accordance with AWWA Standard C116.
 - b. Buried Ductile Iron Pipe: The exterior of ductile iron pipe, special, and fittings shall be coated with a 1 mil asphaltic coating in accordance with AWWA C151, Section 51-9.
 - c. Aboveground Ductile Iron Pipe: The exterior of ductile iron pipe, specials, and fittings shall be coated with one of the following coatings or primers:
 - 1) Above Grade – Exterior (Mild Exposure)
 - 2) Polyamidoamine Epoxy Primer.
 - 3) Typical Topcoats: Epoxies and Urethanes
 - 4) This coating shall be lightly blast cleaned before top coating if it has not been exterior exposed for 60 days or longer.
 - 5) Shop coat thickness: 3.0-8.0 mils dry film thickness

B. Ductile-Iron Fittings:

1. Standard fittings shall be ductile iron conforming to AWWA Standard C110. Compact ductile iron fittings shall meet the requirements of AWWA Standard C153.
2. Working Pressures
 - a. Fittings shall be suitable for the following working pressures unless otherwise noted in AWWA Standard C110 or C153: 150 psi.
 - b. The use of standard ductile iron fittings having a 250 psi pressure rating with ductile iron pipe (having a rating of 350 psi) is not permitted except by the express written approval of the Owner.
3. Coating and Lining
 - a. The fittings shall be coated on the outside with a petroleum asphaltic coating in accordance with AWWA Standard C110 or fusion-bonded epoxy in accordance with AWWA Standard C116.

C. Joints:

1. Comply with AWWA C111.
2. Type: Mechanical or push on.
3. Push-on Joints: Push-on joints shall conform to AWWA C111. Unless otherwise specified gasket material shall be standard styrene butadiene copolymer (SBR.) Push-on joints shall be Fastite, as manufactured by American Ductile Iron Pipe, or equal. The pressure rating for push-on joints shall be a minimum of 350 psi or the specified pressure rating of the pipe, whichever is less.
4. Restrained Joints: Restrained joints for valves and fittings shall be of the boltless push-on type which provides joint restraint independent of the joint seal. Field Lok gaskets are not permitted on valves or fittings. Restrained push-on joints allowed for pipe only shall have accessories conforming to AWWA Standard C111. Restrained system shall be suitable for the following minimum working pressures.

Size (in)	Pressure (psi)
Less than 20	300
20	300
24	250
30 - 64	250

Where adjacent fittings are to be placed (as in a mechanical joint hydrant tee and a mechanical joint hydrant valve), the use of a suitably sized Foster adaptor is permitted to facilitate restraint between the fittings.

5. Flanged Joints – Pipe: Candidate pipe for 4”- 54” flanged pipe thread-fabrication shall be Special Thickness Class 53 ductile iron pipes, all in accordance with AWWA C115.
 - a. Threaded companion flanges for ductile iron pipe shall be ductile iron in accordance with AWWA C115, not ASME B16.1.
 - b. Bolt circle and bolt holes match those of ASME B16.1 class 125 and ASME B16.5 class 150 flanges.
 - c. The flanges shall be rated for at least 250 psi working pressure.
 - d. The threaded flanges shall be individually fitted and machine tightened on the pipe ends.
 - e. Bolts, gaskets and installation shall be in accordance with AWWA C115, Appendix A requirements.
 - f. Gaskets for flanged ductile iron pipe must not have the larger inside diameters provided by the requirements of ASME B16.21.
 - g. Flange facing shall be smooth or with shallow serrations per AWWA C115.
6. Flanged Joints – Fittings: Flange fittings shall be ductile iron in accordance with AWWA C110 not ASME B16.1.
 - a. Bolt circle and bolt holes match those of ASME B16.1 class 125 and ASME B16.5 class 150 flanges.
 - b. The flanges shall be rated for at least 250 psi working pressure.
 - c. Bolts, gaskets and installation shall be in accordance with AWWA C110 or AWWA C115, Appendix A requirements.
 - d. Gaskets for flanged ductile iron pipe must not have the larger inside diameters provided by the requirements of ASME B16.21.
 - e. Flange facing shall be smooth or with shallow serrations per AWWA C110.

D. Rubber Gaskets, Lubricants, Glands, Bolts, and Nuts: Comply with AWWA C111.

2.2 FACTORY HYDROSTATIC TEST

- A. All pipe shall be subject to a factory hydrostatic test of at least 500 psi for a period of not less than 10 seconds.

2.3 MATERIALS

- A. Bedding and Cover:
 1. Bedding: Fill Type A1 (No. 8 Stone), as specified in Section 31 05 16 - Aggregates for Earthwork.
 2. Backfill within one foot above pipe: Fill Type A1 (No. 8 Stone), as specified in Section 31 05 16 - Aggregates for Earthwork.

3. Backfill more than one foot above pipe, within five feet of pavement/sidewalks: Fill Type A1 (No. 8 Stone) or Type A3 (B-Borrow), as specified in Section 31 05 16 - Aggregates for Earthwork.
4. Backfill more than one foot above pipe, more than five feet of pavement/sidewalks: Fill Type S2, as specified in Section 31 05 13 - Soils for Earthwork.
5. Cover for non-pavement sections: Fill Type S1 (Topsoil), as specified in Section 31 05 13 - Soils for Earthwork.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Follow the provisions of Section – Piping General Provisions in addition to the following requirements.
- B. Piping:
 1. Install pipe, fittings, and accessories as indicated on Drawings.
 2. Route piping in straight line.
 3. Install bedding at sides and over top of pipe to minimum compacted thickness of 12 inches.
 4. Backfilling and Compacting:
 - a. As specified in Section 31 23 16.13 – Trenching.
 - b. Do not displace or damage pipe while compacting.
- C. Push-On Joints
 1. Clean the surfaces that the gasket will contact thoroughly, just prior to assembly using a bacteria free solution (bleach, potable water or NSF approved material). Insert the gasket into the groove in the bell. Apply a liberal coating of special lubricant to the gasket and the spigot end of the pipe before assembling the joint. Center the spigot end in the bell and push home the spigot end.
- D. Mechanical Joints
 1. Clean and lubricate all components with soapy water prior to assembly. Slip the follower gland and gasket over the pipe plain end making sure that the small side of the gasket and lip of the gland face the bell socket. Insert the plain end into socket. Push gasket into position with fingers. Seat gasket evenly. Slide gland into position, insert bolts, and tighten nuts by hand. Tighten bolts alternately (across from one another) to the recommended manufacturing rating or if not provided, to the following normal torques:

Bolt Size	Range of Torque (Foot-Pounds)
5/8	40 - 60
3/4	60 - 90
1	70 - 100
1-1/4	90 - 120

2. After field installation, all bolts shall receive petrolatum tape or petroleum wax protection or other approved coating material. Protection shall be applied before applying polywrap per Section 33 06 00 - Polyethylene Wrap (Wastewater), if required.

E. Restrained Joints

1. Ball and Socket:
 - a. Assemble and install the ball and socket joint according to the manufacturer's recommendations. Thoroughly clean and lubricate the joint. Check the retainer ring fastener.
2. Push-On:
 - a. Assemble and install the push-on joint according to the manufacturer's recommendations. Thoroughly clean and lubricate the joint. Check the retainer ring fastener. Protect pipe from damage from the jacking device (backhoe bucket, pipe jack, etc.) when "pushing home" any pipe by using wood or other suitable (non-metallic) material.
3. Mechanical Joint:
 - a. Assemble and install the mechanical joint according to the manufacturer's recommendations. Thoroughly clean and lubricate the joint. Use approved restrained joint device on fittings and valves where required and approved for use by Owner.

3.2 PROTECTION

- A. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.

END OF SECTION 33 34 10

SECTION 40 05 05
IDENTIFICATION FOR PROCESS PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Hangtags.

1.2 REFERENCE STANDARDS

A. ASME International:

1. ASME A13.1 - Scheme for the Identification of Piping Systems.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit manufacturer's catalog literature for each specified product.

C. Shop Drawings:

1. Indicate list of wording, symbols, letter size, and color-coding for mechanical identification of valves.
2. Indicate valve tag number, location, function, and valve manufacturer's name and model number.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

B. Store materials according to manufacturer instructions.

PART 2 - PRODUCTS

2.1 METAL HANGTAGS

A. Manufacturers:

1. Craftmark Pipe Markers
2. Kolbi Pipe Marker
3. Brimar Industries
4. Approved Equal.

- B. Description:
 - 1. Brass construction; stamped letters.
 - 2. Minimum Tag Size and Configuration: 1-1/2 inches; square with finished edges.
 - 3. Letters at least ½ inch high by ¼ inch wide.
 - 4. Letters to be embossed and of easily legible color.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation preparation.

3.2 INSTALLATION

- A. According to manufacturer instructions.
- B. Install identifying devices after completion of coverings and painting.
- C. Hangtags:
 - 1. Identify butterfly valves in main and branch piping with tags.
 - 2. Install tags using corrosion-resistant chain.
 - 3. Names on tags as indicated in tag schedule.
- D. Tag Schedule, locationS as indicated on the Drawings:
 - 1. BLOWER 1
 - 2. BLOWER 2
 - 3. BLOWER 3
 - 4. TOP
 - 5. RIGHT
 - 6. FILTER
 - 7. LAGOON

END OF SECTION 40 05 05

SECTION 40 05 06
COUPLINGS, ADAPTERS, AND SPECIALS FOR PROCESS PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipe penetrations.
2. Restrained joints.
3. Flexible connections.
4. Expansion joints.
5. Expansion loops.
6. Sleeve-type couplings.
7. Piping insulation.

B. Related Requirements:

1. Section 09 90 00 - Painting and Coating: Product and execution requirements for painting specified by this Section.
2. Section 40 05 19 - Ductile Iron Process Pipe: Ductile-iron piping materials and appurtenances.
3. Section 40 05 51 - Common Requirements for Process Valves: Common product requirements for valves for placement by this Section.

1.2 REFERENCE STANDARDS

A. American Water Works Association:

1. AWWA C219 - Bolted, Sleeve-Type Couplings for Plain-End Pipe.

B. ASME International:

1. ASME B31.3 - Process Piping.

C. ASTM International:

1. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation.
2. ASTM D2000 - Standard Classification System for Rubber Products in Automotive Applications.

1.3 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.

B. Coordinate Work of this Section with installation of valves and equipment.

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

- B. Product Data:
 1. Submit manufacturer catalog information for each specified product.
 2. Flexible Pipe Connectors: Indicate maximum temperature and pressure rating, face-to-face length, live length, hose wall thickness, hose convolutions per foot and per assembly, fundamental frequency of assembly, braid structure, and total number of wires in braid.
 3. Expansion Joints: Indicate maximum temperature, pressure rating, and expansion compensation.
- C. Shop Drawings:
 1. Indicate restrained joint details and materials.
 2. Submit layout drawings showing piece numbers and location, indicating restrained joint locations.
 3. Indicate layout of piping systems, including flexible connectors, expansion joints and compensators, loops, offsets, and swing joints.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Manufacturer Instructions: Submit special procedures and setting dimensions.
- F. Source Quality-Control Submittals: Indicate results of factory tests and inspections.
- G. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

1.5 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.
- B. Project Record Documents: Record actual locations of piping appurtenances.
- C. Identify and describe unexpected variations to pipe routing or discovery of uncharted utilities.

1.6 QUALITY ASSURANCE

- A. Perform Work according to applicable code for installation of piping systems.

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years' experience.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

- C. Store materials according to manufacturer instructions.
- D. Protection:
 - 1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
 - 2. Furnish temporary end caps and closures on piping and fittings and maintain in place until installation.
 - 3. Provide additional protection according to manufacturer instructions.

1.9 EXISTING CONDITIONS

- A. Field Measurements:
 - 1. Verify field measurements prior to fabrication.
 - 2. Indicate field measurements on Shop Drawings.

1.10 WARRANTY

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for warranties.

PART 2 - PRODUCTS

2.1 FLEXIBLE CONNECTIONS

- A. Manufacturers:
 - 1. Flex-Weld, Inc
 - 2. Flexicraft Industries
 - 3. Hyspan Precision
 - 4. Equal
 - 5. Substitutions: As specified in Section 016000 - Product Requirements.
- B. Steel Piping:
 - 1. Inner Hose: Bronze.
 - 2. Exterior Sleeve: Double-braided.
 - 3. Pressure Rating: 125 psig WSP at 450 degrees F, 200 psig WOG at 250 degrees F.
 - 4. Joints: As specified for pipe joints.
 - 5. Size: Use pipe-sized units.
 - 6. Maximum Offset: 3/4inch on each side of installed center line.

2.2 SLEEVE-TYPE COUPLINGS

- A. Description:
 - 1. Comply with AWWA C219.
 - 2. Middle Ring: Ductile iron.
 - 3. Followers: Ductile iron.
 - 4. Gaskets:
 - a. Material: Buna-N for air piping, EPDM for liquids.
 - b. Comply with ASTM D2000.

5. Bolts: Steel.

B. Finishes:

1. Buried Couplings: Factory epoxy coated.

2.3 PIPE INSULATION

A. Type P-1:

1. Description: Molded glass fiber.

2. Comply with ASTM C547.

3. Thermal Conductivity: 0.23 Btu-in./h-ft.-deg. F at 75 degrees F.

4. Operating Temperature Range: Zero to 850 degrees F.

5. Vapor Barrier Jacket:

a. Description: Factory-applied, reinforced foil kraft with self-sealing adhesive joints.

b. Comply with ASTM C1136, Type I.

6. Jacket Temperature Limits: Minus 20 to 150 degrees F.

2.4 FINISHES

A. Prepare piping appurtenances for field finishes as specified in Section 09 90 00 - Painting and Coating.

2.5 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for testing, inspection, and analysis.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.

B. Verify that field dimensions are as indicated on Drawings.

C. Inspect existing flanges for nonstandard bolt hole configurations or design and verify that new pipe and flanges mate properly.

D. Verify that openings are ready to receive sleeves.

E. Verify that pipe plain ends to receive sleeve-type couplings are smooth and round for 12 inches from pipe ends.

F. Verify that pipe outside diameter conforms to sleeve manufacturer's requirements.

REPARATION

- G. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation preparation.
- H. Cleaning: Thoroughly clean end connections before installation.
- I. Close pipe and equipment openings with caps or plugs during installation.
- J. Surface Preparation: Clean surfaces to remove foreign substances.

3.2 INSTALLATION

- A. According to ASME B31.3.
- B. Coating: Finish piping appurtenances as specified in Section 09 90 00 - Painting and Coating for service conditions.
- C. Flexible Connections: Install flexible couplings at connections to equipment and where indicated on Drawings.
- D. Air Release and Vacuum Breakers: Provide vacuum breakers on process equipment.
- E. Insulation:
 - 1. Install where indicated on the Drawings
 - 2. Verify that surfaces are clean and dry, with foreign material removed.
 - 3. Verify that piping has been tested before applying insulation materials.
 - 4. Install insulation only when ambient temperature and humidity conditions are within ranges as recommended by manufacturer.
 - 5. Piping Exterior to Building:
 - a. Place seams located at 3- or 9-o'clock position on side of horizontal piping, with overlap facing down to shed water, or on bottom side of horizontal piping.

3.3 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Requirements for inspecting and testing.
- B. After installation, inspect for proper supports and interferences.
- C. Repair damaged coatings with material equal to original coating.

3.4 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.
- B. Keep equipment interior clean as installation progresses.

END OF SECTION 40 05 06

SECTION 40 05 07
HANGERS AND SUPPORTS FOR PROCESS PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Pipe supports.
- B. Related Requirements:
 - 1. Section 09 90 00 - Painting and Coating.

1.2 REFERENCE STANDARDS

- A. ASME International:
 - 1. ASME B31.1 - Power Piping.
 - 2. ASME B31.9 - Building Services Piping.
- B. ASTM International:
 - 1. ASTM A36 - Standard Specification for Carbon Structural Steel.
- C. Manufacturers Standardization Society of the Valve and Fittings Industry:
 - 1. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacturer, Selection, Application, and Installation.

1.3 COORDINATION

- A. Coordinate Work of this Section with piping and equipment connections specified in other Sections and as indicated on Drawings.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit manufacturer information, including load capacity.
- C. Shop Drawings: Indicate system layout with location, including critical dimensions, sizes, and support locations.
- D. Manufacturer Instructions: Submit special procedures and assembly of components.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- B. Store materials according to manufacturer instructions.

- C. Protection:
 - 1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
 - 2. Provide additional protection according to manufacturer instructions.

1.6 EXISTING CONDITIONS

- A. Field Measurements:
 - 1. Verify field measurements prior to fabrication.
 - 2. Indicate field measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 PIPE SUPPORTS

- A. Manufacturers:
 - 1. B-Line.
 - 2. Grinnell.
 - 3. Carpenter-Patterson.
 - 4. Unistrut.
 - 5. Superstrut.
 - 6. Substitutions: As specified in Section 01 60 00 - Product Requirements.
- B. Description:
 - 1. Comply with ASME B31.9 and MSS SP-58.
 - 2. Provide means of vertical adjustment after erection.
 - 3. Floor Supports: Cast-iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
- C. Performance and Design Criteria:
 - 1. Riser Supports: Support risers on floor with riser clamps and lugs, independent of connected horizontal piping.

2.2 HORIZONTAL PIPING HANGERS AND SUPPORTS

- A. Adjustable Saddle Support:
 - 1. MSS Type 38, including saddle, pipe and reducer.
 - 2. Fabricate base support from steel pipe and include cast iron flange or welded steel plate.
- B. Stanchion Saddle Support:
 - 1. MSS Type 37, including saddle and U-bolt.
 - 2. Fabricate base support from steel pipe and include cast iron flange or welded steel plate.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Section 01 70 00 - Execution and Closeout Requirements.

- B. Verify that field dimensions as indicated on Shop Drawings.

3.2 GENERAL

- A. Contractor is responsible for designing and supplying pipe supports per the Drawings.
- B. Proceed with installation of supports, and anchors after required building structural work is complete and concrete support structure has reached 28-day compressive strength as of 3,000 psi.
- C. Install supports, clamps, and attachments on concrete floor.
- D. Install supports to provide indicated pipe slopes and maximum pipe deflections allowed by ANSI B31.1 are not exceeded.
- E. Except as otherwise indicated for exposed continuous pipe runs, install supports of same type and style as installed for adjacent similar piping.
- F. Prevent contact between dissimilar metals. Where concrete or metal pipe support is used, place 1/8 in. thick Teflon, neoprene rubber or plastic strip under piping at point of bearing. Cut to fit entire area of contact between pipe and support.
- G. Apply anti-seize compound to nuts and bolts.

3.3 INSTALLATION

- A. Inserts: Not allowed.
- B. Where necessary to anchor supports to hardened concrete or completed masonry, use concrete anchors.
- C. Pipe Supports:
 - 1. Comply with ASME B31.1, ASME B31.9 and MSS SP-58.
 - 2. Support horizontal piping as indicated on Drawings.
 - 3. Place supports within 12 inches of each unsupported elbow.
 - 4. Minimum Vertical Adjustment: 1-1/2 inches.
 - 5. Independently of equipment.
 - 6. Riser Piping: Independent of connected horizontal piping.
 - 7. Provide sheet-lead packing between support and piping.
- D. Pipes with Insulation:
 - 1. Accommodate insulation.
- E. Finishes:
 - 1. Prime coat exposed steel supports as specified in Section 09 90 00 - Painting and Coating.

END OF SECTION 40 05 07

SECTION 40 05 19
DUCTILE IRON PROCESS PIPE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Ductile-iron pipe.
 - 2. Ductile-iron, malleable-iron, and cast-iron fittings.
 - 3. Accessories.

- B. Related Requirements:
 - 1. Section 09 90 00 - Painting and Coating: Product and execution requirements for painting specified by this Section.
 - 2. Section 33 05 05.41 - Air Testing.
 - 3. Section 33 34 10 - Ductile Iron Pipe and Fittings.
 - 4. Section 40 05 06 - Couplings, Adapters, and Specials for Process Piping: Piping appurtenances.
 - 5. Section 40 05 51 - Common Requirements for Process Valves: Common product requirements for valves for placement by this Section.

1.2 REFERENCE STANDARDS

- A. American Water Works Association:
 - 1. AWWA C104 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings.
 - 2. AWWA C110 - Ductile-Iron and Gray-Iron Fittings.
 - 3. AWWA C111 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
 - 4. AWWA C115 - Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
 - 5. AWWA C150 - Thickness Design of Ductile-Iron Pipe.
 - 6. AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast.
 - 7. AWWA C153 - Ductile-Iron Compact Fittings.

- B. ASME International:
 - 1. ASME B31.3 - Process Piping.

1.3 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.

- B. Coordinate Work of this Section with piping and equipment connections specified in other Sections and indicated on Drawings.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit manufacturer information regarding pipe and fittings.
- C. Shop Drawings: Indicate layout of piping systems, including equipment, critical dimensions, sizes, and materials lists.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Source Quality-Control Submittals: Indicate results of factory tests and inspections.
- F. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

1.5 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.
- B. Project Record Documents: Record actual locations of piping, valves and other appurtenances, connections, and invert elevations.
- C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.6 QUALITY ASSURANCE

- A. Permanently mark each length of pipe with manufacturer's name or trademark and indicate conformance to standards.
- B. Perform Work according to industry standards.

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years' experience.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- C. Store materials according to manufacturer instructions.

- D. Protection:
 - 1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
 - 2. Protect piping and appurtenances by storing off ground.
 - 3. Provide additional protection according to manufacturer instructions.

1.9 EXISTING CONDITIONS

- A. Field Measurements:
 - 1. Verify field measurements prior to fabrication.
 - 2. Indicate field measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 DUCTILE IRON PIPE AND FITTINGS

- A. Piping:
 - 1. Comply with AWWA C150.
 - 2. Class 150.
- B. Fittings:
 - 1. Material: AWWA C110, ductile iron or AWWA C153, ductile iron.
 - 2. Class 150: Same as that of connected piping.
 - 3. Mechanical Joints:
 - a. Comply with AWWA C110 and AWWA C111.
 - b. Glands: Ductile iron with asphaltic coating.
 - c. Push-on Joints: Comply with AWWA C111.
 - 4. Restrained Joints: Comply with AWWA C111.
 - 5. Flanged Fittings: Comply with AWWA C110.
- C. Cement-Mortar Lining:
 - 1. Comply with AWWA C104.
 - 2. Thickness: Standard.
- D. Outside Coating:
 - 1. Buried Service:
 - a. Type: Asphaltic.
 - b. Thickness: 0.04 inch.
 - 2. Exposed Service: As specified in Section 09 90 00 - Painting and Coating.

2.2 ACCESSORIES

- A. Jackets:
 - 1. Description:
 - a. Double-layer, half-lapped polyethylene tape.
 - b. Thickness: 10 mils.

- B. Gaskets: Rubber.

2.3 SOURCE QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Requirements for testing, inspection, and analysis.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.
- B. Verify that field dimensions are as indicated on Drawings.
- C. Inspect existing flanges for nonstandard bolt hole configurations or design and verify that new pipe and flange mate properly.

3.2 PREPARATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation preparation.
- B. Thoroughly clean pipe and fittings before installation.
- C. Surface Preparation:
 1. Clean surfaces to remove loose rust, mill scale, and other foreign substances by power wire brushing.
 2. Touch up shop-primed surfaces with primer as specified in Section 09 90 00 - Painting and Coating.
 3. Solvent-clean surfaces that are not shop primed.

3.3 INSTALLATION

- A. Buried Service Piping: As specified in Section 33 34 10 - Ductile Iron Pipe and Fittings.
- B. Exposed Service Piping:
 1. According to ASME B31.3.
 2. Run piping straight along alignment as indicated on Drawings, with minimum number of joints.
- C. Fittings:
 1. According to manufacturer instructions.
 2. Clean gasket seats thoroughly, and wipe gaskets clean prior to installation.
 3. Tighten bolts progressively, drawing up bolts on opposite sides until bolts are uniformly tight; use torque wrench to tighten bolts to manufacturer instructions.

- 4. Provide required upstream and downstream clearances from devices as indicated on Drawings.
 - D. Make taps to ductile iron piping only with service saddle, tapping boss of a fitting or valve body, or equipment casting.
 - E. Install piping with sufficient slopes for venting or draining liquids and condensate to low points.
 - F. Provide expansion joints as specified in Section 40 05 06 - Couplings, Adapters, and Specials for Process Piping to compensate for pipe expansion due to temperature differences.
 - G. Dielectric Fittings: Provide between dissimilar metals.
 - H. Field Cuts: According to pipe manufacturer instructions.
 - I. Finish primed surfaces according to Section 09 90 00 - Painting and Coating.
 - J. Installation Standards: Install Work according to industry standards.
- 3.4 TOLERANCES
- A. Section 01 40 00 - Quality Requirements: Requirements for tolerances.
 - B. Laying Tolerance: As specified in Section 33 34 10 - Ductile Iron Pipe and Fittings.
- 3.5 FIELD QUALITY CONTROL
- A. Section 01 40 00 - Quality Requirements: Requirements for inspecting and testing.
 - B. Inspection:
 - 1. Inspect for damage to pipe lining or coating and for other defects that may be detrimental as determined by Engineer.
 - 2. Repair damaged piping or provide new, undamaged pipe.
 - 3. After installation, inspect for proper supports and interferences.
 - C. Pressure Testing: Per Section 33 05 05.41 - Air Testing.
- 3.6 CLEANING
- A. Section 01 70 00 - Execution and Closeout Requirements specifies requirements for cleaning.
 - B. Keep pipe interior clean as installation progresses.
 - C. After installation, clean pipe interior of soil, grit, and other debris.

END OF SECTION 40 05 19

**SECTION 40 05 31.13
HDPE PROCESS PIPING**

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. High-density polyethylene (HDPE) process piping.
2. Heat-Fused Joints: Butt fusion, saddle fusion, or electrofusion welded.
3. Flange adapters and mechanical joint adapters.
4. Fittings and couplings.
5. Bedding and cover materials.
6. Tracer wire and plastic ribbon tape.

B. Related Requirements:

1. Section 22 15 13 - General Service Compressed-Air Piping.
2. Section 31 23 16.13 - Trenching: Execution requirements.
3. Section 31 05 13 - Soils for Earthwork: Requirements for backfill.
4. Section 40 05 51 - Common Requirements for Process Valves: Common product requirements for valves for placement by this Section.

1.2 DEFINITIONS

- A. CC1, CC2, CC3 (Highest Performance): The oxidative resistance categories as set forth in PPI TN-44.
- B. Polyethylene (PE) Plastics: A type of plastic or resin prepared by the polymerization of no less than 85 percent ethylene and no less than 95 percent of total olefins with additional compounding ingredients.
- C. Slow Crack Growth (SCG): A phenomenon by which a stress crack may form, comprised of a crack initiation phase and a crack propagation phase.
- D. Slow Crack Growth (SCG) Resistance: The primary material property that relates quality and the critical component for assessing service life, measured using the notched, constant ligament-stress (NCLS) test per ASTM F2136.
- E. Stress Crack: An external or internal fracture in plastic caused by tensile stresses less than its short-time mechanical strength.
- F. Virgin Polyethylene (PE): A type of plastic material in the form of pellets, granules, powder, floc, or liquid that has not been subjected to use or processing other than required for initial manufacture.

1.3 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Pipe and Fittings:

1. Basis of Measurement: By linear foot.
2. Basis of Payment: Includes excavating, hand trimming, removing soft subsoil, bedding and fill, pipe and fittings, accessories, and connecting.

1.4 REFERENCE STANDARDS

A. American Public Works Association:

1. APWA Uniform Color Code.

B. American Water Works Association:

1. AWWA C901 - Polyethylene (PE) Pressure Pipe and Tubing, 1/2 In. (13 mm) through 3 In. (76 mm), for Water Service.
2. AWWA C906 - Polyethylene (PE) Pressure Pipe and Fittings, 4 In. Through 65 In. (100 mm Through 1,650 mm), for Waterworks.
3. AWWA M55 - PE Pipe - Design and Installation.

C. ASTM International:

1. ASTM D1598 - Standard Test Method for Time-to-Failure of Plastic Pipe Under Constant Internal Pressure.
2. ASTM D1599 - Standard Test Method for Resistance to Short-Time Hydraulic Pressure of Plastic Pipe, Tubing, and Fittings.
3. ASTM D1603 - Standard Test Method for Carbon Black in Olefin Plastics.
4. ASTM D2122 - Standard Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings.
5. ASTM D2774 - Standard Practice for Underground Installation of Thermoplastic Pressure Piping.
6. ASTM D2837 - Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products.
7. ASTM D3035 - Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter.
8. ASTM D3212 - Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
9. ASTM D3261 - Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.
10. ASTM D3350 - Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.
11. ASTM D4218 - Standard Test Method for Determination of Carbon Black Content in Polyethylene Compounds by the Muffle-Furnace Technique.
12. ASTM F412 - Standard Terminology Relating to Plastic Piping Systems.
13. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
14. ASTM F714 - Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter.

15. ASTM F1055 - Standard Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene and Crosslinked Polyethylene (PEX) Pipe and Tubing.
16. ASTM F1290 - Standard Practice for Electrofusion Joining Polyolefin Pipe and Fittings.
17. ASTM F1668 - Standard Guide for Construction Procedures for Buried Plastic Pipe.
18. ASTM F2136 - Standard Test Method for Notched, Constant Ligament-Stress (NCLS) Test to Determine Slow-Crack-Growth Resistance of HDPE Resins or HDPE Corrugated Pipe.
19. ASTM F2164 - Standard Practice for Field Leak Testing of Polyethylene (PE) and Crosslinked Polyethylene (PEX) Pressure Piping Systems Using Hydrostatic Pressure.
20. ASTM F2263 - Standard Test Method for Evaluating the Oxidative Resistance of Polyethylene (PE) Pipe to Chlorinated Water.
21. ASTM F2620 - Standard Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings.
22. ASTM F3190 - Standard Practice for Heat Fusion Equipment (HFE) Operator Qualification on Polyethylene (PE) and Polyamide (PA) Pipe and Fittings.

D. Plastics Pipe Institute (PPI):

1. PPI - Handbook of Polyethylene Pipe.
2. PPI - Polyethylene Piping Systems Field Manual for Municipal Water Applications.
3. PPI TN-38 - Bolt Torque for Polyethylene Flanged Joints.
4. PPI TR-4 - PPI Listing of Hydrostatic Design Basis (HDB), Hydrostatic Design Stress (HDS), Strength Design Basis (SDB), Pressure Design Basis (PDB) and Minimum Required Strength (MRS) Ratings for Thermoplastic Piping Materials or Pipe.

1.5 SUBMITTALS

A. Product Data:

1. Submit data on pipe materials, fittings, and accessories.
2. Submit piping manufacturer's catalog information.

B. Shop Drawings:

1. Indicate piping plans, elevations, sections, and connection details.
2. Include pipe elevations, invert elevations, pipe-to-pipe coupler connections, connections to structures, bedding, and cover materials.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Manufacturer Instructions: Submit special procedures required to install specified products and storage and handling procedures.

E. Field Quality-Control Submittals:

1. Indicate results of Contractor-furnished tests and inspections.
2. Fusion Technician Requirements: Indicate qualifications to perform each type and size of fusion joint.

1.6 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual locations of HDPE piping, pipe runs, connections, and invert elevations.
- B. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.7 QUALITY ASSURANCE

- A. Perform Work according to industry standards.

1.8 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years' experience.
- B. Fusion Technician: Technician qualified in accordance with ASTM F2620 and ASTM F3190 when making butt fusion and saddle fusion joints or qualified in accordance with ASTM F1290 when making electrofusion fitting joints. Verify qualification has occurred within previous 12 months before performing on-site fusion joining.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- B. Store HDPE piping according to manufacturer instructions.
- C. Protection:
 - 1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
 - 2. Provide additional protection according to manufacturer instructions.
 - 3. Block individual and stockpiled pipe lengths to prevent movement.

1.10 AMBIENT CONDITIONS

- A. Minimum Conditions: Do not install when temperature is below 32 deg. F.

1.11 EXISTING CONDITIONS

- A. Field Measurements:
 - 1. Verify field measurements prior to fabrication.
 - 2. Indicate field measurements on Shop Drawings.

1.12 WARRANTY

- A. Provide a 1-year warranty covering product materials and workmanship from pipe and fitting suppliers. A successful pressure test or pressure leak test prior to the expiration of the warranty period does not relieve the pipe or fitting supplier of warranty responsibility for the full warranty term.

PART 2 - PRODUCTS

2.1 HDPE PROCESS PIPE

- A. Manufacturers:
 - 1. ACU-TECH Piping Systems.
 - 2. AGRU America Inc.
 - 3. Applied Plastics Co.,Inc.
 - 4. Charter Plastics Inc.
 - 5. Flying W Plastics, Inc.
 - 6. HDPE, Inc.
 - 7. ISCO Industries, LLC.
 - 8. Substitutions: As specified in Section 016000 - Product Requirements.
 - 9. Provide PE 4710 HDPE pipe for 3/4-inch to 3-inch diameters complying with ANSI/AWWA C901.
 - 10. Provide PE 4710 HDPE pipe for 4-inch to 65-inch diameters complying with ANSI/AWWA C906.
 - 11. Fittings:
 - a. Butt fusion.
 - b. Saddle fusion.
 - c. Electrofusion.
 - d. Mechanical.

2.2 MATERIALS

- A. HDPE Resin Material Properties:
 - 1. Provide material for pipe production from an engineered compound of virgin and recycled HDPE.
 - 2. Conform with the minimum requirements of cell classification PE445574C, Type III for 4- through 65-inch diameters, and PE445574C for 3/4- through 3-inch diameters, as defined and described in the latest version of ASTM D3350.
 - 3. Verify compatibility, as determined by design engineer, with overall system, including structural, hydraulic, material, and installation requirements for a given application.
- B. HDPE Process Piping and Fittings for Pressure Non-Potable Piping Service:
 - 1. Provide HDPE PE4710 pipe complying with ANSI/AWWA C906 for applications where diameters of 4 to 65 inches are required and where loading conditions permit.
 - 2. Provide HDPE PE4710 pipe comply with ANSI/AWWA C901 for applications where diameters of 3/4 to 3 inches are required and where loading conditions permit.

3. Provide PE4710 material compound having a hydrostatic design stress (HDS) rating for water at 73 deg. F of 1,000 psi or greater and that is listed in PPI TR-4 in the name of the pipe manufacturer.
4. Provide PE4710 material compound having a hydrostatic design basis (HDB) rating at 140 deg. F of 1,000 psi or greater and that is listed in PPI TR-4 in the name of the pipe manufacturer. Obtain HDB for HDPE pipe per ASTM D2837.
5. Require PE4710 pipe and fitting material compound, in PE4710 pipe and fittings, to contain color and ultraviolet (UV) stabilizer meeting the requirements of Code C or E per ASTM D3350.
 - a. Code C material contains two to three percent carbon black to provide indefinite protection against UV degradation when material from the pipe is tested in accordance with ASTM D1603 or ASTM D4218.
 - b. Code E material used for coextruded outside diameter color stripes or a coextruded identification color layer contains sufficient UV stabilizer to protect the pipe against UV degradation for at least 18 months of unprotected outdoor exposure.
 - c. Provide coextruded color PE compound material that is PE4710 pipe material compound, varying only by color and UV stabilizer.
6. Provide HDPE pipe rated for use at a pressure class of 150 psi as determined by Engineer. Provide selection of pressure class from Table X1.1 in ASTM D3035. Refer also to ASTM D1598 and ASTM D1599 for test methods of pressure testing of plastic pipe.
 - a. The outside pipe diameter is based upon the IPS or DIPS sizing system. Comply with ASTM D2122 for test methods of determining diameter, wall thickness and length dimensions of thermoplastic pipe.

C. PE4710 Pipe:

1. This pipe and butt fusion fittings require plain ends for butt fusion.
2. Provide nominal straight lengths of 40 or 50 feet for 3-inch and larger pipe.
3. Provide nominal coil lengths of 500 feet for 4-inch and smaller pipe. Coil lengths of 800 feet for 4-inch pipe, 1,000 feet for 3-inch pipe, or 2,000 feet for 2-inch pipe or smaller are acceptable.
4. Provide black pipe.
5. Provide pipe permanently marked using heated indent printing that includes the following:
 - a. Nominal size and sizing system, such as IPS or DIPS.
 - b. DR or SDR.
 - c. Standard Designation: ASTM 3035 material designation, pressure rating, or pressure class for water at 73 deg. F.
 - 1) Standard designation on pipe represents the manufacturer's certification that pipe has been manufactured, sampled, tested, and found to comply with the requirements of the standard.
 - 2) Provide pipe pressure rating for water at 73 deg. F in accordance with ASTM D3035: "PE4710 PCXXX" where "XXX" is pressure rating in psi.
 - d. Extrusion production-record code.
 - e. Manufacturer's trademark or trade name.

D. PE4710 Fittings:

1. Provide butt fusion, saddle fusion, electrofusion, and fabricated fittings manufactured from PE4710 material (compound).
2. Provide PE 4710 fittings complying with ASTM D3261 for molded butt fusion and saddle fusion fittings, flange adapters, and mechanical joint adapters (MJ adapters).
3. Comply with ASTM F2206 or AWWA C906 for fabricated butt fusion fittings.

4. Comply with ASTM F1055 for electrofusion fittings.

2.3 FUSION JOINTS

- A. Assemble PE4710 pipe and fittings in the field with butt fusion, saddle fusion, or electrofusion joints using pipe manufacturer's fusion machines.
 1. Comply with ASTM F2620 and pipe manufacturer's recommended procedures for butt and saddle fusion joints.
 2. Comply with ASTM F1290 and the electrofusion fitting manufacturer's recommended joining procedure for electrofusion joints.
- B. Perform field butt fusion, saddle fusion, and electrofusion joints using qualified fusion technicians.
- C. Record and document field fusion joints.

2.4 CONNECTIONS AND FITTINGS FOR PRESSURE APPLICATIONS

- A. Mechanical Piping:
 1. Provide acceptable mechanical fittings used with PE4710 pipe and fittings that are qualified by mechanical fitting manufacturer for use with HDPE pipe and fittings.
 2. Provide mechanical fittings used with HDPE pipe that provide restraint against longitudinal separation that is inherent to joint design.
 3. Provide mechanical connections to non-HDPE devices and appurtenances that are bolted flange or MJ adapters. Assemble, install, and tighten flange and MJ adapter connections in accordance with adapter manufacturer's instructions. Provide flange bolt tightening in accordance with PPI TN-38.
- B. Gasketed Push-On Fittings:
 1. Provide gasketed push-on fittings fitted with external mechanical restraints that span across the joint and that are assembled in accordance with restraint manufacturer's written instructions.
 - a. Plain end PE4710 pipe assembled with push-on fittings requires the pipe end to be fitted with electrofusion restraints.
 - b. Gaskets (Elastomeric Seals): Comply with ASTM F477.
 2. PE 4710 pipe connected to gasketed mechanical joint fittings or appurtenances requires connection by butt fusing a PE4710 MJ adapter to the PE4710 pipe and connecting the PE4710 MJ adapter to the mechanical joint fitting or appurtenances.
- C. Sleeve-Type Couplings:
 1. Manufacture sleeve-type mechanical couplings for use with HDPE pipe. Restrain as indicated or as specified.
- D. Expansion and Flexible Couplings:
 1. Prohibit use of expansion-type mechanical couplings.
- E. Connection Hardware:

1. Provide bolts and nuts for buried service made of noncorrosive, high-strength, low-alloy steel having characteristics specified in AWWA C111/A21.11, regardless of any other protective coating.

2.5 PLASTIC UNDERGROUND PIPE MARKERS

- A. Manufacturers:
 1. Kolbi Pipe Marker Co.
 2. Marking Services, Inc.
 3. Pipemarket.com; Brimar Industries, Inc.
 4. Rhino Marking and Protection Systems.
 5. Seton Identification Products; a Brady Corporation company.
 6. Substitutions: As specified in Section 016000 - Product Requirements.
- B. Bury underground pipe marking tape over underground utility lines to warn excavators and to prevent damage, service interruption, and personal injury.
- C. Tapes are printed on colors approved by American Public Works Association (APWA) to meet or exceed industry standards.
- D. Provide 5-mil tape with aluminum backing to make it easy to find pipe underground using a nonferrous locator.
- E. 1,000-foot long rolls are available in 2-inch tape widths for maximum 12-inch depth; 3-inch tape widths for 12- to 18-inch depths; or 6-inch tape widths for maximum 24-inch depth.
- F. Message reads "Caution Buried Pipeline Below" in black lettering on a yellow background.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that trench cut is ready to receive Work of this Section.
- B. Verify that excavations, dimensions, and elevations are as indicated on Drawings.
- C. Soil investigation should attempt to evaluate conditions at the nominal placement depth of the product pipe.

3.2 PREPARATION

- A. Correct over-excavation with coarse aggregate.
- B. Remove large stones or other hard materials that could damage pipe or impede consistent backfilling or compaction.
- C. Protect and support existing storm drainage lines, utilities, and appurtenances.

- D. Utilities:
 - 1. Maintain profiles of utilities.
 - 2. Coordinate with other utilities to eliminate interference.
 - 3. Notify Engineer if crossing conflicts occur.

3.3 INSTALLATION - BURIED PIPING SYSTEMS

- A. Verify connection to above ground piping system size, location, and invert are as indicated on Drawings.
- B. Establish elevations of buried piping with not less than two feet of cover.
- C. Establish minimum separation of four feet from other services according to applicable code.
- D. Excavate pipe trench according to Section 31 23 16.13 - Trenching.
- E. Install pipe to elevation as indicated.
- F. Place bedding material at trench bottom in one continuous layer not exceeding 4 inches compacted depth; compact to 95 percent maximum density to provide uniform bedding for piping.
- G. Install pipe on prepared bedding.
- H. Route pipe in straight line.

3.4 INSTALLATION - PIPING

- A. Install HDPE pipe in accordance with ASTM D2321, ASTM F1668, and manufacturer's recommended installation guidelines.
 - 1. Provide minimum cover for 4-inch to 48-inch diameter pipe of at least two feet.
- B. Pressure Installation: Install Work according to ASTM D2774 and manufacturer instructions.
- C. Install plastic ribbon tape continuous buried 6 inches below finish grade, above pipeline; coordinate with Section 31 23 16.13 - Trenching.

3.5 FUSION PROCESS

- A. General:
 - 1. Perform butt and saddle fusion of PE4710 pipe and fittings in accordance with ASTM F2620 and the manufacturer's recommended joining procedure.
 - 2. Perform electrofusion of PE4710 pipe and fittings in accordance with ASTM F1290 and electrofusion fitting manufacturer's recommended procedure.
 - 3. Fuse PE4710 pipe and fittings by qualified fusion technicians, as documented by the fusion provider. Provide training records for qualified fusion technicians to Engineer upon request.
 - 4. Record and log pressure, time, and temperature parameters by an electronic monitoring device (data logger) affixed to the fusion machine as each fusion joint is constructed.

Submit joint data as part of the As-Recorded information in accordance with this Specification.

5. Include the following elements in butt fusion machines:
 - a. Heat plate.
 - b. Carriage.
 - c. Data logger.
 6. Include the following additional equipment for fusion processes:
 - a. Pipe Rollers: Use to support pipe on either side of butt fusion machine. Rollers provide for vertical and lateral pipe alignment straight through the butt fusion machine.
 - b. Protective Enclosure: Provide protective enclosure for full machine motion of the clamps, heat plate, fusion assembly, and carriage for fusion in inclement or windy weather. Cover or block open pipe ends that allow winds to blow through pipe.
 - c. Maintenance Manual: Keep fusion machine operations and maintenance manual with the fusion machine at all times.
- B. Joint Recording:
1. Record and log each fusion joint using an electronic monitoring device (data logger) connected to the fusion machine. Manually log data not logged by the data logger and include in fusion technician's joint report.

3.6 MAKING CONNECTIONS TO NON-PE4710 PIPING SYSTEMS

- A. Prior to making connections into existing piping systems, provide the following:
1. Actual field location, size, piping material, and service of non-PE4710 piping systems.
 2. Obtain all required non-PE4710 piping manufacturer(s) approved fittings (such as saddles, sleeve type couplings, flanges, and tees as shown).
 3. Installation of all temporary pumps and/or pipes in accordance with established connection plans.
 4. Furnish pipe stoppers, blind flanges, or other devices to seal a valve or appurtenance that fails to seal properly. When applied to pressure-rated valves or appurtenances, all such devices are required to have pressure ratings equal to or greater than the pressure rating of the valve or appurtenance to which they are attached.
- B. Where PE4710 pipe connects in-line to unrestrained, gasketed, push-on piping, anchor the end of the PE4710 pipe in-line within 10 feet of the connection.
1. Fit PE4710 pipe with a PE4710 wall anchor or electrofusion flex restraint.
 2. Encase the PE4710 wall anchor or electrofusion flex restraint in reinforced concrete sufficient to withstand Poisson effect longitudinal loads in accordance with AWWA M55 in-line anchoring.
- C. Completely assemble and successfully test new piping systems prior to making connections to non-PE4710 piping systems.

3.7 PIPE SYSTEM CONNECTIONS

- A. Install pipe connections per applicable standards and regulations, as well as per the connection manufacturer's recommendations and as indicated.
- B. Comply with ASTM D3212 for Drain and Sewer Pipe Joints using flexible elastomeric seals.

3.8 TESTING

- A. Provide testing that complies with all local building codes, statutes, standards, local jurisdiction, and laws.
- B. Test segments of pipe separately in accordance with standard testing procedure, as approved by Engineer.
- C. Hydrostatic Leakage Testing for Pressure Piping:
 - 1. Provide hydrostatic leakage testing complying with ASTM F2164.
 - 2. Repair or replace joint leakage and any defective materials or workmanship at no additional cost to the Owner.
 - 3. Prohibit pneumatic (compressed air) leakage testing of PE4710 pressure piping.

END OF SECTION 40 05 31.13

- E. Source Quality-Control Submittals: Indicate results of factory tests and inspections.
- F. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections, including factory-applied coatings.
- G. Manufacturer Reports: Certify that equipment has been installed according to manufacturer instructions.

1.5 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.
- B. Project Record Documents: Record actual locations of valves and actuators.
- C. Tools for Buried Valves: Furnish one tee wrench of required length to Owner.

1.6 QUALITY ASSURANCE

- A. Maintain clearances per manufacturer's instructions.
- B. Ensure that materials of construction of wetted parts are compatible with process liquid.

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three (3) years' experience.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- C. Store materials according to manufacturer instructions.
- D. Protection:
 - 1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
 - 2. Protect valve ends from entry of foreign materials by providing temporary covers and plugs.
 - 3. Provide additional protection according to manufacturer instructions.

1.9 EXISTING CONDITIONS

- A. Field Measurements:
 - 1. Verify field measurements prior to fabrication.

2. Indicate field measurements on Shop Drawings.

1.10 WARRANTY

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for warranties.

PART 2 - PRODUCTS

2.1 VALVES

- A. Description: Valves, operator, handwheel, extension stem, worm and gear operator, operating nut, wrench, and other accessories as required.
- B. Valve Ends: Compatible with adjacent piping system.
- C. Operation:
 1. Open by turning counterclockwise; close by turning clockwise.
 2. Cast directional arrow on valve or actuator with OPEN and CLOSE cast on valve in appropriate location.
- D. Valve Marking:
 1. Marking: Comply with MSS SP-25.
 2. Provide buried valves with valve boxes, covers, and extensions.
- E. Valve Construction:
 1. Bodies: Rated for maximum temperature and pressure to which valve will be subjected as specified in valve Sections.
 2. Bonnets:
 - a. Flanged to body and of same material and pressure rating as body.
 - b. Furnish glands, packing nuts, or yokes as specified in valve Sections.
 3. Stems and Stem Guides:
 - a. Materials and Seals: As specified in valve Sections.
 - b. Bronze Valve Stems: According to ASTM B584.
 - c. Space stem guides: 10 feet o.c.
 - d. Submerged Stem Guides: Type 304 stainless steel.
 4. Nuts and Bolts: As specified in Section 40 05 19 - Ductile Iron Process Pipe.

2.2 VALVE ACTUATORS

- A. Provide actuators with position indicators for shutoff valves 6 inches and larger.
- B. Accessories:
 1. Handwheel:
 - a. Furnish permanently attached handwheel for emergency manual operation.
 - b. Rotation: None during powered operation.
 - c. Permanently affix directional arrow and cast OPEN and CLOSE on handwheel to indicate appropriate direction to turn handwheel.

- d. Maximum Operating Force: 60 lbf.

2.3 FINISHES

- A. Valve Coating: Comply with AWWA C550.
- B. Exposed Valves: As specified in Section 09 90 00 - Painting and Coating.
- C. Do not coat flange faces of valves unless otherwise specified.

2.4 VALVE BOXES

- A. Manufacturers:
 - 1. Ford Meter Box Company, Inc. (The).
 - 2. Mueller Co.
 - 3. Tyler Utilities; Union Foundry Company.
 - 4. Substitutions: As specified in Section 01 60 00 - Product Requirements
- B. Description:
 - 1. 12-inch Diameter Valves and Smaller:
 - a. Material: Cast iron.
 - b. Type: Two piece; screw.
 - 2. Lid Inscription: SEWER.

2.5 ACCESSORIES

- A. Valve Box Aligner: High-strength plastic device designed to automatically center valve box base and to prevent it from shifting off center during backfilling.

2.6 SOURCE QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Requirements for testing, inspection, and analysis.
- B. Testing: Test valves according to manufacturer's standard testing protocol, including hydrostatic, seal, and performance testing.
- C. Certificate of Compliance:
 - 1. If manufacturer is approved by authorities having jurisdiction, submit certificate of compliance indicating Work performed at manufacturer's facility conforms to Contract Documents.
 - 2. Specified shop tests are not required for Work performed by approved manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Requirements for installation examination.
- B. Verify that piping system is ready for valve installation.

3.2 PREPARATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation preparation.
- B. Thoroughly clean valves before installation.
- C. Surface Preparation:
 - 1. Touch up shop-primed surfaces with primer as specified in Section 09 90 00 - Painting and Coating.
 - 2. Solvent-clean surfaces that are not shop primed.
 - 3. Clean surfaces to remove loose rust, mill scale, and other foreign substances by power wire brushing.
 - 4. Prime surfaces as specified in Section 09 90 00 - Painting and Coating.

3.3 INSTALLATION

- A. Install valves, extensions, valve boxes, and accessories according to manufacturer instructions.
- B. Install buried valves with valve boxes installed flush with finished grade.
- C. Firmly support valves to avoid undue stresses on piping.
- D. Coat studs, bolts and nuts with anti-seizing lubricant.
- E. Clean field welds of slag and splatter to provide a smooth surface.
- F. Install valves with stems upright or horizontal, not inverted.
- G. Install valves with clearance for installation and to allow access.
- H. Comply with Division 40 - Process Interconnections for piping materials applying to various system types.
- I. Valve Applications:
 - 1. Install valves at locations as indicated on Drawings and as specified in this Section.
 - 2. Install shutoff and isolation valves.
 - 3. Isolate equipment, part of systems, or vertical risers as indicated on Drawings.
 - 4. Install valves for throttling, bypass, or manual flow control services as indicated on Drawings.
 - 5. Install ball, butterfly, plug and gate valves in sanitary systems for shutoff service.

- J. Installation Standards: Install Work according to Missouri Department of Natural Resources standards.

3.4 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Requirements for inspecting and testing.
- B. Valve Field Testing:
 - 1. Test for proper alignment and clearances.
 - 2. If specified by valve Section, field test equipment to demonstrate operation without undue noise, vibration, or overheating.
 - 3. Engineer will witness field testing.

END OF SECTION 40 05 51

SECTION 40 05 61 GATE VALVES

1.1 SUMMARY

A. Section Includes:

1. Resilient-seated gate valves.

B. Related Requirements:

1. Section 40 05 51 - Common Requirements for Process Valves: Basic materials and methods related to valves commonly used for process systems.

1.2 REFERENCE STANDARDS

A. American Water Works Association:

1. AWWA C509 - Resilient-Seated Gate Valves for Water Supply Service.

B. ASTM International:

1. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
2. ASTM B584 - Standard Specification for Copper Alloy Sand Castings for General Applications.

1.3 RESILIENT SEATED GATE VALVES

- #### A. As specified in Section 400551 - Common Requirements for Process Valves: Submittal requirements for compliance with this Section.

PART 2 - PRODUCTS

2.1 RESILIENT-SEATED GATE VALVES

A. Manufacturers:

1. Apollo Valves; a part of Aalberts Integrated Piping Systems.
2. Crane; a Crane Co. brand.
3. DeZURIK.
4. FNW; Ferguson Enterprises, Inc.
5. Hammond Valve.
6. Jenkins Valves; a Crane Co. brand.
7. KITZ Corporation.
8. Legend Valve & Fitting, Inc.
9. Milwaukee Valve Company.
10. NIBCO INC.
11. Smith-Cooper International.
12. Stockham; a Crane Co. brand.

13. Zurn Industries, LLC.
14. Substitutions: Section 01 60 00 - Product Requirements.

B. Description:

1. As specified in Section 40 05 51 - Common Requirements for Process Valves.
2. Comply with AWWA C509.
3. Minimum Working Pressure: 150 psig at 100 deg. F.
4. Maximum Process Fluid Temperature: 125 deg. F
5. End Connections: Mechanical joint.
6. Gear Actuators for Manual Valves: Comply with AWWA C509.

C. Operation:

1. As specified in Section 40 05 51 - Common Requirements for Process Valves.
2. Stem: Rising.
3. Operator: Handwheel

D. Materials:

1. Wedge: Resilient ASTM A126, cast iron, fully encapsulated with Buna-N.
2. Body and Disc: ASTM A536, ductile iron, Buna-N coated.
3. Stem, Stem Nuts, Glands, and Bushings: ASTM B584, bronze.
4. Connecting Hardware: Type 316 stainless steel.

2.2 SOURCE QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Requirements for testing, inspection, and analysis.
- B. As specified in Section 40 05 51 - Common Requirements for Process Valves.
- C. Testing: Test gate valves according to AWWA C509.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. According to AWWA C509.
- B. As specified in Section 400551 - Common Requirements for Process Valves: Submittal requirements for compliance with this Section.
- C. Install valves according to manufacturer's written instructions.

END OF SECTION 40 05 61

**SECTION 40 05 64
BUTTERFLY VALVES**

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Rubber-seated butterfly valves.
- B. Related Requirements:
 - 1. Section 22 15 13 - General Service Compressed-Air Piping: Requirements for piping, fittings, and accessories for compressed-air systems in plant applications.
 - 2. Section 40 05 51 - Common Requirements for Process Valves: Basic materials and methods related to valves commonly used for process systems.

1.2 REFERENCE STANDARDS

- A. American Water Works Association:
 - 1. AWWA C504 - Rubber-Seated Butterfly Valves.
- B. ASTM International:
 - 1. ASTM A536 - Standard Specification for Ductile Iron Castings.
- C. Manufacturers Standardization Society of the Valve and Fittings Industry:
 - 1. MSS SP-67 - Butterfly Valves.

PART 2 - PRODUCTS

2.1 RUBBER-SEATED BUTTERFLY VALVES

- A. Manufacturers:
 - 1. ABZ Valve and Controls.
 - 2. American Valve, Inc.
 - 3. Apollo Valves; a part of Aalberts Integrated Piping Systems.
 - 4. Cooper Cameron Valves.
 - 5. Crane; a Crane Co. brand.
 - 6. DeZURIK.
 - 7. FNW; Ferguson Enterprises, Inc.
 - 8. Hammond Valve.
 - 9. KITZ Corporation.
 - 10. Legend Valve & Fitting, Inc.
 - 11. Milwaukee Valve Company.
 - 12. Mueller Steam Specialty; A WATTS Brand.
 - 13. NIBCO INC.
 - 14. Norriseal.

15. Stockham; a Crane Co. brand.
16. Sure Flow Equipment Inc.
17. WATTS.
18. Substitutions: As specified in Section 016000 - Product Requirements.

B. Description - 2-1/2 Inches and Larger:

1. Comply with MSS SP-67.
2. Class: 150
3. End Connections: Wafer.
4. Shaft: Self-lubricating.
5. Seats Mounting: On body for valves 24 inches and smaller.
6. Packing: Replaceable without dismantling valve.

C. Operator:

1. Ten-position lever handle.
2. Self-locking and adjustable.
3. Operating nut 2" square.

D. Materials:

1. Body: Cast or ductile iron, ASTM A536.
2. Stem: Stainless steel.
3. Neck: Extended.
4. Disc: Elastomer coated ductile iron.
5. Seats: Resilient and replaceable Buna-N.
6. Bearings: Non-metallic, permanently lubricated.
7. Connecting Hardware: Type 316 stainless steel.

E. Finishes: As specified in Section 40 05 51 - Common Requirements for Process Valves.

2.2 SOURCE QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Requirements for testing, inspection, and analysis.
- B. As specified in Section 40 05 51 - Common Requirements for Process Valves.
- C. Testing: Test butterfly valves according to AWWA C504.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. According to AWWA C504.
- B. As specified in Section 40 05 51 - Common Requirements for Process Valves: Submittal requirements for compliance with this Section.

END OF SECTION 40 05 64

SECTION 400565.29
DOUBLE-DISK CHECK VALVES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Double-disk swing check valves, 2 through 52 inches in size.
- B. Related Requirements:
 - 1. Section 40 05 51 - Common Requirements for Process Valves: Basic materials and methods related to valves commonly used for process systems.

1.2 REFERENCE STANDARDS

- A. American Water Works Association:
 - 1. AWWA C518 - Dual-Disc Swing-Check Valves for Waterworks Service.
- B. ASTM International:
 - 1. ASTM A536 - Standard Specification for Ductile Iron Castings.

1.3 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.
- B. Coordinate Work of this Section with piping and equipment connections as specified in other Sections and as indicated on Drawings.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit catalog information, indicating materials of construction and compliance with indicated standards.
- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- D. Source Quality-Control Submittals: Indicate results of factory tests and inspections.
- E. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

1.5 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.

- B. Project Record Documents: Record actual locations of piping, valves and other appurtenances, connections, and centerline elevations.

1.6 QUALITY ASSURANCE

- A. Comply with AWWA C518.
- B. Perform Work according to industry standards.

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years' experience.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- C. Store materials according to manufacturer instructions.
- D. Protection:
 - 1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
 - 2. Protect valves and appurtenances by storing off ground.
 - 3. Provide additional protection according to manufacturer instructions.

1.9 EXISTING CONDITIONS

- A. Field Measurements:
 - 1. Verify field measurements prior to fabrication.
 - 2. Indicate field measurements on Shop Drawings.

1.10 WARRANTY

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for warranties.

PART 2 - PRODUCTS

2.1 DOUBLE-DISK CHECK VALVES

- A. Manufacturers:
 - 1. Crispin Valve.

2. Hammond Valve.
3. Krombach; Crane Energy Flow Solutions.
4. NIBCO INC.
5. Substitutions: Section 01 60 00 - Product Requirements.

B. Description:

1. Type: Double-disk, spring-loaded, swing check valves.
2. Size: 2 through 52 inches.
3. Style: Wafer.
4. Body: Ductile iron, ASTM A536.
5. Disk: Ductile iron, ASTM A536.
6. Seats: Resilient.
7. Seal: Buna-N.
8. Hinge Pin and Spring: Type 316 stainless steel.

C. Minimum Working Pressure:

1. Valves 2 through 12 Inches: 150 psig 140 deg. F.

D. Finishes: As specified in Section 40 05 51 - Common Requirements for Process Valves.

E. Accessories:

1. Closing Cylinder: Bottom mounted.
2. Disk position indicator.
3. Connecting Hardware: Type 304 stainless steel.

2.2 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for testing, inspection, and analysis.

B. Testing:

1. Hydrostatically test check valves at twice rated pressure according to AWWA C518.
2. Permitted Leakage at Indicated Working Pressure: None.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.

B. Verify that field dimensions are as indicated on Drawings.

C. Inspect existing flanges for nonstandard bolt-hole configurations or design and verify that new valve and flange mate properly.

3.2 INSTALLATION

- A. According to AWWA C518 and manufacturer instructions.
- B. Dielectric Fittings: Provide between dissimilar metals.

3.3 FIELD QUALITY CONTROL

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.
- B. Inspection:
 - 1. Inspect for damage to valve lining or coating and for other defects that may be detrimental as determined by Engineer.
 - 2. Repair damaged valve or provide new, undamaged valve.
 - 3. After installation, inspect for proper supports and interferences.
- C. Pressure test valves with piping.

3.4 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.
- B. Keep valve interior clean as installation progresses.
- C. After installation, clean valve interior of soil, grit, loose mortar, and other debris.

END OF SECTION 40 05 65.29

SECTION 40 72 13
ULTRASONIC LEVEL METERS (CONTINUOUS AND POINT TYPE)

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Ultrasonic-level measurement device.
- B. Related Requirements:
 - 1. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables.
 - 2. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
 - 3. Section 26 05 29 - Hangers and Supports for Electrical Systems.
 - 4. Section 26 05 33.13 - Conduit for Electrical Systems.
 - 5. Section 26 05 53 - Identification for Electrical Systems.

1.2 REFERENCE STANDARDS

- A. Institute of Electrical and Electronics Engineers Standards Association:
 - 1. 754-2019 IEEE Standard for Floating-Point Arithmetic.
- B. National Electrical Manufacturers Association:
 - 1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

1.3 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.
- B. Coordinate Work of this Section with piping Work.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit manufacturer information for system materials and component equipment, including connection requirements and electrical characteristics.
- C. Shop Drawings:
 - 1. Indicate system materials and component equipment.
 - 2. Submit installation requirements and other details.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Source Quality-Control Submittals: Indicate results of factory tests and inspections.

- F. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.
- G. Manufacturer Reports: Certify that equipment has been installed according to manufacturer instructions.

1.5 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for closeout procedures.

1.6 QUALITY ASSURANCE

- A. Ensure that materials of construction of wetted parts are compatible with process liquid.
- B. Perform Work according to applicable standards.

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years' experience.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- C. Store materials according to manufacturer instructions.
- D. Protection:
 - 1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
 - 2. Provide additional protection according to manufacturer instructions.

1.9 WARRANTY

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for warranties.
- B. Furnish 18-months manufacturer's warranty for ultrasonic-level measurement devices.

PART 2 - PRODUCTS

2.1 ULTRASONIC-LEVEL MEASUREMENT DEVICES

A. Product and Manufacturer:

1. Model: Accuron[®] 7100 Single Range Cartridge Meter
 - a. Manufactured by
Eastech Flow Controls
Tulsa, OK
Telephone: 918-664-1212
Email: info@eastechflow.com.
2. Substitutions: Or equal, as specified in Section 01 60 00 - Product Requirements.

B. Description:

1. Microprocessor-based Cartridge Flowmeter with data logger.
2. One single factory integrated pre-aligned unit that includes:
 - a. Trapezoidal flume, stainless steel.
 - b. Ultrasonic level sensor.
 - c. Integrated mounting bracket.
 - d. Gasketed cartridge, 304 stainless steel.
3. Non-contact sensor mounted above flow stream.
4. Sealed vibration-isolated enclosure.
5. Factory aligned, preprogrammed and calibrated.
6. On-board level for proper alignment with the pipe.
7. IEEE 754 single floating point precision.
8. Pre-sized and pre-programmed for pipe diameter.
9. Capable of field validation prior to installation of permanent power.

C. Requirements:

1. Maximum Flow Rate: 45 gpm
2. Turndown Ratio: 60:1
3. Flow Rate Accuracy: $\pm 3-5\%$ of actual
4. Distance Accuracy: $\pm 0.02''$ or $\pm 0.05\%$ of target
5. Environmental Rating: IP66 Submersible, NEMA 4, 4X
6. Sensor Housing: Teflon[®], resin filled.
7. Operating Temperature Range: -40°F to 158°F .
8. Power: 240-VAC, single phase, 60 Hz.
9. Wiring: Per Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables.
10. Furnish cable, field preamplifiers, and signal conditioners as required to maintain accuracy from sensor to terminal device.

D. Site Conditions:

1. Meter Mounting: Inside end of pipe, as shown on the Drawings.
2. Nominal Pipe Size: 6 inches
3. Pipe Material: Ductile Iron
4. Pipe Construction: Lined
5. Sensor Cable: 50 to 100 ft.
6. Options: None
7. Program Units: gpm
8. Data Retrieval Add-ons: None

- E. Features:
 1. Designed for 30-minute field installation.
- F. Operation: Menu guided.
- G. Data Logging:
 1. Built-in data logger.
 2. Eight distinct channels for logging flow and totals.
 3. Minimum storage capacity for a single channel at 5-minute intervals: 113 days.
 4. Logger data to be retrievable through a laptop computer.
- H. Display:
 1. 20-character four-line backlit display.
 2. Display to be programmable to be ON or OFF, or to remain OFF during a selected time interval.
 3. Display contrast to be fully adjustable.
 4. Display to provide visual access to the logger data.
 5. The main screen to be programmable to display up to eight lines of meter information such as flow, totals, time, date and relay alarm.
 6. The order of display line information to be programmable to user preference.
- I. Data Capabilities:
 1. Daily summaries viewable for the previous eight days, including times, dates, averages, minimums, maximums, and totals.
 2. Logger bar graph viewable in pre-programmed time intervals.
 3. Diagnostic information retrievable via a menu-driven self-test.
 4. Program capable of isolating fault parameters such as: loss of signal, 4-20 mA loop failure, logger memory full, communications error, sensor fault and open transmitter cable connection.
- J. Data Acquisition
 1. Current Output: One 4-20 mA. Isolated, 800 ohms maximum.
 2. Relay Outputs: Three SPDT relays available for alarm conditions.
 3. Serial Outputs: RS-232: with Modbus protocol.

2.2 SOURCE QUALITY CONTROL

- A. Section 014000 - Quality Requirements: Requirements for testing, inspection, and analysis.
- B. Provide shop inspection and testing of completed assembly.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Section 017000 - Execution and Closeout Requirements: Requirements for installation examination.

- B. Verify site-conditions and that the cartridge meter dimensions are correct and that the site conditions are suitable for installing the cartridge meter prior to ordering meter.
- C. Verify that items provided by other Sections of Work are ready to receive Work of this Section.

3.2 RECEIVING, HANDLING, AND STORAGE

- A. Receiving:
 - 1. Inspect for damage
 - 2. All parts should be inspected upon delivery to the site, noting any missing items or visible damage.
 - 3. Verify that the interior flow surfaces have not been damaged or otherwise marked during transit.
 - 4. Flanges, anchor clips, and dimensional bracing should also be inspected.
 - 5. For smaller boxed items make sure to verify that all packaging seals are in place and that there is no visible damage to the packaging.
- B. Investigate for order correctness and count:
 - 1. Once the order has been received review the packing list against what has been received. Should any items not appear to be present, or the configuration of the items does not match the description on the packing list, contact supplier immediately.
 - 2. Small connection hardware (nuts, bolts, etc.) not attached to the flumes may ship in individual boxes. Special care should be taken to secure these and any other small items that can be misplaced on a job site.
- C. Handling
 - 1. Flowmeters are specialty items and are fabricated to strict dimensional tolerances and flumes must be handled with care.
- D. Storage
 - 1. Flow meters should only be stored in a location that is clean, level, and protected from construction traffic.
 - 2. When shipped on pallets, flow meters should be left on those pallets until such time as they are needed. Otherwise flow meters should be stored upside down so that the interior flow surfaces are protected. Flumes should then be covered as an additional protection for the flow surfaces.

3.3 INSTALLATION

- A. Install the meter system in accordance with manufacturer's recommended procedures and applicable codes and standards.
- B. Cartridge Installation
 - 1. Install meter in end of pipe, as shown on the Drawings.
 - 2. Insert the cartridge until the flange is flush with the wall.
 - 3. Rotate the Cartridge to center the level.
 - 4. It may be necessary to use flat washers as spacers between the Cartridge flange and the wall.

5. Line up the slots with the lag shield holes and screw the lag bolts with the flat washers into the wall.
- C. Enclosure Mounting: Install display adjacent to ultraviolet disinfection system controls, as shown on the Drawings.

3.4 ADJUST AND CLEAN

- A. Verify that the complete installation meets the criteria above and any additional criteria supplied by the Engineer.
- B. Clean the flow surfaces in accordance with the manufacturer's operation and maintenance instructions.
- C. Remove all trash and debris, leaving the site in a clean condition.

3.5 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Requirements for inspecting and testing.
- B. Section 01 70 00 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.
- C. Furnish installation, inspection, field testing, and instructing Owner's personnel in maintenance of equipment.
- D. Equipment Acceptance:
 1. Adjust, repair, modify, or replace components failing to perform as specified and rerun tests.
 2. Make final adjustments to equipment under direction of manufacturer's representative.
- E. Furnish installation certificate from equipment manufacturer's representative attesting that equipment has been properly installed and is ready for startup and testing.

3.6 DEMONSTRATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for demonstration and training.
- B. Demonstrate equipment startup, shutdown, routine maintenance, and emergency repair procedures to Owner's personnel.

END OF SECTION 40 72 13

**SECTION 43 11 10
AERATION EQUIPMENT**

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. In-water aeration process equipment and piping:
 - a. Fine bubble aeration diffusers, diffuser ballast and all required hardware.
 - b. Floating lateral air distribution / diffuser support system, anchor posts, cable, and hardware.
2. Positive displacement air supply blowers and accessories.
3. Blower control panel w/VFD drives (common panel with filter blowers).

B. Related Requirements:

1. Section 46 64 23 - Gravity Filters – This section is directly related to this Aeration Equipment Section.

1.2 REFERENCE STANDARDS

A. American Society for Testing and Materials International:

1. ASTM D3350 Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.

B. National Electrical Manufacturers Association:

1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
2. NEMA MG1 - Motors and Generators

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit manufacturer information for blower, including accessories, curves with specified operating point plotted, power, rpm, sound power levels for both blower inlet and outlet at rated capacity, electrical characteristics, and connection requirements.

C. Shop Drawings: Indicate size and configuration of blower assembly, mountings, weights, and accessory connections.

D. Manufacturer's Certificate: Certify that blowers meet or exceed specified requirements.

E. Manufacturer Instructions: Submit detailed instructions on installation requirements, including storage and handling procedures.

F. Source Quality-Control Submittals: Indicate results of factory tests and inspections.

- G. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.
- H. Manufacturer Reports:
 - 1. Certify that equipment has been installed according to manufacturer instructions.
 - 2. Indicate activities on Site, adverse findings, and recommendations.
- I. Qualifications Statement:
 - 1. Submit qualifications for manufacturer.

1.4 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for closeout procedures.
- B. Project Record Documents: Record actual locations of aeration equipment.

1.5 SOURCE QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Requirements for testing, inspection, and analysis.
- B. Furnish shop inspection and testing of each blower.

1.6 QUALIFICATIONS AND EXPERIENCE

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum five years' experience.
- B. The supplier shall have experience in the design, manufacturing, supplying, and commissioning of fine bubble diffuser aeration equipment of the type specified.
- C. Aeration equipment shall be of proven design and shall be referenced by at least four (4) installations in cold climate wastewater treatment lagoons of similar scope, having been in operation for not less than 2 years.
- D. All equipment specified in the Wastewater Treatment System Package sections shall be supplied as a complete package, from one supplier (unless specifically noted otherwise in the specifications), in order to unify responsibility for the system warranty, performance, and proper operation.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- C. Store materials and equipment according to manufacturer instructions.
- D. Protection:

1. Protect blowers, diffusers and appurtenances from moisture and dust by storing in clean, dry location remote from construction operations areas.
2. Provide additional protection according to manufacturer instructions.

1.8 EXISTING CONDITIONS

- A. Field Measurements:
1. Verify field measurements prior to fabrication.
 2. Indicate field measurements on Shop Drawings.

1.9 INSURANCE REQUIREMENTS

- A. System supplier shall maintain a minimum \$1,000,000 Errors and Omissions insurance policy acceptable to the client.

1.10 WARRANTY

- A. The aeration system Supplier shall provide written warranties for the aeration system.
- B. The Supplier shall repair or replace defective parts without charge to the Owner.
- C. Lateral Piping and Fittings Warranty
1. Lateral piping and fittings shall be warranted to be free from defects in material and workmanship for a period of 24 months from the date of start-up.
 2. The cost for removal (disposal) and reinstallation of any defective parts during the warrantee period shall be fully born by the responsibility of the Owner.
- D. Aeration Diffuser Warranty
1. Aeration diffusers shall be warranted to be free from defects in material and workmanship for a period of 24 months from the date of start-up.
 2. The cost for removal (disposal) and reinstallation of any defective parts during the warrantee period shall be fully born by the responsibility of the Owner.
- E. Blower Package Warranty
1. Blower package shall be warranted to be free from defects in material and workmanship for a period of 24 months from the date of start-up or 30 months from shipping (whichever is sooner).
 2. The cost for removal (disposal) and reinstallation of any defective parts during the warrantee period shall be fully born by the responsibility of the Owner.

1.11 PERFORMANCE AND DESIGN CRITERIA

- A. Influent/Effluent Design Values
1. Design aeration system based on the following design values:
 - a. Average Daily Flow: 8,000 gpd
 - b. CBOD₅: 17.3 lb/day
 - c. Total Suspended Solids: 13.3 lb/day

- d. Total Ammonia-N: 3.3 lb/day
- B. Wastewater Effluent Design Values (lagoon effluent, filter influent):
- a. CBOD₅: 35 mg/L
 - b. Total Suspended Solids: 45 mg/L
 - c. Total Ammonia-N: 35 mg/L
- C. Aeration Design Criteria
1. Aeration Design Factors
 - a. Alpha: 0.60
 - b. Beta: 0.95
 - c. Theta: 1.024
 - d. Site Elevation: 569 ft
 - e. Maximum Water Temperature: 67 °F
 - f. Minimum Water Temperature: 33 °F
 2. Aeration system shall be designed transfer sufficient oxygen to accommodate loads from:
 - a. CBOD removal.
 - b. Internal sludge digestion.
 3. The average dissolved oxygen content shall be not less than 2.0 mg/L in any part of the aerated lagoons.
 4. Diffusers shall have a minimum SOTE of 14.9% at a diffuser submergence depth of 7.1 ft
 5. Diffusers shall have a maximum flux rate of 1.86 SCFM/sq.ft of active surface area at the standard design conditions.
 6. Air distribution shall be designed to match the projected oxygen demand and minimum spacing requirements. Minimum requirements are as follows:
 - a. Cell #1: 3 H3-4 diffuser assemblies
 - b. Cell #2: 1 H3-4 diffuser assembly
 7. All diffuser assemblies shall be same make/model in all cells.
 8. Submit complete aeration design calculations and results of ASCE Standard Oxygen Transfer Efficiency (SOTE) tests conducted by an independent laboratory.

PART 2 - PRODUCTS

2.1 BASIS OF DESIGN

- A. The design drawings, system layout, equipment selection, etc. have been based on the OPTAER aeration system. The pre-selected Wastewater Treatment System Package consists of multiple processes as designed and supplied by Nexom Inc.
- B. This system was pre-selected by the Engineer to best meet the design requirements for this application.
- C. The OPTAER system shall be manufactured and supplied by:
 - Nexom Inc.
 - Winnipeg, Manitoba
 - Telephone: 888-426-8180
 - Email: kevin.esau@nexom.com

- D. Components specified herein shall be supplied by one supplier and shall be of the manufacturer's latest design.
- E. Under no circumstances will a system consisting of parts compiled and assembled by a manufacturer's representative or distributor be accepted.
- F. Contractor shall specify at time of bid all major subcontractors and suppliers to be used. Use of any subcontractors or suppliers other than specified will not be accepted.
- G. Substitutions: Engineer approved equal. NOTE: All costs of evaluation and redesign associated with change of system or manufacturer to be paid by General Contractor.

2.2 GENERAL LAYOUT/ARRANGEMENT

- A. The Lagoon aeration system shall generally consist of shallow buried main air supply headers with distribution laterals:
 1. Galvanized steel or ductile iron pipe header shall be used to provide blower heat dissipation prior to connection to the buried HDPE main header (by Contractor).
 2. Lateral piping shall be connected to the main air supply header with a flanged connection (by Contractor).
 3. Each lateral pipe shall have a shutoff valve at the main header connection (existing).
 4. Lateral pipes shall be anchored to shore.
 5. Floating Laterals: diffuser connection ports shall be thermally fused onto the lateral piping. At each connection point, a length of feeder hose (equal to the maximum water depth) shall be connected to the connection port with an electrofusion coupler. The aeration diffuser shall be connected to the opposite end of the feeder hose.
- B. Diffusers shall be suspended from a floating lateral to ensure all diffusers remain at a constant depth and are unaffected by sludge accumulation.
- C. The aeration system, including diffusers, lateral system, and feeder lines shall ensure that the lagoon cells do not have to be dewatered or drained for system installation or maintenance.
- D. Non-retrievable submerged aeration headers/laterals will not be accepted. PVC headers will not be accepted.

2.3 AERATION PIPING

- A. High-Density Polyethylene (HDPE) Pipe: butt-fused joints.
- B. The polyethylene pipe shall be PE3408, or PE3608, or PE4710, and conform to the requirements of ASTM D3350.
- C. Minimum DR requirements shall be the more stringent of the following:
 1. for buried piping: DR17 for heavy traffic areas; DR21 for light traffic areas; DR26 for non-traffic areas
 2. for other piping: DR17 for 4" piping, DR21 for 6" piping, DR26 for 8" and larger.
- D. Minimum aeration header pipe size: 4" diameter.

- E. Flange assemblies: Polyethylene stub end manufactured to match the pipe, with ductile iron slip-on flange (out of water and buried service), and SS slip-on flange (in-water).
- F. Provide saddles, tees, reducers, and other fittings required for the installation shown.

2.4 DIFFUSERS AND FEEDER TUBING

- A. H3-4 fine bubble membrane diffuser assemblies consisting of PVC support tubes with EPDM diffuser membranes connected to an HDPE distribution manifold.
 - 1. Maximum dry weight of individual diffuser and ballast assembly shall be 58 lb to allow for safe manual retrieval.
 - 2. Each diffuser assembly shall consist of four (4) 610 mm long membranes.
 - 3. EPDM diffuser membranes shall be fully supported over entire length.
 - 4. EPDM diffuser membranes shall have a design life space of not less than 5 years before replacement is required.
- B. Aeration supplier shall provide precast concrete diffuser ballast weight assemblies including SS support brackets with an HDPE cover around perimeter of weight. No on-site diffuser ballast weight fabrication will be accepted.
- C. Each aeration diffuser shall be individually accessible from the water surface by boat with no additional lifting equipment required. Aeration diffuser replacement shall require no more than a crew of two workers.
- D. Diffusers shall have a history of efficient operation, and freedom from clogging, excessive back pressures, or structural failure when applied to service conditions similar to those indicated for this project.
- E. Provide one (1) complete diffuser assembly as spare parts
- F. Diffuser outlet connections shall be heavy walled HDPE branch saddles with socket outlet connections and shall be factory-side fusion welded to the HDPE lateral pipe.
 - 1. As determined by the manufacturer and as dictated by site conditions, branch saddles may be factory welded to short lengths of HDPE pipe and provided as pre-fabricated HDPE branch saddle outlet tee assemblies. Field butt fusion welding of the tee assembly will be required within the lateral at the locations indicated during the field installation procedure.
 - 2. The branch saddles shall have a welded contact area on the lateral pipe of a minimum of 2.1 square inches.
 - 3. Mechanical saddles or outlet fittings will not be accepted.
- G. Feeder tubing used as the connection between the fine bubble diffuser and lateral piping shall be flexible PVC or EPDM material reinforced with spiral polyester yarn; UV and weather resistant.
 - 1. Nominal inside diameter 1" or 1.25".
 - 2. Service temperature range -15°F to 149°F
 - 3. Feeder tubing to be cut to length in factory.

2.5 LATERAL ANCHORING

- A. Each end of the floating laterals shall be held in place with a stainless steel cable attached to anchor posts.
- B. Adjustable tension assemblies shall be located at the free end of each lateral and shall have the following characteristics:
 - 1. Adjustment range: +/- 20”.
 - 2. Tension assembly to provide a minimum constant tension force on lateral of 275 lb.
 - 3. Equipped with winch for adjustments.
- C. Anchor posts
 - 1. 2.5” diameter, schedule 40 pipe - galvanized
 - 2. Minimum embedment of post in concrete pier: 24”
 - 3. Maximum Length – Fixed post: 48”
 - 4. Minimum Length – Self-Adjusting Tension Assembly post: 72”
- D. Concrete Pier
 - 1. 18” diameter x 36” deep (minimum)

2.6 AERATION BLOWERS

- A. Blower unit(s): Rotary positive displacement type; meeting the following performance requirements (as per aeration system supplier design):
 - 1. Maximum inlet temperature: 104 °F
 - 2. Relative humidity: 50%
 - 3. Normal pressure: 5.1 psi
 - 4. Maximum pressure: 6.2 psi (intermittent)
 - 5. Design Airflow: 48 SCFM.
 - 6. Normal blower operating RPM shall be less than 90% of maximum blower RPM.
 - 7. Maximum noise level: 65 dBa (1 meter distance, free field measurement)
 - 8. Motor power requirements: 5 hp, 460 V, 3-phase, 60 Hz (VFD compatible), NEMA premium efficiency meeting NEMA MG1 Part 31 if running on VFD.
 - 9. Number of units: 1 (each blower shall provide 100% of the required airflow.)
- B. Provide sound attenuating enclosures as required to meet the noise requirements, with mechanical cooling fans.
- C. Blowers shall have automatic belt tensioning: motor mounted on swing frame where tensioning is accomplished by the motor weight.
- D. Provide inlet filter assemblies, filter restrictor gauges, inlet/discharge silencers, check valves, pressure relief valves, pressure gauges, temperature gauges, temperature switches, flexible inlet and discharge piping couplers, etc. as required for a complete installation.
- E. Blower isolation butterfly valves shall be supplied as part of the metal piping discharge manifold.
- F. Spare Parts
 - 1. Provide one (1) spare air intake filter and one (1) v-belt set for each blower.
 - 2. Provide blower oil for first two (2) years of operation

- G. Acceptable manufacturer: Aerzen.
- H. Standby blower for the filter aeration system shall also act as standby blower for Lagoon aeration system.
- I. Refer to Section 46 64 23 – Gravity Filters for filter aeration blower details.

2.7 AERATION BLOWER CONTROL PANEL

- A. One (1) integrated aeration control panel shall be designed to control both the Lagoon Aeration Blowers and the filter Aeration Blowers
- B. Control panel shall be integrated to control and monitor all blowers.
- C. Control panel shall be furnished by the aeration system supplier and be factory assembled as a complete, fully wired and tested package.
- D. Control panel shall have the minimum following requirements:
 1. 460 V, 3-phase service.
 2. NEMA 12 enclosure (floor mount or wall mount) c/w cooling fans suitable for continuous VFD operation.
 3. Main disconnect.
 4. Splitter block.
 5. Control power transformer, control circuit fuses.
 6. Control breakers / motor circuit protectors suited for motors.
 7. Constant torque VFD drives (for main blower drive motors) c/w 3% Line and 3% Load Reactors.
 8. Run Pilot Lights, Elapsed Time Meters, Hand-Off-Auto or Duty-Off-Standby selectors, manual speed adjustment potentiometers, HMI display.
 9. PLC compatible control.
 10. Blower overload alarms, discharge high temp alarms, alarm lights & relays, thermistor trip relays, alarm reset button, alarm contacts for remote monitoring, terminal strip.
 11. Blower start and control sequencing to be provided by BlowerMaster controller.
 12. Two (2) remote pressure sensor/transducer with digital displays mounted in panel.
- E. Package shall be UL listed.

2.8 MISCELLANEOUS COMPONENTS

- A. Provide all other miscellaneous process equipment accessories including winches, stainless steel cable, concrete diffuser ballasts, rope, clamps, nuts/bolts, etc. as required for a complete system

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Section 017000 - Execution and Closeout Requirements: Requirements for installation examination.

3.2 GENERAL

- A. Verify layout, type, and orientation of piping connections.
- B. Verify that items provided by other Sections of Work are ready to receive Work of this Section.
- C. The General Contractor shall install all supplied components in accordance with the manufacturer's instructions and in conformance with submitted Shop Drawings.
- D. The installer of the aeration system shall supply all materials, tools, equipment, and services necessary to install the aeration system.
- E. The site shall be kept in a neat and orderly manner throughout the duration of the system installation.

3.3 INSTALLATION

- A. Per industry standards.

3.4 AERATION PIPING INSTALLATION

- A. The General Contractor shall provide equipment for excavation and backfill for all shallow buried aeration headers. Backfill buried piping with select native excavated material. Backfill buried piping under building foundation or roadways with base course gravel.
- B. The General Contractor shall accurately excavate to the correct grades allowing for sand bedding if/where required. Trench bottom shall be smooth, straight, and free of large rocks. Support piping on undisturbed material along its entire length.
- C. The General Contractor shall provide sufficient labor and equipment to install all aeration header piping and accessories. Install buried piping to the extent shown on the drawings using open-cut trench method.
- D. The General Contractor shall supply and install all air valves, main air header piping, and fittings as necessary to complete the aeration system as shown on the plans.
- E. Join HDPE pipe and fittings using the butt-fusion method in accordance with the pipe manufacturer's instructions, and under the supervision of certified fusion technologists.

- F. Keep piping, during the progress of the Work and on completion, free from obstructions and thoroughly clean. Remove foreign material from the pipe lines and ensure lines are free from leaks. Remove and replace any defective sections.

3.5 AERATION DIFFUSER AND LATERAL INSTALLATION

- A. The General Contractor shall provide sufficient labor and equipment to install all in-basin aeration diffuser piping and accessories within the treatment cells.
- B. Join HDPE pipe and fittings using the butt-fusion method in accordance with the pipe manufacturer's instructions, and under the supervision of certified fusion technologists.
- C. Keep piping, during the progress of the Work and on completion, free from obstructions and thoroughly clean. Remove foreign material from the pipelines and ensure lines are free from leaks. Remove and replace any defective sections.
- D. Install HDPE lateral piping at flange connection locations as shown on the drawings.
- E. Install diffusers and feeder tubing in accordance with supplier's instructions at locations as shown on the drawings.
- F. Ensure adequate water levels in cell prior to any in-water equipment installation.

3.6 BLOWER INSTALLATION

- A. The General Contractor shall provide sufficient labor and equipment to install all blower and related intake/discharge piping.
- B. Install blower units on concrete bases in accordance with the manufacturer's instructions.
- C. Install one intake filter in each air intake assembly upon system start-up; leave the remaining spare for each blower in the Blower Building for the Owner's future use.
- D. Blower control panel shall be provided by aeration system Supplier. Installation of panel including all electrical connections, related wiring, hookup of blowers, sensors, control wiring, etc. shall be by the General Contractor.

3.7 MANUFACTURER'S/SUPPLIER'S FIELD SERVICE

- A. Provide services of an experienced, competent, and authorized representative of the Manufacturer (Supplier). A minimum of one (1) trip with one (1) day shall be allowed.
 - 1. Inspect equipment covered by these specifications.
 - 2. Supervise any adjustments and installation checks.
 - 3. Perform operation checks and tests as outlined below.
 - 4. Perform start-up and commissioning of the system.
- B. Perform air flow rate tests
 - 1. Testing shall be performed under full normal lagoon operational conditions.

2. RPM testing shall be performed on blower motor and block and correlated with factory generated blower performance curves to obtain airflows.
- C. Visually inspect aeration pattern
1. Pattern shall be uniform at all diffuser locations.
- D. If defects are revealed during testing, the Engineer may issue instructions for removal or correcting defective work and irregularities. If any material, in whole or in part, does not conform to the Specifications or is found to be defective then such material shall be rejected by the Engineer and replaced by the Contractor/Supplier.

3.8 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Requirements for inspecting and testing.
- B. Section 01 70 00 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.
- C. Inspection: Inspect for proper operation of blowers.
- D. Testing:
1. Test each blower minimum two hours at blower's rated capacity.
 2. Test in presence of Engineer.
 3. Sound Level: Less than 65 dBA, measured at 3 feet from blower.
- E. Manufacturer Services: Furnish services of manufacturer's representative experienced in installation of products furnished under this Section for not less than 1 **day** on Site for installation, inspection, startup, field testing, and instructing Owner's personnel in maintenance of equipment.
- F. Equipment Acceptance:
1. Adjust, repair, modify, or replace components failing to perform as specified and rerun tests.
 2. Make final adjustments to equipment under direction of manufacturer's representative.
- G. Furnish installation certificate from equipment manufacturer's representative attesting that equipment has been properly installed and is ready for startup and testing.

3.9 ADJUSTING

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for starting and adjusting.
- B. Check control functions and adjust as required.

3.10 DEMONSTRATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for demonstration and training.
- B. Demonstrate equipment startup, shutdown, routine maintenance, and emergency repair procedures to Owner's personnel.

3.11 COMMISSIONING

- A. Supplier shall provide start-up and commissioning for the system including on-site training of the Owner's operators. A minimum of one (1) trip with one (1) day shall be allowed.
- B. Check the installation of all components and provide a written commissioning report to the Engineer upon completion of installation and commissioning.

END OF SECTION 43 11 33.10

**SECTION 46 61 23
GRAVITY FILTERS**

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Aerated granular aggregate-media filter and accessories.
 - 1. Filter process design criteria and requirements.
 - 2. Process equipment and piping for aeration system within the filter bed.
 - 3. Process equipment and piping for influent distribution/effluent collection system within the filter bed.
 - 4. Positive displacement air supply blowers, accessories.
 - 5. Blower control panel w/VFD drives (common panel with Lagoon blowers).
 - 6. Civil Works/Materials for filter bed construction. NOTE: All civil works/materials for filter bed construction to be supplied and installed by General Contractor.

- B. Related Requirements:
 - 1. Section 06 10 00 - Rough Carpentry
 - 2. Section 31 23 16.13 - Trenching
 - 3. Section 31 05 19.13 - Geotextiles for Earthwork
 - 4. Section 43 11 33.10 - Aeration Equipment – This section is directly related to this Gravity Filters Section.
 - 5. Sections 46 61 23A - Gravity Filters - Attachment: Manufacturer's and Contractor's Scope Listing.
 - 6. Section 46 61 23.10 - Geomembrane Liner

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

- A. Treatment and Aeration System Components:
 - 1. Basis of Measurement: Lumps Sum, per Bid Item.
 - 2. Basis of Payment: Cost of equipment paid to Manufacturer.
 - 3. Refer to Attachment to this Section for a breakdown of Manufacturer supplied items.

- B. Treatment and Aeration System Procurement:
 - 1. Basis of Measurement: Lumps Sum, per Bid Item.
 - 2. Basis of Payment: Contractor's cost of procurement.

- C. Treatment and Aeration System Accessory Material, Equipment and Installation:
 - 1. Basis of Measurement: Unit Prices, per Bid Items.
 - 2. Basis of Payment: Contractor's cost of procurement.
 - 3. Refer to Attachment to this Section for a breakdown of Contractor supplied items.

1.3 REFERENCE STANDARDS

- A. American Society for Testing and Materials International:
 - 1. ASTM C88: Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate.
 - 2. ASTM C131: Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
 - 3. ASTM D1997: Standard Test Method for Laboratory Determination of the Fiber Content of Peat and Organic Soils by Dry Mass.
 - 4. ASTM D3034: Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
 - 5. ASTM D3350: Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.
 - 6. ASTM D 6928: Standard Test Method for Resistance of Coarse Aggregate to Degradation by Abrasion in the Micro-Deval Apparatus.
- B. The National Electrical Manufacturers Association
 - 1. NEMA MG1 - Motors and Generators

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit manufacturer's Product Data for system materials and component equipment.
- C. Shop Drawings:
 - 1. Indicate system materials and component equipment.
 - 2. Submit installation and anchoring requirements, fasteners, and other details.
- D. Manufacturer's Certificate: Certify that filters meet or exceed specified requirements.
- E. Manufacturer's Instructions: Submit detailed instructions on installation requirements, including storage and handling procedures.
- F. Source Quality-Control Submittals: Indicate results of factory tests and inspections.
- G. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.
- H. Manufacturer Reports: Indicate that equipment has been installed according to manufacturer's instructions.

1.5 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for closeout procedures.
- B. Project Record Documents: Record actual location of installed gravity filter.

- C. Operation and Maintenance Data: Submit maintenance instructions for equipment and accessories.

1.6 QUALITY ASSURANCE

- A. Perform Work according to referenced industry standards.
- B. All equipment specified in the Wastewater Treatment System Package shall be supplied as a complete package, from one supplier (unless specifically noted otherwise in the specifications), in order to unify responsibility for the system warranty, performance, and proper operation.

1.7 QUALIFICATIONS AND EXPERIENCE

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum five years' experience.
- B. The supplier shall have experience in the design, manufacturing, supplying, and commissioning of equipment of the type specified.
- C. Submit a list of a minimum of four (4) full scale filter installations of similar scope and design in cold climate (minimum four months of ice cover conditions) following wastewater treatment lagoons, having been in operation for not less than 3 years. Information required for each installation shall include:
 - 1. Name and location of facility, including operator contact information, engineer contact information, and owner contact information.
 - 2. Design flows, organic loading, and effluent requirements.
 - 3. Operating data including effluent quality.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Deliver materials in manufacturer's packaging including application instructions.
- C. Inspection: Accept materials on-Site in original packaging and inspect for damage.
- D. Store materials according to manufacturer's instructions.

1.9 EXISTING CONDITIONS

- A. Field Measurements:
 - 1. Verify field measurements prior to fabrication.
 - 2. Indicate field measurements on Shop Drawings.

1.10 INSURANCE REQUIREMENTS

- A. System Supplier shall maintain a minimum \$1,000,000 Errors and Omissions insurance policy acceptable to the client.

1.11 WARRANTY

- A. The System Supplier shall provide written warranties against defects in materials and workmanship for a period of 24 months after substantial completion for the system.
 - 1. The cost for removal (disposal) and reinstallation of any defective parts during the warranty period shall be fully born by the responsibility of the Owner.
 - 2. The Supplier shall repair or replace defective parts without charge to the Owner.

1.12 PERFORMANCE AND DESIGN CRITERIA

A. System Design Values:

- 1. Design Average Daily Flow: 8,000 gpd.
- 2. Maximum Daily Flow: 14,400 gpd.
- 3. Minimum Influent Temperature: 33 degrees F.
- 4. Flow Conditions: Continuous.

B. Filter Influent Design Values:

- 1. CBOD₅: 2.3 lb/day
- 2. Total Suspended Solids: 3.0 lb/d.
- 3. Total Kjeldahl Nitrogen: 2.3 lb/day

C. Filter Effluent Design Values:

- 1. CBOD₅ (monthly average): <30 mg/L
- 2. Total Suspended Solids (monthly average): <30 mg/L
- 3. Total Ammonia – N (monthly average): <0.6/2.1 mg/L (summer/winter)

D. Basin Design Criteria:

- 1. It is entirely the responsibility of the Supplier to verify all design parameters, and basin design dimensions based on design values.
- 2. Basin sizing, geometry, and gravel bed design shall be based on aggregate bed depth, retention time, influent loading rates, influent temperature, maximum frontal loading flux rate, and required nitrification rates.
 - a. The volumetric design shall be based on TKN loading.
 - b. The organic loading flux rate shall be based on the influent mass organic loading and the cross-sectional area at the influent end of the bed.
- 3. Insulation layer design:
 - a. Design depth of the insulating layer shall be based on local climate conditions and minimum average temperatures.
 - b. Minimum insulation layer of 9” shall be provided.

E. Distribution & Collection Design Criteria:

- 1. Influent distribution system:

- a. There shall be two influent distribution points within each train of the system, which shall be fed using the step-feed process to establish sufficient nitrifying biomass within the bed for cold climate nitrification.
 - b. The influent distribution piping shall be designed to ensure flow distribution across the width of the bed.
 - c. Pipe size, orifice size and spacing shall be designed based on maximum monthly flows.
 - 2. Effluent collection system:
 - a. Collection system shall be designed to collect effluent across the width of the bed.
 - b. Collection system shall be sized based on maximum monthly flows.
- F. Aeration Design Criteria:
- 1. Aeration design factors:
 - a. Alpha: 0.70
 - b. Beta: 0.95
 - c. Theta: 1.024
 - d. Site Elevation: 569 ft
 - e. Maximum water temperature: 67 °F
 - f. Minimum water temperature: 33 °F
 - 2. Aeration system shall be designed to transfer a minimum of 1.5 lbs of dissolved oxygen per 1 lb of CBOD₅ applied at normal operating conditions and 4.57 lbs of dissolved oxygen per 1 lb of TKN entering the filter system.
 - 3. The average dissolved oxygen content shall be not less than 3.0 mg/L in the aggregate layer.
 - 4. Air distribution within the filter bed shall be designed to match the projected oxygen demand. The design diffuser distribution is critical to ensure that nitrification occurs throughout the bed.
 - 5. Submit complete design calculations and results of Standard Oxygen Transfer Efficiency (SOTE) tests conducted by an independent laboratory within a bed that contains aggregates that are similar in size to the specified gradations.
- G. Reliability and Redundancy Criteria
- 1. A minimum dual train system is required. Each train in the system must have two feed zones: one at the front-end of the system, and one at the mid-point of the system with the ability to step-feed filter influent for biomass control.

PART 2 - PRODUCTS

2.1 AERATED GRANULAR AGGREGATE-MEDIA FILTERS

A. Basis of Design

- 1. The design drawings, system layout, equipment selection, etc. have been based on the OPTAER system. The pre-selected Wastewater Treatment System Package consists of multiple processes as designed and supplied by Nexom Inc.
- 2. The system was pre-selected by the Engineer to best meet the overall design requirements for this application.
- 3. Approved system is the OPTAER SAGR[®] system as manufactured and supplied by:
Nexom Inc.

Winnipeg, Manitoba
Telephone: 888-426-8180
kevin.esau@nexom.com

4. Components specified herein shall be supplied by one supplier and shall be of the manufacturer's latest design.
5. Under no circumstances will a system consisting of parts compiled and assembled by a manufacturer's representative or distributor be accepted.
6. Substitutions: Engineer approved equal. NOTE: All costs of evaluation and redesign associated with change of system or manufacturer to be paid by General Contractor.

B. General Layout/Arrangement

1. The SAGR (submerged attached growth reactor) is a tertiary wastewater process that provides year-round nitrification with prolonged cold water temperatures. The SAGR process can be utilized for nitrification following any secondary treatment processes including aerated or facultative lagoons. (See also specification section "Civil Works – General Arrangement" for additional overview.)
2. All process equipment within the SAGR basin shall be the OPTAER SAGR system as designed and manufactured/supplied by Nexom Inc. as a total system.
3. All civil works specified in this section (including but not limited to aggregate, protective fabric, HDPE liner, insulating material, and sacrificial wood) shall be provided by the General Contractor.

C. Aeration Pipe and Appurtenances

1. High-Density Polyethylene (HDPE) Pipe: butt-fused joints, 3" and larger.
2. The polyethylene pipe shall be PE3408, or PE3608, or PE4710, and conform to the requirements of ASTM D3350.
3. Minimum DR requirements shall be the more stringent of the following:
 - a. for buried piping: DR17 for heavy traffic areas; DR21 for light traffic areas; DR26 for non-traffic areas.
 - b. for other piping: DR17 for 4" piping, DR21 for 6" piping, DR26 for 8" and larger.
4. Minimum aeration header/lateral pipe size: 3" diameter
5. Flange assemblies: Polyethylene stub end manufactured to match the pipe, with ductile iron slip-on flange (out-of water) or stainless steel slip-on flange (in-water).
6. Provide saddles, tees, reducers, and other fittings required for the installation shown.
7. Feeder Tubing
 - a. Feeder tubing used as the connection between the aeration tubing and the manifold pipe shall be SDR11 HDPE (black) Ultraviolet resistant tubing.
 - b. Socket-fused couplers, fittings used for feeder tubing 1" and smaller

D. Aeration Diffusers

1. Aeration Tubing
 - a. LINEAR aeration diffusers shall be suitable for direct bury (up to 15' depth) within granular media
 - b. Diffuser air releases shall require 0.5 to 3 psi more than hydrostatic pressure to ensure pattern uniformity. Diffuser air release back pressure will vary with airflow per orifice.
 - c. Internal diffuser friction loss shall be lower than the orifice pressure drop.
 - d. Aeration diffusers shall be able to accommodate a bottom variation of +/- 4" without compromising the aeration distribution.

- E. Influent Distribution and Effluent Collection
1. Plastic Pipe
 - a. Type PSM Polyvinyl Chloride (PVC): to ASTM D3034 CSA-B182.2.
 - b. Standard Dimensional Ratio (SDR): 35
 - c. Gasket and integral bell system
 - d. Drilled orifices (as sized by the system supplier) to provide uniform flow distribution
 2. Distribution/Collection Chamber System
 - a. Chamber system shall include any fittings, etc. to create a complete and functional system.
 - b. Chamber modifications as required to provide horizontal and vertical flow distribution.
- F. Aeration Blowers
1. Blower unit(s): Rotary positive displacement type; meeting the following performance requirements (as per SAGR system supplier design):
 - a. Maximum inlet temperature: 104 °F
 - b. Relative humidity: 50%
 - c. Normal pressure: 5.2 psi
 - d. Maximum pressure: 9.2 psi (intermittent)
 - e. Design Airflow: 26 SCFM.
 - f. Normal blower operating RPM shall be less than 90% of maximum blower RPM
 - g. Maximum noise level: 65 dBA (1 meter distance, free field measurement)
 - h. Motor power requirements: 5 hp, 460 V, 3-phase, 60 Hz (VFD compatible), NEMA premium efficiency meeting NEMA MG1 Part 31 if running on VFD
 - i. Number of units: 2 (1 operating, 1 common standby, each blower shall provide 100% of the required airflow. Standby blower shall also act as standby blower for lagoon aeration).
 2. Provide sound attenuating enclosures as required to meet the noise requirements, with mechanical cooling fans.
 3. Blowers shall have automatic belt tensioning: motor mounted on swing frame where tensioning is accomplished by the motor weight.
 4. Provide inlet filter assemblies, filter restrictor gauges, inlet/discharge silencers, check valves, pressure relief valves, pressure gauges, temperature gauges, temperature switches, flexible inlet and discharge piping couplers, etc. as required for a complete installation.
 5. Blower isolation butterfly valves shall be supplied as part of the metal piping discharge manifold.
 6. Spare Parts
 - a. Provide one (1) spare air intake filter and one (1) v-belt set for each blower.
 - b. Provide blower oil for first two (2) years of operation.
 7. Acceptable manufacturer: Aerzen
 8. Standby blower for the SAGR Aeration system shall also act as standby blower for Lagoon aeration system.
- G. Aeration Blower Control Panel
1. One (1) integrated aeration control panel shall be designed to control both the Lagoon Aeration Blowers and the SAGR Aeration Blowers.
 2. Control panel shall be furnished by the aeration equipment supplier and be factory assembled as a complete, fully wired and tested package.
 3. Refer to Section 43 11 33.10 - Aeration Equipment for Aeration Blower Control Panel details.

H. Civil Works by Contractor

1. All civil works specified in this section (including but not limited to aggregate, protective fabric, HDPE liner, insulating material, and sacrificial wood) shall be provided by the General Contractor.

I. Civil Works – General Arrangement

1. The SAGR is a clean gravel bed with horizontal chambers at the front end of the system to distribute the secondary wastewater flow across the width of the cell, and horizontal collection chambers at the end of the system treatment zones.
2. The basin is constructed with perimeter “sacrificial” walls to provide vertical side-slopes. The walls are not intended to provide a water-tight seal nor provide structural support. The walls provide a means to keep the backfill separated from the granular bed. An HDPE liner along the bottom and sides of each basin provides the watertight seal.
3. Influent splitting structure is located at the front of the system to divide flow equally between treatment zones. Effluent hydraulic control structure is located at the back end of the system to maintain a constant water level in the SAGR bed by the use of an overflow pipe, weirs, stop-logs, etc.
4. Shallow buried air supply headers run from the blowers to the SAGR bed. Aeration distribution headers are located on top of the SAGR bed within the insulation layer. LINEAR aeration throughout the floor of the SAGR provides aerobic conditions that are required for nitrification.
5. The aggregate bed is covered with a layer of wood chips (or other approved insulating material) to prevent the bed from freezing during extreme winter conditions.
6. A protective fabric layer is placed between the bottom and sides of the basin and the aggregate layer, and the top of the basin between the granular layer and the insulating layer.

J. Civil Works - Aggregate

1. Aggregate shall be of igneous, sedimentary or similar insoluble material origin.
 - a. The aggregate shall be free from dust, sand, silt, clay, and organic matter.
 - b. The aggregate shall be considered unsuitable, if it contains soft, thin, elongated, or laminated materials that break up when alternately frozen and thawed or wetted and dried.
 - c. The aggregate shall be considered unsuitable, if it contains deleterious materials, even though particle sizes are within the limits of the gradation sizes required.
 - d. Approval shall be obtained from the Engineer as to the proposed source and type of aggregate to be used.

2. Aggregate sieve analysis

- a. Aggregate sieve analysis shall meet the following specifications:

<u>Sieve Size (inches)</u>	<u>Percent Passing</u>
2	100
1 1/2	95 - 100
1	40 – 100
3/4	5 – 80
1/2	0 – 30
3/8	0 – 4
1/4	0 – 1

- b. All aggregate samples to be washed to determine fines as part of sieve analysis.
- c. Aggregate may need to be washed as part of aggregate production to meet fines specifications.

3. The aggregate shall also comply with the following test results:

Test	Maximum Value	ASTM Ref.
Abrasion	35% Loss	C 131
Soundness	8% Loss	C 88
Micro-Deval	25% Loss	D 6928
4. Quality control and aggregate testing
 - a. Initial Testing: Complete testing for gradation, abrasion, soundness, and micro-Deval prior to start of production.
 - b. Testing during production: Gradation testing during production shall include a minimum of one (1) gradation test per 250 cubic yards of material produced.
 - c. Testing during hauling operations: The contractor shall include as part of a quality assurance program additional gradation testing during hauling. Complete a minimum of ten (10) gradation tests at intervals of approximately 10% of hauled material to site.
 - d. All testing results must be submitted to the Engineer in a timely manner.
5. Sampling
 - a. Do not sample from outside of stockpile where rain may clean aggregate and where segregation may occur.
 - b. At the Engineers request, allow Engineer to take independent sample for testing.
6. Preliminary review of the aggregate as represented in the test results shall not constitute general acceptance of all or any material in a deposit or source of supply. The Engineer has the right to request additional testing if there are any concerns with any proposed aggregate. The Engineer shall have the final authority in approving or rejecting aggregate.
7. Aggregate not meeting the specifications shall be rejected. If material found to be unsuitable has already been placed into the SAGR beds, the material shall be removed and replaced by the Contractor. Any damage to process equipment or contract schedule delays resulting from removal of rejected aggregate shall be the full responsibility of the Contractor.

K. Civil Works - Protective Fabric

1. The fabric shall be a non-woven, needle punched, polypropylene fabric.
 - a. minimum weight shall be 7 ounces per square yard.
 - b. minimum grab tensile strength of at least 180 pounds.

L. Civil Works - HDPE Liner

1. Provide HDPE liner as show on the plans and as specified in Section 46 61 23.10 Geomembrane Liner.
2. Liner manufacturer shall provide pipe boots for pipe penetrations through the liner as shown on the plans.

M. Civil Works - Insulating Material Options

1. Wood chips
 - a. Wood chips shall be generally uniform in size
 - b. Wood chips containing large quantities of sawdust (fines) will NOT be acceptable.
 - c. A sample of material for approval by Engineer is required prior to the use of wood chips.
2. Peat Mulch (alternate insulating material)
 - a. Peat mulch shall be uniform throughout and have a minimum of 33% fiber content as per ASTM D1997.

- b. At the time of delivery, the peat mulch shall be in an air-dried condition (moisture content 25 to 75% by mass).
- c. Other peaty soils lacking fiber will NOT be acceptable.
- d. A sample for approval by Engineer is required prior to the use of peat mulch.

N. Civil Works - Sacrificial Wood Walls

- 1. Perimeter walls
 - a. Wood studs: Studs shall be minimum 2x6, spaced at maximum 24" centers. Provide single bottom plate and double top plate.
 - b. Sheathing: minimum 3/4" plywood. Sheathing is required on one side of stud only (inside of SAGR beds).
- 2. Provide temporary bracing as required during construction/backfill

2.2 SOURCE QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Requirements for testing, inspection, and analysis.
- B. Certificate of Compliance: When fabricator is approved by authorities having jurisdiction, submit certificate of compliance indicating Work performed at fabricator's facility conforms to Contract Documents.
 - 1. Specified shop tests are not required for Work performed by approved fabricator.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.

3.2 GENERAL

- A. Install gravity filter components according to manufacturer's instructions.
- B. The General Contractor shall install all supplied components in accordance with the manufacturer's instructions and in conformance with submitted shop drawings.
- C. The installer of the filter and aeration system shall supply all materials, tools, equipment, and services necessary to install the complete system.
- D. The site shall be kept in a neat and orderly manner throughout the duration of the system installation.
- E. All civil works related to the filter, as specified in this section (including but not limited to aggregate, protective fabric, HDPE liner, insulating material, and sacrificial wood), shall be provided and installed by the General Contractor.

3.3 AERATION PIPING INSTALLATION

- A. The General Contractor shall provide equipment for excavation and backfill for all shallow buried aeration headers. Backfill buried piping with select native excavated material. Backfill buried piping under building foundation or roadways with base course gravel.
- B. The General Contractor shall accurately excavate to the correct grades allowing for sand bedding if/where required. Trench bottom shall be smooth, straight, and free of large rocks. Support piping on undisturbed material along its entire length.
- C. The General Contractor shall provide sufficient labor and equipment to install all aeration header piping and accessories. Install buried piping to the extent shown on the drawings using open-cut trench method.
- D. The General Contractor shall supply and install all air valves, main air header piping, blower intake/discharge piping, and fittings as necessary to complete the aeration system as shown on the plans.
- E. Join HDPE pipe and fittings using the butt-fusion method in accordance with the pipe manufacturer's instructions, and under the supervision of certified fusion technologists.
- F. Keep piping, during the progress of the Work and on completion, free from obstructions and thoroughly clean. Remove foreign material from the pipelines and ensure lines are free from leaks. Remove and replace any defective sections.
- G. Install HDPE lateral piping at flange connection locations as shown on the drawings.

3.4 FILTER AERATION DIFFUSER INSTALLATION

- A. The General Contractor shall provide sufficient labor and equipment to install all aeration diffuser piping and accessories within the filter bed.
- B. Install diffusers and feeder tubing at locations as shown on the drawings. LINEAR diffusers shall be installed at the bottom of the bed, above the protective fabric layer, prior to granular placement.
- C. Care shall be taken not to kink or twist tubing during installation.
- D. Ensure that during aggregate placement the diffuser lines remain aligned and are not displaced.
- E. Keep diffusers, during the progress of the work and on completion, free from obstructions and thoroughly clean. Remove foreign material from the lines

3.5 BLOWER AND RELATED PIPING INSTALLATION

- A. The General Contractor shall provide sufficient labor and equipment to install all blower and related intake/discharge piping.
- B. Install blower units on concrete bases in accordance with the manufacturer's instructions.

- C. Install one intake filter in each air intake assembly upon system start-up; leave the remaining spare for each blower in the Blower Building for the Owner's future use.
- D. Blower control panel shall be provided by aeration system Supplier. Installation of panel, including all electrical connections, related wiring, hookup of blowers, sensors, control wiring, etc. shall be by the General Contractor.

3.6 FILTER DISTRIBUTION & COLLECTION PIPING INSTALLATION (WITHIN CELL)

- A. The General Contractor shall provide sufficient labor and equipment to install all distribution and collection piping within the filter beds.
- B. The effluent collection chambers shall be located near the bottom of the bed within the granular layer. The effluent collection chambers shall be installed prior to any aggregate placement.
- C. The influent distribution piping shall be located near the top of the bed within the granular media layer. Influent distribution piping and associated distribution chambers shall be installed prior to final aggregate placement.
- D. Influent and effluent chambers/piping shall be installed to elevations shown in the Contract Drawings.

3.7 FILTER AGGREGATE & INSULATING MATERIAL PLACEMENT

- A. The General Contractor shall provide sufficient labor and equipment to supply, deliver, and place the aggregate and insulating layer within the filter bed.
- B. An authorized representative of the filter designer/supplier shall be on site during critical stages of aggregate placement. Sole purpose of inspection is to ensure that bottom laid equipment is not damaged during initial rock placement.
- C. It is absolutely essential that clean aggregate be used and that no dirt or dust enter the aggregate during its storage, transport and placement. The aggregate substrates for the filter cells are water flow media and great care must be taken to prevent contamination by dust and dirt.
- D. The finished granular surfaces of the cells shall have no grade. The aggregate layer shall be level to ensure a final thickness meeting the design elevation.
- E. The insulating material shall be placed on the protective fabric, over the aggregate bed media, in a single lift to the specified design depth within acceptable tolerances. Spreading mulch to the required depth shall be done by hand or with low ground pressure tracked vehicles.

3.8 BASIN CONSTRUCTION

- A. The General Contractor shall provide sufficient labor and equipment to supply materials for the construction of filter basins, including sacrificial walls, HDPE liner, and protective fabric.

- B. Supply and install sacrificial wood walls as shown on the plans. Provide temporary bracing as required during construction and aggregate placement.
- C. Supply and install HDPE liner, pipe boots, etc. as shown on the plans.
- D. Protective fabric shall be installed on the bottom and sides of the basin prior to aggregate installation, and at the top of the granular media once the media has been installed to the required elevation and leveled.

3.9 SEQUENCE OF CONSTRUCTION (FILTER MANUFACTURER RECOMMENDED)

- A. All process equipment within the filter basin(s) shall be provided by the system Supplier and installed by the system Supplier.
- B. All civil works specified in this section (including but not limited to aggregate, protective fabric, HDPE liner, insulating material, and sacrificial wood) shall be provided and installed by the General Contractor.
- C. In order to facilitate the filter construction, the following is the recommended sequence of events to occur during construction phase:
 1. Basin Construction (General Contractor)
 - a. Civil works/earthworks required to excavate and shape filter bed to required depth/dimensions as shown on the drawings.
 - b. The finished floor shall be flat and level prior to proceeding with any other work.
 2. Wood Framed Walls (General Contractor)
 - a. Construction of wood framed "sacrificial" walls around perimeter of each filter cell.
 - b. Sheathing material installed on inside of wall.
 - c. Temporary supports as required to keep wall secure and vertical during construction
 3. Impermeable Liner (General Contractor)
 - a. Installation of impermeable liner within each filter cell.
 - b. Installation of all pipe penetrations, boots, etc.
 4. Protective Fabric (General Contractor)
 - a. Installation of the protective fabric layer along bottom and sides of each filter cell.
 5. Effluent Collection (System Supplier)
 - a. Installation of effluent collection chambers (infiltration chambers) on bottom of cell.
 6. Aeration Equipment (System Supplier)
 - a. Installation of bottom laid diffuser tubing.
 - b. Installation of HDPE in-basin distribution manifolds and HDPE vertical feeder piping.
 - c. Connection of aeration lines to distribution manifolds on each side of cell.
 7. Granular/Aggregate (General Contractor)
 - a. Placement of granular material up to bottom level of influent distribution chambers (to elevations shown on drawings).
 - b. Vertical aeration feeder piping to be temporarily supported to top/edge of wall to minimize movement during aggregate placement.
 - c. Care must be taken during this stage to not disturb the aeration lines.
 - d. Granular shall be placed parallel to the direction of the tubing and placed in such a way as to prevent damage to the tubing.

- e. Backfilling around the outside perimeter of walls should take place at the same rate as granular placement to avoid shifting of the sacrificial walls.
 - f. Granular placement at influent distribution piping locations to be coordinated with multiple infiltration chamber placement. Granular to be placed in lifts equal to chamber height at distribution piping locations.
 - 8. Influent Distribution (System Supplier)
 - a. Installation of orifice drilled piping and protective chambers on granular material near the top of the filter bed (or to elevations shown on the drawings).
 - 9. Granular/Aggregate (General Contractor)
 - a. Final placement of granular material to finished grade.
 - b. The finished granular surfaces of the cells shall be level and at the design elevation.
 - c. The aggregate placed may naturally settle and compact and may require “topping up” to ensure a final thickness meeting the design elevation.
 - 10. Protective Fabric (General Contractor)
 - a. Installation of the protective fabric on top of the final finished granular level.
 - b. Temporary anchoring/ballast may be required prior to placement of insulating layer.
 - 11. Aeration Equipment (System Supplier)
 - a. Installation of HDPE aeration supply header on top of granular layer.
 - b. Connection of HDPE vertical feeder lines to aeration header.
 - 12. Insulating Layer (General Contractor)
 - a. Layer of insulating material wood chips, mulch, etc. placed on top of the fabric layer.
 - b. Material shall be placed on the protective fabric, over the aggregate bed media in a single lift to the specified design depth within acceptable tolerances.
 - c. Spreading material to the required depth shall be done by hand or with low ground pressure tracked vehicles.
- D. This list of events is not intended to be an exhaustive list, but rather a general outline of the sequence of events expected to occur during the SAGR construction. Actual site conditions and/or construction techniques may alter the sequence of events.

3.10 MANUFACTURER’S/SUPPLIER’S FIELD SERVICE

- A. The Supplier shall provide services of an experienced, competent, and authorized representative. Multiple trips may be required due to staging of construction.
 - 1. Inspect equipment covered by these specifications.
 - 2. Supervise any adjustments and installation checks.
 - 3. Perform operation checks and tests as outlined below.
 - 4. Perform start-up and commissioning of the system.
- B. Perform air flow rate tests on blowers
 - 1. Testing shall be performed under full normal lagoon operational conditions.
 - 2. Verification of airflow shall be obtained by measuring RPM on blower motor and block and correlated with factory generated blower performance curves to obtain airflows.
- C. If defects are revealed during testing, the Engineer may issue instructions for removal or correcting defective work and irregularities. If any material, in whole or in part, does not conform to the Specifications or is found to be defective then such material shall be rejected by the Engineer and replaced by the Contractor/Supplier.

3.11 COMMISSIONING

- A. Section 01 40 00 - Quality Requirements: Requirements for inspecting and testing.
- B. Section 01 70 00 - Execution and Closeout Requirements: Requirements for demonstration and training.
- C. After installation, inspect and test for proper operation.
- D. Equipment Acceptance:
 - 1. Adjust, repair, modify, or replace components failing to perform as specified, and rerun tests.
 - 2. Make final adjustments to equipment under direction of manufacturer's representative.
- E. Furnish installation certificate from equipment manufacturer's representative attesting equipment has been properly installed and is ready for startup and testing.
- F. Filter Supplier shall provide start-up and commissioning for the system including on-site training of the Owner's operators. A minimum of one (1) trip with one (1) day shall be allowed.
- G. Demonstrate equipment startup, shutdown, routine maintenance, and emergency repair procedures to Owner's personnel.
- H. Check the installation of all components and provide a written commissioning report to the Engineer upon completion of installation and commissioning.

3.12 DESIGN AND OPERATION SUPPORT

- A. Filter system supplier shall provide operational support for a minimum of one year following commissioning. The support shall include a minimum of one (1) site visits along with establishing full operation and maintenance manuals.
- B. Filter system supplier shall analyze water chemistry data (as sampled by the system Operator and as tested by a certified independent lab) for a minimum of one (1) year to ensure the process is operating as designed.
- C. Any costs associated with sampling and testing shall be borne by the Owner.

3.13 AMMONIA SUPPLEMENTATION (IF NECESSARY)

- A. At the direction of the Engineer, and if requested by the filter system supplier, it may be necessary to supplement the wastewater treatment facility with additional ammonia during startup to encourage growth of nitrifying bacteria in the filter beds.
- B. Procedures for ammonia supplementation shall be provided by the filter system supplier only if ammonia supplementation is required.

- C. The Contractor shall be responsible for adding batches of ammonia to the system as directed by and in accordance with procedures provided by the filter system supplier for a period of up to one month during initial system operations.
- D. The Contractor shall provide a pH meter and temporary pump and hose lengths.
- E. The Contractor shall monitor the wastewater treatment facility and communicate with the filter system supplier results of the monitoring tests.
- F. In no case shall the ammonia supplementation procedure cause the wastewater treatment facility to become noncompliant with the facility's permitted discharge.
- G. Ammonia supplementation, if required, shall be done at no additional expense to the Owner for a period of up to one month.

END OF SECTION 46 61 23

SECTION 46 61 23
GRAVITY FILTERS - ATTACHMENT
(Based on 10/16/25 Manufacturer's Scope of Supply)

MANUFACTURER SCOPE OF SUPPLY

1. GENERAL

- A. Technical submittal.
- B. Installation support for supplied equipment.
- C. Start-up, commissioning, and initial training.
- D. 2-years warranty from date of start-up for all in-water aeration system material.
- E. Operation & Maintenance Manuals.
- F. Record drawings.
- G. Shipping to jobsite.

2. LAGOON FLOATING LATERAL AERATION SYSTEM EQUIPMENT

- A. All in-water aeration equipment required to make a fully functioning system after the lateral control valve up to and including all in-water components, including but not limited to:
 - 1. Lateral and diffuser:
 - a. Cell 1: 3 laterals with total of 3 diffuser assemblies.
 - b. Cell 2: 1 lateral with total of 1 diffuser assembly.
 - 2. 1.5'' floating HDPE aeration lateral piping, including HDPE flange adapters, backup rings, including SS flange bolts, nuts, washers.
 - 3. Prefabricated HDPE aeration lateral piping with thermally factory-fused diffuser outlets, shipped in maximum 50' lengths. (Site assembly required).
 - 4. Fine bubble membrane diffuser assemblies (factory pre-assembled).
 - 5. 1'' flexible feeder piping factory cut to length.
 - 6. Precast concrete diffuser ballast weights, including cast-in-place support brackets, attachment hardware, etc.
 - 7. Marine grade diffuser retrieval rope secured to each diffuser ballast assembly, factory cut to length and marked for easy installation.
 - 8. Lateral end assemblies consisting of HDPE endcaps with integral anchoring system, prefabricated SS support brackets, SS cables, and clamps.
 - 9. Fixed anchor posts (located on berm near control valves) (concrete piers by others)
 - 10. Adjustable lateral tension assemblies, counterweights, posts (located on berm at end of lateral) (concrete piers by others).
 - 11. One (1) complete diffuser assembly as spare.
 - 12. Allowance of one (1) trip with one (1) day on site for installation inspection/support of materials supplied by manufacturer.
 - 13. Allowance of one (1) trip with one (1) day on site for start-up, commissioning, training.

3. FILTER AERATION AND IN-BASIN PROCESS EQUIPMENT

- A. All process equipment within the filter bed, starting at the filter wall (after the lateral control valve), required to make a fully functioning system including but not limited to:
 - 1. Aeration Equipment Within Bed:

- a. Prefabricated HDPE aeration lateral piping on top of granular layer in filter bed with thermally factory-fused outlet saddles.
 - b. Required bends, fittings, flange adapters, backup rings, nuts/bolts, etc.
 - c. FBA® LINEAR air diffuser lines.
 - d. HDPE feeder lines cut to length, prefabricated HDPE in-basin air distribution manifolds, miscellaneous required fittings.
 - e. 2" blow-off assemblies, support posts, etc. located within filter bed
 - f. Prefabricated materials shipped in maximum 50' lengths. (Site assembly including thermal butt-fusion required).
2. Process Piping/Equipment Within Bed
- a. PVC SDR-35 primary and secondary influent distribution piping, clean-out assemblies (drilling of orifices not included). Orifice size and spacing as per manufacturer's shop drawings.
 - b. Influent distribution chambers, fittings, end caps.
 - c. Effluent collection chambers, fittings, end caps.
3. General
- a. Installation inspection as required during critical rock placement. Sole purpose of inspection is to ensure that process equipment supplied by manufacturer is not damaged during initial rock placement.
 - b. Analyze wastewater chemistry data as per specifications
 - c. One (1) trip one (1) day onsite for start-up, commissioning, and initial training of all manufacturer-supplied equipment (combined with Lagoon Aeration trip.)

4. AIR SUPPLY SYSTEM

- A. All blower equipment required to make a fully functioning system, including but not limited to:
- 1. Blower Packages
 - a. Three (3) 5 hp positive displacement blower packages (2 operating, 1 common standby).
 - b. Each blower package includes:
 - i. Sound attenuating enclosures with integrated exhaust fans.
 - ii. Complete with integral check valve, PRV, flexible inlet/discharge connectors.
 - iii. Factory installed intake filter/silencer, discharge silencer
 - iv. Enclosure mounted pressure gauge, temperature gauge, filter maintenance indicator.
 - v. High discharge temperature switch.
 - vi. PTC thermistor motor protection.
 - vii. VFD compatible main drive motors (208 V, 60 Hz, 3-ph).
 - viii. Spare parts (belts, intake filters, oil).
 - 2. Control Panel
 - a. One local control panel for all blowers.
 - b. UL Listed, NEMA 12 floor-mounted enclosure complete with main disconnect, splitter block, and fused control transformer.
 - c. 125 A main breaker.
 - d. Three (3) 5 hp Constant torque VFD main motor drives (upsized to allow for phase conversion) with 3% line and 3% load reactors, manually adjusted speed potentiometer.

- e. Interlocking mechanical contactors. Panel is designed to only allow 2 blowers to run at any given time.
- f. Controls for blower operation and protection including high temperature discharge switch, and motor thermistor protection relays.
- g. Panel is designed with capability of integration with future plant PLC, all alarms have external contacts available for remote monitoring (i.e. dialer compatible).
- h. Two (2) integrated remote system pressure displays (lagoon/SAGR).
- i. Indicator/alarm lights, duty/off/standby switches, elapsed time meter.

TO BE PROVIDED BY CONTRACTOR

1. GENERAL REQUIREMENTS

- A. Receiving/off-loading and secure storage of all equipment.
- B. Installation of all supplied equipment, including labor and materials.
- C. Any civil works for site preparation and restoration.

2. LAGOON & FILTER AERATION SYSTEMS

- A. Main aeration headers from blowers to filter. (Buried header from blowers to lagoon is existing.)
- B. Air lateral isolation butterfly valves inside building. (Lagoon-side valves are existing.)
- C. Main header blow-off assemblies.
- D. Concrete piers for all anchor posts.

3. MATERIALS AND CONSTRUCTION REQUIRED FOR THE FILTER

- A. Specifically graded granular material (including but not limited to: sourcing, procurement, approvals, quality assurance and quality control).
- B. Insulating layer consisting of wood chips or mulch.
- C. Wood-constructed "sacrificial" vertical side walls around perimeter of filter cell.
- D. Geomembrane liner for filter cell.
- E. Pipe penetrations through filter liner, pipe boots as required.
- F. Non-woven geotextile protective fabric on bottom and sides of filter cell and between granular and mulch.
- G. Filter water level control structures.
- H. Yard piping and valves, as shown on the Drawings.

4. BLOWER SYSTEM

- A. Anchor bolts, stands, supports as required.
- B. Mechanical systems for air piping including but not limited to: blower discharge piping, isolation valves, fittings, supports, etc.
- C. Electrical connections, wiring and hookup of blowers and control panel, sensors, control wiring, etc.

END OF SECTION 46 61 23 - ATTACHMENT

**SECTION 46 61 23.10
GEOMEMBRANE LINER**

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. The Work of this section includes supply and installation of HDPE geomembrane for the Filter cells as shown on the Drawings. All materials shall meet or exceed the requirements of this specification, and all work shall be performed in accordance with the procedures provided in these project specifications.

- B. Related Requirements:
 - 1. Section 46 61 23 - Gravity Filters.
 - 2. Section 31 05 19.13 - Geotextiles for Earthwork.

1.2 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM)
 - 3. ASTM D1004 - Test Method for Initial Tear Resistance of Plastic Film and Sheeting
 - 4. ASTM D1238 - Standard Test Method for Flow Rates of Thermoplastics by Extrusion Plastometer
 - 5. ASTM D1505 - Test Method for Density of Plastics by the Density-Gradient Technique
 - 6. ASTM D1603 - Test Method for Carbon Black in Olefin Plastics
 - 7. ASTM D3895 - Standard Test Method for Oxidative-Induction Time of Polyolefins by Differential Scanning Calorimetry
 - 8. ASTM D4218 - Standard Test Method for Determination of Carbon Black in Polyethylene Compounds
 - 9. ASTM D4833 - Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products
 - 10. ASTM D5199 - Standard Test Method for Measuring Nominal Thickness of Geotextiles and Geomembranes
 - 11. ASTM D5397 - Standard Test Method for Evaluation of Stress Crack Resistance of Polyolefin Geomembranes Using Notched Constant Tensile Load Test
 - 12. ASTM D5596 - Standard Test Method for Microscopic Evaluation of the Dispersion of Carbon Black in Polyolefin Geosynthetics
 - 13. ASTM D5994 - Standard Test Method for Measuring Core Thickness of Textured Geomembranes
 - 14. ASTM D6392 - Standard Test Method for Determining the Integrity of Nonreinforced Geomembrane Seams Produced Using Thermo-Fusion Methods
 - 15. ASTM D6693 - Standard Test Method for Determining Tensile Properties of Nonreinforced Polyethylene and Nonreinforced Flexible Polypropylene Geomembranes
 - 16. ASTM D7240 - Standard Practice for Leak Location using Geomembranes with an Insulating Layer in Intimate Contact with a Conductive Layer via Electrical Capacitance Technique (Conductive Geomembrane Spark Test)

- B. Geosynthetic Research Institute
 - 1. GRI GM13 - Test Properties, Testing Frequency and Recommended Warranty for High Density Polyethylene (HDPE) Smooth and Textured Geomembranes

1.3 DEFINITIONS

- A. Lot - A quantity of resin (usually the capacity of one rail car) used in the manufacture of geomembranes. Finished roll will be identified by a roll number traceable to the resin lot used.
- B. Engineer - The individual or firm responsible for the design and preparation of the project's Contract Drawings and Specifications.
- C. Geomembrane Manufacturer (Manufacturer) - The party responsible for manufacturing the geomembrane rolls.
- D. Geosynthetic Quality Assurance Laboratory (Testing Laboratory) - Party, independent from the Owner, Manufacturer and Contractor, responsible for conducting laboratory tests on samples of geosynthetics obtained at the site or during manufacturing, usually under the direction of the Owner.
- E. Contractor - Party responsible for field handling, transporting, storing, deploying, seaming and testing of the geomembrane seams.
- F. Panel - Unit area of a geomembrane that will be seamed in the field that is larger than 9.3 m².
- G. Patch - Unit area of a geomembrane that will be seamed in the field that is less than 9.3 m².
- H. Subgrade Surface - Soil layer surface which immediately underlies the geosynthetic material(s).

1.4 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.
- B. Coordinate Work of this Section with other Sections of Work related to the aerated filter construction and components of other Work.

1.5 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Furnish the following product data, in writing, to Engineer prior to installation of the geomembrane material:
 - 1. Resin Data including certification stating that the resin meets the specification requirements (see Table 2.1 B).
 - 2. Geomembrane Roll data including statement certifying no recycled polymer and no more than 10% rework of the same type of material is added to the resin (product run may be recycled).

- C. The Contractor shall furnish the following information to the Engineer prior to installation:
 1. Installation layout drawings showing proposed panel layout including field seams and details. Drawings shall be approved prior to installing the geomembrane.
 2. Approved drawings will be for concept only and actual panel placement will be determined by site conditions.
 3. Contractor's Geosynthetic Field Installation Quality Assurance Plan.

- D. The Contractor will submit the following to the Engineer upon completion of installation:
 1. Certificate stating the geomembrane has been installed in accordance with the Contract Documents.
 2. Material and installation warranties.
 3. As-built drawings showing actual geomembrane placement and seams including typical anchor trench detail.

- E. Material Labeling, Delivery, Storage, and Handling
 1. Labeling: Each roll of geomembrane delivered to the site shall be labeled by the Manufacturer. The label will identify: Manufacturer's name, product identification, thickness, length, width, and roll number.
 2. Delivery: Rolls of liner will be prepared to ship by appropriate means to prevent damage to the material and to facilitate off-loading.
 3. Storage: The on-site storage location for geomembrane material, shall be level (no wooden pallets), smooth, dry, protected from theft and vandalism, and adjacent to the area being lined. The storage location provided by the Contractor shall protect the geomembrane from punctures, abrasions, excessive dirt and moisture.
 4. Handling: Materials are to be handled so as to prevent damage.

- F. Warranty
 1. Material shall be warranted, on a pro-rata basis against Manufacturer's defects for a period of 5 years from the date of geomembrane installation.
 2. Installation shall be warranted against defects in workmanship for a period of 1 year from the date of geomembrane completion.

1.6 QUALITY ASSURANCE

- A. Perform Work and source materials according to industry standards.

1.7 QUALIFICATIONS

- A. Contractor shall have worked in a similar capacity on projects similar in size and complexity to the project described in the contract documents.

1.8 1.1 MEASUREMENT AND PAYMENT

- A. Payment for geomembrane installation will be as per contract unit price, as measured parallel to liner surface, including designed anchor trench material and is based upon net lined area.

- B. Net lined area is defined to be the true area of all surfaces to be lined plus designed burial in all anchor trenches, rubsheets, and sacrificial layers.

- C. Prices shall include full compensation for furnishing all labor, material, tools, equipment, and incidentals.
- D. Prices also include doing all the Work involved in performing geomembrane installation completely as shown on the drawing, as specified herein, and as directed by the Engineer.

PART 2 - PRODUCTS

2.1 GEOMEMBRANE PROPERTIES

- A. Material shall be HDPE smooth 60 mil polyethylene geomembrane as shown on the Drawings.
- B. Minimum physical properties as per the following table:

TESTED PROPERTY	TEST METHOD	FREQUENCY	UNIT ENGLISH (METRIC)	VALUE ENGLISH (METRIC)
Thickness Lowest individual reading	ASTM D5199	every roll	mil (mm)	60 (1.50) 54 (1.35)
Density	ASTM D1505	200,000 lbs (90,000 kg)	g/cm ² (min.)	0.940
Tensile Properties (each direction) Strength at Break Strength at Yield Elongation at Break Elongation at Yield	ASTM D6693, Type IV 2 in/m G.L. 2.0 in (50mm) G.L. 1.3 in (33mm)	20,000 lbs (9,000 kg)	lb/in-width (N/mm) lb/in-width (N/m) % %	240 (42) 132 (23.1) 700 13
Tear Resistance	ASTM D1004	45,000 lbs (20,000 kg)	lb (N)	45 (200)
Puncture Resistance	ASTM D4833	45,000 lbs (20,000 kg)	lb (N)	120 (534)
Carbon Black Content	ASTM D4218	20,000 lbs (9,000 kg)	% (range)	2.0 – 3.0
Carbon Black Dispersion	ASTM D5596	45,000 lbs (20,000 kg)	Note ⁽¹⁾	Note ⁽¹⁾
Stress Crack Resistance (SP-NCTL)	ASTM D5397 Appendix	45,000 lbs (20,000 kg)	hrs	500
Oxidative Induction Time	ASTM D3895, 200°C; O ₂ , 1 atm	200,000 lbs (90,000 kg)	min	>100
TYPICAL ROLL DIMENSIONS				
Roll Length			ft (m)	540 (164)
Roll Width			ft (m)	23 (7)
Roll Area			ft ² (m ²)	12,420 (1,154)

- 1. Table Notes:
 - a. (1) Dispersion only applies to near spherical agglomerates. 10 views in Cat. 1 or 2.
 - b. HDPE Smooth is available in rolls weighing approximately 4,000 lb (1,800 kg).
 - c. All geomembranes have dimensional stability of ±2% when tested according to ASTM D1204 and LTB of <-77° when tested according to ASTM D746.

- C. Acceptable products: Titan 60HD, Nilex HDPE 60mil, or approved equal
- D. Resin shall be new, first quality, compounded and manufactured specifically for producing geomembrane.
- E. Natural resin (without carbon black) shall meet the following raw material requirements:
 - 1. Density: to ASTM D1505, minimum 0.932 g/cm³.
 - 2. Melt Flow Index: to ASTM D1238, maximum 1.0 g/10 min.
 - 3. OIT (minutes): to ASTM D3895, minimum 100 1 atm/200°C.
- F. Geomembrane Rolls
 - 1. Do not exceed a combined maximum total of 1 percent by weight of additives other than carbon black.
 - 2. Geomembrane shall be free of holes, pinholes as verified by on-line electrical detection, bubbles, blisters, excessive contamination by foreign matter, and nicks and cuts on roll edges.
 - 3. Geomembrane material is to be supplied in roll form. Each roll is to be identified with labels indicating roll number, thickness, length, width and Manufacturer.
 - 4. All liner sheets produced at the factory shall be inspected prior to shipment for compliance with the physical property requirements listed above and be tested by an acceptable method of inspecting for pinholes. If pinholes are located, identified and indicated during manufacturing, these pinholes may be corrected during installation.
- G. Extrudate Rod or Bead
 - 1. Extrudate material shall be made from same type resin as the geomembrane.
 - 2. Additives shall be thoroughly dispersed.
 - 3. Materials shall be free of contamination by moisture or foreign matter.
- H. Pipe Liner Boot
 - 1. Boots to be the same material as liner and supplied by the same supplier.
 - 2. Weld the boot to the liner in accordance with manufacturer's recommendations. Provide copies of such recommendations to Engineer.
 - 3. Use non-corrosive materials as recommended by manufacturer to seal the boot around the pipe. Where pipe is compatible to boot, wedge weld pipe to boot liner.
 - 4. Provide shop drawings for approval by Engineer for the method of applying boots to all piping that penetrates the liner.

PART 3 – EXECUTION

3.1 EQUIPMENT

- A. Welding equipment and accessories shall meet the following requirements:
 - 1. Gauges showing temperatures in apparatus such as extrusion welder or fusion welder shall be present.
 - 2. An adequate number of welding apparatus shall be available to avoid delaying work.
 - 3. Power source must be capable of providing constant voltage under combined line load.

3.2 WEATHER CONDITIONS

- A. Measure sheet temperature for seaming by an infrared thermometer or surface contact thermometer.
- B. Ensure that any thawing or heating of the ground does not cause water to be condensed onto the unbonded region of the seam being fabricated.
- C. Do not proceed with panel placement and seaming when sheet temperatures are below 40°F or above 104°F for chemical fusion welds or below 40°F or above 104°F for hot wedge welds, during any precipitation, in presence of excessive moisture (including snow, rain, fog, dew), nor in presence of high winds.
- D. Placement and welding of membrane may continue in weather other than that stated, if it can be demonstrated to the satisfaction of the Engineer that project specifications can be maintained.

3.3 DEPLOYMENT

- A. Assign each panel a simple and logical identifying code. The coding system shall be subject to approval and shall be determined at the job site.
- B. Visually inspect the geomembrane during deployment for imperfections and mark faulty or suspect areas.
- C. Deployment of geomembrane panels shall be performed in a manner that will comply with the following guidelines:
 - 1. Geomembranes shall be installed according to site-specific specifications, and GSE Conductive should be installed with the Conductive layer down. Note: A spark tester or ohm meter can be used to determine Conductive layer.
 - 2. Unroll geomembrane using methods that will not damage geomembrane and will protect underlying surface from damage (spreader bar, protected equipment bucket).
 - 3. Place ballast (commonly sandbags) on geomembrane which will not damage geomembrane to prevent wind uplift.
 - 4. Personnel walking on geomembrane shall not engage in activities or wear shoes that could damage it. Smoking will not be permitted on the geomembrane.
 - 5. Do not allow heavy vehicular traffic directly on geomembrane. Rubber-tired ATV's and trucks are acceptable if wheel contact is less than 8 psi.
 - 6. Protect geomembrane in areas of heavy traffic by placing protective cover over the geomembrane.
- D. Sufficient material (slack) shall be provided to allow for thermal expansion and contraction of the material.

3.4 FIELD SEAMING

- A. Seams shall meet the following requirements:
 - 1. To the maximum extent possible, orient seams parallel to line of slope, i.e., down and not across slope.

2. Minimize number of field seams in corners, odd-shaped geometric locations and outside corners.
 3. Slope seams (panels) shall extend a minimum of 5 feet beyond the grade break into the flat area.
 4. Use a sequential seam numbering system compatible with panel numbering system that is agreeable to the Engineer and Contractor.
 5. Align seam overlaps consistent with the requirements of the welding equipment being used. A 6-inch overlap is commonly suggested.
- B. During welding operations provide at least one Master Seamer who shall provide direct supervision over other welders as necessary.
- C. Extrusion Welding
1. Hot-air tack adjacent pieces together using procedures that do not damage the geomembrane.
 2. Clean geomembrane surfaces by disc grinder or equivalent.
 3. Purge welding apparatus of heat-degraded extrudate before welding.
- D. Hot Wedge Welding
1. Welding apparatus shall be a self-propelled device equipped with an electronic controller which displays applicable temperatures.
 2. Clean seam area of dust, mud, moisture and debris immediately ahead of hot wedge welder.
 3. Protect against moisture build-up between sheets.
- E. Trial Welds
1. Perform trial welds on geomembrane samples to verify welding equipment is operating properly.
 2. Make trial welds under the same surface and environmental conditions as the production welds, i.e., in contact with subgrade and similar ambient temperature.
 3. Minimum of two trial welds per day, per welding apparatus, one made prior to the start of work and one completed at mid shift.
 4. Cut four, 1-inch wide by 6-inch long test strips from the trial weld.
 5. Quantitatively test specimens for peel adhesion, and then for shear strength.
 6. Trial weld specimens shall pass when the results shown in the following table for HDPE are achieved in both peel and shear test.

Property	Test Method	1.5 mm (60 mil)
Peel Strength (fusion), lbf/ft	ASTM D6392	3,900
Peel Strength (extrusion), lbf/ft	ASTM D6392	3,100
Shear Strength (fusion & ext.), lbf/ft	ASTM D6392	4,800

7. During peel testing, the break shall be ductile, and occurs in the liner material itself, not through peel separation (FTB).

8. Repeat the trial weld, in its entirety, when any of the trial weld samples fail in either peel or shear.
 9. No welding equipment or welder shall be allowed to perform production welds until equipment and welders have successfully completed trial weld.
- F. Seaming shall not proceed when ambient air temperature or adverse weather conditions jeopardize the integrity of the liner installation. Contractor shall demonstrate that acceptable seaming can be performed by completing acceptable trial welds.
- G. Defects and Repairs
1. Examine all seams and non-seam areas of the geomembrane for defects, holes, blisters, undispersed raw materials, and any sign of contamination by foreign matter.
 2. Repair and non-destructively test each suspect location in both seam and non-seam areas. Do not cover geomembrane at locations that have been repaired until test results with passing values are available.

3.5 PENETRATIONS

- A. Cut panels around piping projections with rounded corners to prevent tear elongation.
- B. Cut liner sheets to fit accurately around inlets, outlets, and other projections through lining.
- C. Inspect and test joints 12 hours after completion of installation and reseal defective joints in accordance with manufacturer's recommendations.
- D. Complete flashing and sealing of penetrations as recommended by Manufacturer.

3.6 FIELD QUALITY ASSURANCE

- A. Manufacturer and Contractor shall participate in and conform to all terms and requirements of the Owner's quality assurance program. Contractor shall be responsible for assuring this participation.
- B. Quality assurance requirements are as specified in this Section and in the Field Installation Quality Assurance Manual if it is included in the contract.

3.7 FIELD TESTING

- A. Non-destructive testing may be carried out as the seaming progresses or at completion of all field seaming.
 1. Vacuum Testing shall be performed in accordance with ASTM D5641, Standard Practice for Geomembrane Seam Evaluation by Vacuum Chamber.
 2. Air Pressure Testing shall be performed in accordance with ASTM D5820, Standard Practice for Pressurized Air Channel Evaluation of Dual Seamed Geomembranes.
 3. Spark Testing shall be performed accordance with ASTM D7240 Standard Practice for Leak Location using Geomembranes with an Insulating Layer in Intimate Contact with a Conductive Layer via Electrical Capacitance Technique (Conductive Geomembrane Spark Test).

4. Other approved methods.
- B. Destructive Testing (performed by Contractor in presence of Engineer)
1. Collect destructive test samples at a frequency of one per every 500 feet of seam length.
 2. Test locations will be determined after seaming.
 3. Exercise Method of Attributes as described by GRI GM-14 (Geosynthetic Research Institute, <http://www.geosynthetic-institute.org>) to minimize test samples taken.
 4. Contractor shall cut samples at locations designated by the Engineer as the seaming progresses in order to obtain field laboratory test results before the geomembrane is covered.
 5. Contractor will number each sample, and the location will be noted on the installation as-built.
 6. Samples shall be 8-inch wide by minimal length with the seam centered lengthwise.
 7. Cut a 2-inch wide strip from each end of the sample for field-testing.
 8. Cut the remaining sample into two parts for distribution as follows:
 9. One portion for Contractor, 8-inch by 8-inch.
 10. One portion for the Third Party laboratory, 8-inch by 18-inch.
 11. Additional samples may be archived if required.
 12. Destructive testing shall be performed in accordance with ASTM D6392, Standard Test Method for Determining the Integrity of Non-Reinforced Geomembrane Seams Produced Using Thermo-Fusion Methods.
 13. Contractor shall repair all holes in the geomembrane resulting from destructive sampling.
 14. Repair and test the continuity of the repair in accordance with these Specifications.
- C. Failed Seam Procedures
1. If the seam fails, Contractor shall follow one of two options:
 - a. Reconstruct the seam between any two passed test locations.
 - b. Trace the weld to intermediate location at least 10 feet minimum or where the seam ends in both directions from the location of the failed test.
 2. The next seam welded using the same welding device is required to obtain an additional sample, i.e., if one side of the seam is less than 10 feet long.
 3. If sample passes, then the seam shall be reconstructed or capped between the test sample locations.
 4. If any sample fails, the process shall be repeated to establish the zone in which the seam shall be reconstructed.

3.8 REPAIR PROCEDURES

- A. Remove damaged geomembrane and replace with acceptable geomembrane materials if damage cannot be satisfactorily repaired.
- B. Repair any portion of unsatisfactory geomembrane or seam area failing a destructive or non-destructive test.
- C. Contractor shall be responsible for repair of defective areas.
- D. Agreement upon the appropriate repair method shall be decided between Contractor and Contractor by using one of the following repair methods:
 1. Patching: Used to repair large holes, tears, undispersed raw materials and contamination by foreign matter.

2. Abrading and Re-welding: Used to repair short section of a seam.
 3. Spot Welding: Used to repair pinholes or other minor, localized flaws or where geomembrane thickness has been reduced.
 4. Capping: Used to repair long lengths of failed seams.
 5. Flap Welding: Used to extrusion weld the flap (excess outer portion) of a fusion weld in lieu of a full cap.
 6. Remove the unacceptable seam and replace with new material.
- E. The following procedures shall be observed when a repair method is used:
1. All geomembrane surfaces shall be clean and dry at the time of repair.
 2. Surfaces of the polyethylene which are to be repaired by extrusion welds shall be lightly abraded to assure cleanliness.
 3. Extend patches or caps at least 8 inches for extrusion welds and 4 inches for wedge welds beyond the edge of the defect, and around all corners of patch material.
- F. Repair Verification
1. Number and log each patch repair (performed by Contractor).
 2. Non-destructively test each repair using methods specified in this Specification.

END OF SECTION 46 61 23.10

APPENDICES

GEOHYDROLOGIC EVALUATION



Missouri Department Of Natural Resources

Missouri Geological Survey
Geological Survey Program
Environmental Geology Section

Project ID Number

LWE25279

County

Boone County

Request Details

Project: Village of Hartsburg
Wastewater Treatment
Upgrades

Legal Description: 08 T45N R12W

Quadrangle: HARTSBURG

Latitude: 38 41 20.55

Longitude: -92 18 9.58

Organization Official

Name: Timothy Hentz
Address: PO Box 37
City: Hartsburg
State: MO Zip: 65039
Phone: 314-623-2698
Email:

Preparer

Name: Elke Boyd
Address: [REDACTED]
City: [REDACTED]
State: MO Zip: [REDACTED]
Phone: [REDACTED]
Email: elke.boyd@lochgroup.com

Project Details

Report Date: 08/11/2025

Date of Field Visit: 07/30/2025

Previous Reports: Not Applicable

Facility Type

- Mechanical treatment plant
- Recirculating filter bed
- Land application
- Lagoon or storage basin
- Subsurface soil absorption system
- Lagoon or storage basin W/Land App
- Lagoon or storage basin W/SSAS
- Other type of facility

Type of Waste

- Animal
- Human
- Process or industrial
- Leachate
- Other waste type

Funding Source

- IWT
- WWL-SRF

Additional Information

- Plans were submitted
- Site was investigated by NRCS
- Soil or geotechnical data were submitted

Geologic Stream Classification: Gaining Losing No discharge

Overall Geologic Limitations

- Slight
- Moderate
- Severe

Collapse Potential

- Not applicable
- Slight
- Moderate
- Severe

Topography

- <4%
- 4% to 8%
- 8% to 15%
- >15%

Landscape Position

- Broad uplands Floodplain
- Ridgetop Alluvial plain
- Hillslope Terrace
- Narrow ravine Sinkhole

Bedrock: Ordovician-age Jefferson City Dolomite

Surficial Materials: Dark brown silt loam to silty clay loam



Missouri Department Of Natural Resources

Missouri Geological Survey
Geological Survey Program
Environmental Geology Section

Project ID Number

LWE25279

County

Boone County

Recommended Construction Procedures for Earthen Facility

- Installation of clay pad and Compaction
- Diversion of subsurface flow
- Artificial sealing
- Rock excavation
- Limit excavation depth

Determine Overburden Properties

- Particle size analysis
- Atterberg limits
- 95% Max. dry density test method
- Overburden thickness
- Permeability coefficient-undisturbed
- Permeability coefficient-remolded

Determine Hydrologic Conditions

- Groundwater elevation
- Direction of groundwater flow
- 25-Year flood level
- 100-Year flood level

Remarks:

On July 30th, 2025 a geologist with the Missouri Geological Survey conducted a geohydrologic evaluation for proposed additions to an existing wastewater treatment facility in Boone County. The existing lagoon system serves the Village of Hartsburg. The purpose of the site visit was to observe the geologic and hydrologic characteristics at the site and to determine potential impacts in the event of wastewater treatment failure.

The site is located just northeast of the Katy Trail, approximately one-half mile southeast of Hartsburg. The site is located on an alluvial terrace just above the Missouri River floodplain. Surficial materials on the site were sampled using a handheld auger and are dark brown silt loam and silty clay loam with low to moderate permeability.

Bedrock was not observed on site or in the immediate vicinity. Based on well logs and detailed geologic mapping of the area, the uppermost bedrock at the site is the Jefferson City Dolomite. This bedrock has a low to moderate primary permeability and high secondary permeability in areas where the dolomite has been dissolved to form sinkholes, springs, and caves. There are no known karst features within one mile of the site.

The facility discharges to an unnamed tributary to Slate Creek, which is a tributary to the Missouri River. The unnamed tributary and Slate Creek downstream of the facility have been geologically classified as gaining streams. The collapse potential of the existing lagoons is slight, which is consistent with previous reports from the site prior to construction.

Based on the geologic and hydrologic characteristics observed, the site receives a slight overall geologic limitations rating. In the event of wastewater treatment failure, the local, shallow groundwater and the surface waters of the unnamed tributary and Slate Creek may be adversely impacted.



08/11/2025

MISSOURI STATE OPERATING PERMIT

STATE OF MISSOURI
DEPARTMENT OF NATURAL RESOURCES
MISSOURI CLEAN WATER COMMISSION



MISSOURI STATE OPERATING PERMIT

In compliance with the Missouri Clean Water Law, (Chapter 644 R.S. Mo. as amended, hereinafter, the Law), and the Federal Water Pollution Control Act (Public Law 92-500, 92nd Congress) as amended,

Permit No.	MO-0108995
Owner: Address:	Village of Hartsburg P.O. Box 37, Hartsburg, MO 65039
Continuing Authority: Address:	Same as above Same as above
Facility Name: Facility Address:	Hartsburg Wastewater Treatment Facility 0.5 miles SE of 2 nd Street & Katy Trail intersection, Hartsburg, MO 65039
Legal Description: UTM Coordinates:	Sec. 8, T45N, R12W, Boone County X=560665, Y=4282511
Receiving Stream: First Classified Stream and ID: USGS Basin & Sub-watershed No.:	Tributary to Slate Creek (C) 8-20-13 MUDD V1.0 (C) (3960) (10300102-1302)

is authorized to discharge from the facility described herein, in accordance with the effluent limitations and monitoring requirements as set forth herein:

FACILITY DESCRIPTION

Outfall #001 – POTW – SIC #4952

The use or operation of this facility shall be by or under the supervision of a Certified "D" Operator.

Two-cell lagoon with aerated primary cell / UV disinfection / sludge retained in lagoon

Design population equivalent is 144.

Design flow is 14,400 gallons per day.

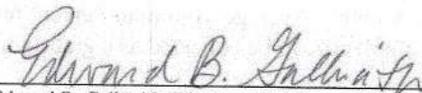
Actual flow is 2,900 gallons per day.

Design sludge production is 2.2 dry tons/year.

This permit authorizes only wastewater discharges under the Missouri Clean Water Law and the National Pollutant Discharge Elimination System; it does not apply to other regulated areas. This permit may be appealed in accordance with Section 621.250 RSMo, Section 640.013 RSMo and Section 644.051.6 of the Law.

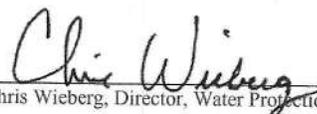
November 1, 2018

Effective Date


Edward B. Galbraith, Director, Division of Environmental Quality

October 31, 2023

Expiration Date


Chris Wieberg, Director, Water Protection Program

OUTFALL #001	TABLE A-1. INTERIM EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS					
	The permittee is authorized to discharge from outfall(s) with serial number(s) as specified in the application for this permit. The interim effluent limitations shall become effective on November 1, 2018 and remain in effect through October 31, 2028 . Such discharges shall be controlled, limited and monitored by the permittee as specified below:					
EFFLUENT PARAMETER(S)	UNITS	INTERIM EFFLUENT LIMITATIONS			MONITORING REQUIREMENTS	
		DAILY MAXIMUM	WEEKLY AVERAGE	MONTHLY AVERAGE	MEASUREMENT FREQUENCY	SAMPLE TYPE
Flow	MGD	*		*	once/quarter***	24 hr. estimate
Biochemical Oxygen Demand ₅	mg/L		65	45	once/quarter***	grab
Total Suspended Solids	mg/L		120	80	once/quarter***	grab
<i>E. coli</i> (Note 1)	#/100mL		1,030	206	once/quarter***	grab
Ammonia as N	mg/L	*		*	once/quarter***	grab
Oil & Grease	mg/L	*		*	once/quarter***	grab
MONITORING REPORTS SHALL BE SUBMITTED <u>QUARTERLY</u> ; THE FIRST REPORT IS DUE <u>JANUARY 28, 2019</u> . THERE SHALL BE NO DISCHARGE OF FLOATING SOLIDS OR VISIBLE FOAM IN OTHER THAN TRACE AMOUNTS.						
EFFLUENT PARAMETER(S)	UNITS	MINIMUM		MAXIMUM	MEASUREMENT FREQUENCY	SAMPLE TYPE
pH – Units **	SU	6.5		9.0	once/quarter***	grab
MONITORING REPORTS SHALL BE SUBMITTED <u>QUARTERLY</u> ; THE FIRST REPORT IS DUE <u>JANUARY 28, 2019</u> .						
EFFLUENT PARAMETER(S)	UNITS	MONTHLY AVERAGE MINIMUM		MEASUREMENT FREQUENCY	SAMPLE TYPE	
Biochemical Oxygen Demand ₅ – Percent Removal (Note 2)	%	65		once/quarter***	calculated	
Total Suspended Solids – Percent Removal (Note 2)	%	65		once/quarter***	calculated	
MONITORING REPORTS SHALL BE SUBMITTED <u>QUARTERLY</u> ; THE FIRST REPORT IS DUE <u>JANUARY 28, 2019</u> .						

- * Monitoring requirement only.
- ** pH is measured in pH units and is not to be averaged.
- *** See table on Page 4 for quarterly sampling requirements

Note 1 - Effluent limitations and monitoring requirements for *E. coli* are applicable only during the recreational season from April 1 through October 31. The Monthly Average Limit for *E. coli* is expressed as a geometric mean. The Weekly Average for *E. coli* will be expressed as a geometric mean if more than one (1) sample is collected during a calendar week (Sunday through Saturday).

Note 2 – Influent sampling is not required when the facility does not discharge effluent during the reporting period. Samples are to be collected prior to any treatment process. Percent removal is calculated by the following formula: $[(\text{Influent} - \text{Effluent}) / \text{Influent}] \times 100\% = \text{Percent Removal}$. The Monthly Average Minimum Percent removal is to be reported as the average of all daily calculated removal efficiencies. Influent samples are to be collected as a grab sample.

OUTFALL #001	TABLE A-2. FINAL EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS						
	The permittee is authorized to discharge from outfall(s) with serial number(s) as specified in the application for this permit. The final effluent limitations shall become effective on November 1, 2028 and remain in effect until expiration of the permit. Such discharges shall be controlled, limited and monitored by the permittee as specified below:						
	EFFLUENT PARAMETER(S)	UNITS	FINAL EFFLUENT LIMITATIONS			MONITORING REQUIREMENTS	
DAILY MAXIMUM			WEEKLY AVERAGE	MONTHLY AVERAGE	MEASUREMENT FREQUENCY	SAMPLE TYPE	
Flow	MGD	*		*	once/quarter***	24 hr. estimate	
Biochemical Oxygen Demand ₅	mg/L		65	45	once/quarter***	grab	
Total Suspended Solids	mg/L		120	80	once/quarter***	grab	
<i>E. coli</i> (Note 1)	#/100mL		1,030	206	once/quarter***	grab	
Ammonia as N (Apr 1 – Sep 30) (Oct 1 – Mar 31)	mg/L	4.3 9.3		1.4 2.8	once/quarter***	grab	
Oil & Grease	mg/L	*		*	once/quarter***	grab	
MONITORING REPORTS SHALL BE SUBMITTED <u>QUARTERLY</u> ; THE FIRST REPORT IS DUE <u>JANUARY 28, 2029</u> . THERE SHALL BE NO DISCHARGE OF FLOATING SOLIDS OR VISIBLE FOAM IN OTHER THAN TRACE AMOUNTS.							
EFFLUENT PARAMETER(S)	UNITS	MINIMUM		MAXIMUM	MEASUREMENT FREQUENCY	SAMPLE TYPE	
pH – Units **	SU	6.5		9.0	once/quarter***	grab	
MONITORING REPORTS SHALL BE SUBMITTED <u>QUARTERLY</u> ; THE FIRST REPORT IS DUE <u>JANUARY 28, 2029</u> .							
EFFLUENT PARAMETER(S)	UNITS	MONTHLY AVERAGE MINIMUM		MEASUREMENT FREQUENCY	SAMPLE TYPE		
Biochemical Oxygen Demand ₅ – Percent Removal (Note 2)	%	65		once/quarter***	calculated		
Total Suspended Solids – Percent Removal (Note 2)	%	65		once/quarter***	calculated		
MONITORING REPORTS SHALL BE SUBMITTED <u>QUARTERLY</u> ; THE FIRST REPORT IS DUE <u>JANUARY 28, 2029</u> .							

- * Monitoring requirement only.
- ** pH is measured in pH units and is not to be averaged.
- *** See table on Page 4 for quarterly sampling requirements

Note 1 - Effluent limitations and monitoring requirements for *E. coli* are applicable only during the recreational season from April 1 through October 31. The Monthly Average Limit for *E. coli* is expressed as a geometric mean. The Weekly Average for *E. coli* will be expressed as a geometric mean if more than one (1) sample is collected during a calendar week (Sunday through Saturday).

Note 2 – Influent sampling is not required when the facility does not discharge effluent during the reporting period. Samples are to be collected prior to any treatment process. Percent removal is calculated by the following formula: $[(\text{Influent} - \text{Effluent}) / \text{Influent}] \times 100\% = \text{Percent Removal}$. The Monthly Average Minimum Percent removal is to be reported as the average of all daily calculated removal efficiencies. Influent samples are to be collected as a grab sample.

Quarterly Minimum Sampling Requirements				
Quarter	Months	<i>E. coli</i>	All Other Parameters	Report is Due
First	January, February, March	Not required to sample.	Sample at least once during any month of the quarter	April 28 th
Second	April, May, June	Sample at least once during any month of the quarter	Sample at least once during any month of the quarter	July 28 th
Third	July, August, September	Sample at least once during any month of the quarter	Sample at least once during any month of the quarter	October 28 th
Fourth	October	Sample once during <u>October</u>	Sample at least once during any month of the quarter	January 28 th
	November & December	Not required to sample.		

B. SCHEDULE OF COMPLIANCE

The facility shall attain compliance with final effluent limitations for Ammonia as soon as reasonably achievable or no later than **10 years** of the effective date of this permit.

1. Within six months of the effective date of this permit, the permittee shall report progress made in attaining compliance with the final effluent limits.
2. The permittee shall submit interim progress reports detailing progress made in attaining compliance with the final effluent limits every 12 months from effective date.
3. Within **10 years** of the effective date of this permit, the permittee shall attain compliance with the final effluent limits.

Please submit progress reports to the Missouri Department of Natural Resources via the Electronic Discharge Monitoring Report (eDMR) Submission System.

C. STANDARD CONDITIONS

In addition to specified conditions stated herein, this permit is subject to the attached Parts I, II, & III standard conditions dated August 1, 2014, May 1, 2013, and March 1, 2015, and hereby incorporated as though fully set forth herein.

D. SPECIAL CONDITIONS

1. Electronic Discharge Monitoring Report (eDMR) Submission System.
 The permittee shall submit an eDMR Permit Holder and Certifier Registration form within **90 days** of the effective date of this permit. Per 40 CFR Part 127 National Pollutant Discharge Elimination System (NPDES) Electronic Reporting Rule, reporting of effluent limits and monitoring shall be submitted by the permittee via an electronic system to ensure a timely, complete, accurate, and nationally-consistent set of data. Visit <http://dnr.mo.gov/pubs/pub2474.pdf> to access the Facility Participation Package which contains the eDMR Permit Holder and Certifier Registration form.

Once the permittee is activated in the eDMR system:

- (a) Discharge Monitoring Reporting Requirements. The permittee must electronically submit compliance monitoring data via the eDMR system. In regards to Standard Conditions Part I, Section B, #7, the eDMR system is currently the only Department approved reporting method for this permit.
- (b) Programmatic Reporting Requirements. The following reports (if required by this permit) must be electronically submitted as an attachment to the eDMR system until such a time when the current or a new system is available to allow direct input of the data:
 - (1) Collection System Maintenance Annual Reports;
 - (2) Schedule of Compliance Progress Reports;

D. SPECIAL CONDITIONS (continued)

- (3) Sludge/Biosolids Annual Reports; and
 - (4) Any additional report required by the permit excluding bypass reporting.
After such a system has been made available by the Department, required data shall be directly input into the system by the next report due date.
 - (c) Other actions. The following shall be submitted electronically after such a system has been made available by the Department:
 - (1) Notices of Intent to discharge (NOIs);
 - (2) Notices of Termination (NOTs); and
 - (3) Bypass reporting. See Special Condition #11 for 24-hr. bypass reporting requirements.
 - (d) Electronic Submissions. To access the eDMR system, use the following link in your web browser: <https://edmr.dnr.mo.gov/edmr/E2/Shared/Pages/Main/Login.aspx>.
 - (e) Waivers from Electronic Reporting. The permittee must electronically submit compliance monitoring data and reports unless a waiver is granted by the Department in compliance with 40 CFR Part 127. The permittee may obtain an electronic reporting waiver by first submitting an eDMR Waiver Request Form: <http://dnr.mo.gov/forms/780-2692-f.pdf>. The Department will either approve or deny this electronic reporting waiver request within 120 calendar days. Only permittees with an approved waiver request may submit monitoring data and reports on paper to the Department for the period that the approved electronic reporting waiver is effective.
2. The full implementation of this operating permit, which includes implementation of any applicable schedules of compliance, shall constitute compliance with all applicable federal and state statutes and regulations in accordance with §644.051.16, RSMo, and the Clean Water Act (CWA) section 402(k); however, this permit may be reopened and modified, or alternatively revoked and reissued:
 - (a) To comply with any applicable effluent standard or limitation issued or approved under Sections 301(b)(2)(C) and (D), 304(b)(2), and 307(a)(2) of the CWA, if the effluent standard or limitation so issued or approved:
 - (1) contains different conditions or is otherwise more stringent than any effluent limitation in the permit; or
 - (2) controls any pollutant not limited in the permit.
 - (b) To incorporate an approved pretreatment program pursuant to 40 CFR 403.8(a).
 3. All outfalls must be clearly marked in the field.
 4. Permittee will cease discharge by connection to a facility with an area-wide management plan per 10 CSR 20-6.010(3)(B) within 90 days of notice of its availability.
 5. Report as no-discharge when a discharge does not occur during the report period.
 6. Changes in existing pollutants or the addition of new pollutants to the treatment facility.
The permittee must provide adequate notice to the Director of the following:
 - (a) Any new introduction of pollutants into the POTW from an indirect discharger which would be subject to section 301 or 306 of CWA if it were directly discharging those pollutants; and
 - (b) Any substantial change in the volume or character of pollutants being introduced into that POTW by a source introducing pollutants into the POTW at the time of issuance of the permit.
 - (c) For purposes of this paragraph, adequate notice shall include information on:
 - (1) the quality and quantity of effluent introduced into the POTW, and
 - (2) any anticipated impact of the change on the quantity or quality of effluent to be discharged from the POTW.
 7. Reporting of Non-Detects:
 - (a) An analysis conducted by the permittee or their contracted laboratory shall be conducted in such a way that the precision and accuracy of the analyzed result can be enumerated.
 - (b) The permittee shall not report a sample result as "Non-Detect" without also reporting the detection limit of the test. Reporting as "Non Detect" without also including the detection limit will be considered failure to report, which is a violation of this permit.
 - (c) The permittee shall provide the "Non-Detect" sample result using the less than sign and the minimum detection limit (e.g. <10).
 - (d) Where the permit contains a Minimum Level (ML) and the permittee is granted authority in the permit to report zero in lieu of the < ML for a specified parameter (conventional, priority pollutants, metals, etc.), then zero (0) is to be reported for that parameter.
 - (e) See Standard Conditions Part I, Section A, #4 regarding proper detection limits used for sample analysis.
 - (f) When calculating monthly averages, one-half of the method detection limit (MDL) should be used instead of a zero. Where all data are below the MDL, the "<MDL" shall be reported as indicated in item (c).

D. SPECIAL CONDITIONS (continued)

8. It is a violation of the Missouri Clean Water Law to fail to pay fees associated with this permit (644.055 RSMo).
9. The permittee shall comply with any applicable requirements listed in 10 CSR 20-9. The permittee has been granted approval for an alternative operational monitoring schedule in accordance with 10 CSR 20-9.010(3). This approval is limited to operational monitoring and does not apply to the certified operator requirements of 10 CSR 20-9.020. The applicable operational monitoring parameters and frequencies for this facility are:

Operational Monitoring Parameter	Frequency
Weather Conditions – Ambient Temperature, Cloud Cover, and Precipitation	once per month
Flow – Influent or Effluent	once per month
pH – Primary Cell	once per month
Dissolved Oxygen – Primary Cell	once per month

10. The permittee shall develop and implement a program for maintenance and repair of the collection system. The recommended guidance is the US EPA’s Guide for Evaluating Capacity, Management, Operation, And Maintenance (CMOM) Programs at Sanitary Sewer Collection Systems (Document number EPA 305-B-05-002) or the Departments’ CMOM Model located at <http://dnr.mo.gov/env/wpp/permits/docs/cmom-template.doc>. For additional information regarding the Departments’ CMOM Model, see the CMOM Plan Model Guidance document at <http://dnr.mo.gov/pubs/pub2574.htm>.

 The permittee shall also submit a report via the Electronic Discharge Monitoring Report (eDMR) Submission System annually, by January 28th, for the previous calendar year. The report shall contain the following information:
 - (a) A summary of the efforts to locate and eliminate sources of excessive infiltration and inflow into the collection system serving the facility for the previous year.
 - (b) A summary of the general maintenance and repairs to the collection system serving the facility for the previous year.
 - (c) A summary of any planned maintenance and repairs to the collection system serving the facility for the upcoming calendar year. This list shall include locations (GPS, 911 address, manhole number, etc.) and actions to be taken.
11. Bypasses are not authorized at this facility unless they meet the criteria in 40 CFR 122.41(m). If a bypass occurs, the permittee shall report in accordance to 40 CFR 122.41(m)(3), and with Standard Condition Part I, Section B, subsection 2.b. Bypasses are to be reported to the Northeast Regional Office during normal business hours or by using the online Sanitary Sewer Overflow/Facility Bypass Application located at: <http://dnr.mo.gov/modnrcag/> or the Environmental Emergency Response hotline at 573-634-2436 outside of normal business hours. Once an electronic reporting system compliant with 40 CFR Part 127, the National Pollutant Discharge Elimination System (NPDES) Electronic Reporting Rule, is available all bypasses must be reported electronically via the new system. Blending, which is the practice of combining a partially-treated wastewater process stream with a fully-treated wastewater process stream prior to discharge, is not considered a form of bypass. If the permittee wishes to utilize blending, the permittee shall file an application to modify this permit to facilitate the inclusion of appropriate monitoring conditions.
12. The facility must be sufficiently secured to restrict entry by children, livestock and unauthorized persons as well as to protect the facility from vandalism.
13. At least one gate must be provided to access the wastewater treatment facility and provide for maintenance and mowing. The gate shall remain closed except when temporarily opened by the permittee to access the facility to perform operational monitoring, sampling, maintenance, or mowing. The gates shall also be temporarily opened for inspections by the Department. The gate shall be closed and locked when the facility is not staffed.
14. At least one (1) warning sign shall be placed on each side of the facility enclosure in such positions as to be clearly visible from all directions of approach. There shall also be one (1) sign placed for every five hundred feet (500') (150 m) of the perimeter fence. A sign shall also be placed on each gate. Minimum wording shall be SEWAGE TREATMENT FACILITY—KEEP OUT. Signs shall be made of durable materials with characters at least two inches (2") high and shall be securely fastened to the fence, equipment or other suitable locations.
15. An Operation and Maintenance (O & M) manual shall be maintained by the permittee and made available to the operator. The O & M manual shall include key operating procedures and a brief summary of the operation of the facility.
16. An all-weather access road shall be provided to the treatment facility.

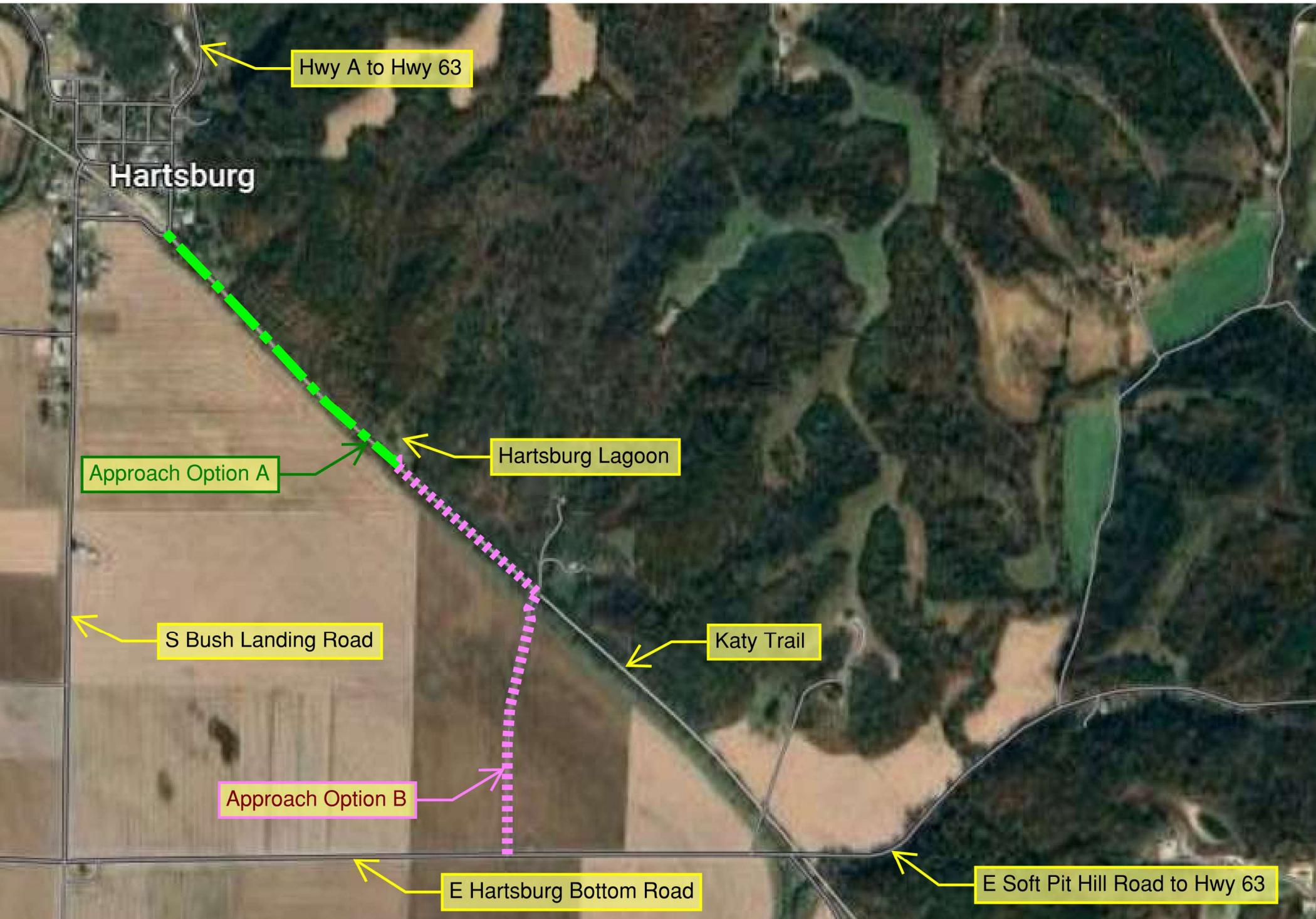
D. SPECIAL CONDITIONS (continued)

17. The discharge from the wastewater treatment facility shall be conveyed to the receiving stream via a closed pipe or a paved or rip-rapped open channel. Sheet or meandering drainage is not acceptable. The outfall sewer shall be protected against the effects of floodwater, ice or other hazards as to reasonably insure its structural stability and freedom from stoppage. The outfall shall be maintained so that a sample of the effluent can be obtained at a point after the final treatment process and before the discharge mixes with the receiving waters.
18. A minimum of two (2) feet freeboard must be maintained in each lagoon cell. A lagoon level gauge, which clearly marks the minimum freeboard level, shall be provided in each lagoon cell.
19. The berms of the lagoon shall be mowed and kept free of any deep-rooted vegetation, animal dens, or other potential sources of damage to the berms.
20. The facility shall ensure that adequate provisions are provided to prevent surface water intrusion into the lagoon and to divert stormwater runoff around the lagoon and protect embankments from erosion.

DATE	DESCRIPTION	INITIALS	REMARKS
10/15/2011	Installation of lagoon level gauge	[Signature]	Installed gauge in Cell 1
10/20/2011	Mowing of lagoon berms	[Signature]	Mowed berms around Cell 1 and Cell 2

The following information was provided to the permittee on 10/15/2011. The permittee is required to maintain the lagoon level gauge and mow the berms as specified in the special conditions. The permittee is also required to provide a copy of this report to the permittee's supervisor. The permittee is also required to provide a copy of this report to the permittee's supervisor. The permittee is also required to provide a copy of this report to the permittee's supervisor.

HARTSBURG LAGOON ACCESS ROUTES



Hwy A to Hwy 63

Hartsburg

Approach Option A

Hartsburg Lagoon

S Bush Landing Road

Katy Trail

Approach Option B

E Hartsburg Bottom Road

E Soft Pit Hill Road to Hwy 63